## Lesson Plan

| Name of Institute          | : Ambala College of Engineering and Applied Research |
|----------------------------|--|
| Name of the Faculty member | : Er. Ajay Kumar                                     |
| Discipline                 | : Mechanical Engineering                             |
| Semester                   | : 8 <sup>th</sup>                                    |
| Subject                    | : Power Plant Engineering                            |
| Lesson Plan Duration       | : 15 weeks (from February 2021 to May 2021)          |
| Work Load                  | : L-4 T-0  |

| WeekLecture dayTopic (including assignment/ test)1**1**Conventional and non-conventional sources of energy2ndGeothermal power plants, Tidal power plants,3rdWindmills, Solar power plants, Solar thermal,4**Solar Photovoltaic: Direct energy conversion systems,2nd1**4**Energy sources in India, Recent developments in power plants,2nd1**2ndHydrology, Rainfall, runoff, hydrographs, flow duration of3rdSite selection for hydro power plants, Classification of hy<br>plants,4**Storage type hydro power plant and its operation, Estimat<br>availability,3rd1**2ndAdvantages and disadvantages of hydro power plants.3rdNumerical Problems4**Numerical Problems4**The Carnot, The ideal Rankine cycle2ndThe Carnot, The ideal Rankine cycle, Superheat,4**Reheat, Regeneration, internally irreversible Rankine cy<br>water heaters, closed type feed water heaters, 15**1**2ndIntroduction to steam generators, Steam generator control   | curves,        |
|---|----------------|
| 2 <sup>nd</sup> Conventional and non-conventional sources of energy     2 <sup>nd</sup> Geothermal power plants, Tidal power plants,     3 <sup>rd</sup> Windmills, Solar power plants, Solar thermal,     4 <sup>th</sup> Solar Photovoltaic: Direct energy conversion systems,     2 <sup>nd</sup> 1 <sup>st</sup> 2 <sup>nd</sup> Ist     2 <sup>nd</sup> Site selection for hydro power plants, Classification of hy plants,     3 <sup>rd</sup> Site selection of water turbines, Combination of hydro power plants,     3 <sup>rd</sup> Ist     2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.     3 <sup>rd</sup> 1 <sup>st</sup> 2 <sup>nd</sup> Numerical Problems     4 <sup>th</sup> Numerical Problems     4 <sup>th</sup> Numerical Problems     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cycle, Superheat,     5 <sup>th</sup> 1 <sup>st</sup> 5 <sup>th</sup> 1 <sup>st</sup>  | curves,        |
| 3rdWindmills, Solar power plants, Solar thermal,4thSolar Photovoltaic: Direct energy conversion systems,2nd1st2ndHydrology, Rainfall, runoff, hydrographs, flow duration of3rdSite selection for hydro power plants, Classification of hy<br>plants,4thStorage type hydro power plant and its operation, Estimati<br>availability,3rd1st2ndStorage type hydro power plant and its operation, Estimati<br>availability,3rd1stSelection of water turbines, Combination of hydro power<br>steam plants,2ndAdvantages and disadvantages of hydro power plants.3rd1stSelection for turbines, Combination of hydro power<br>steam plants,2ndAdvantages and disadvantages of hydro power plants.3rdNumerical Problems4thNumerical Problems & Assignment -14th1st4thNumerical Problems & Assignment -13rdExternally irreversible Rankine cycle3rdFexternally irreversible Rankine cycle, Superheat,4thReheat, Regeneration, internally irreversible Rankine cycle3rd1st5th1st1stTypical layout of steam power plant, Efficiency and heat  | curves,        |
| 2 <sup>nd</sup> 4 <sup>th</sup> Solar Photovoltaic: Direct energy conversion systems,     2 <sup>nd</sup> 1 <sup>st</sup> Energy sources in India, Recent developments in power p     2 <sup>nd</sup> Hydrology, Rainfall, runoff, hydrographs, flow duration of     3 <sup>rd</sup> Site selection for hydro power plants, Classification of hy     9   1 <sup>st</sup> Storage type hydro power plant and its operation, Estimation availability,     3 <sup>rd</sup> 1 <sup>st</sup> Selection of water turbines, Combination of hydro power steam plants,     2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.     3 <sup>rd</sup> 1 <sup>st</sup> Selection, The ideal Rankine cycle     4 <sup>th</sup> Numerical Problems   4 <sup>th</sup> 4 <sup>th</sup> Numerical Problems & Assignment -1     4 <sup>th</sup> 1 <sup>st</sup> The Carnot, The ideal Rankine cycle with Numerical problems     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cycle, Superheat,     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cycle, water heaters, 1     5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat | curves,        |
| 2 <sup>nd</sup> 1 <sup>st</sup> Energy sources in India, Recent developments in power p2 <sup>nd</sup> Hydrology, Rainfall, runoff, hydrographs, flow duration of<br>Site selection for hydro power plants, Classification of hy<br>plants,4 <sup>th</sup> Storage type hydro power plant and its operation, Estimati<br>availability,3 <sup>rd</sup> 1 <sup>st</sup> 2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.3 <sup>rd</sup> 1 <sup>st</sup> 2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.3 <sup>rd</sup> 1 <sup>st</sup> 2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.3 <sup>rd</sup> 1 <sup>st</sup> 2 <sup>nd</sup> The Carnot, The ideal Rankine cycle2 <sup>nd</sup> The Carnot, The ideal Rankine cycle, Superheat,4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy<br>water heaters, closed type feed water heaters, 15 <sup>th</sup> 1 <sup>st</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat   | curves,        |
| 2nd   Hydrology, Rainfall, runoff, hydrographs, flow duration of 3rd     3rd   Site selection for hydro power plants, Classification of hy plants,     4th   Storage type hydro power plant and its operation, Estimate availability,     3rd   1st     Selection of water turbines, Combination of hydro power steam plants,     2nd   Advantages and disadvantages of hydro power plants.     3rd   1st     Selection of water turbines, Combination of hydro power plants.     3rd   Numerical Problems     4th   1st     4th   Numerical Problems & Assignment -1     4th   1st     3rd   Externally irreversible Rankine cycle     3rd   Externally irreversible Rankine cycle, Superheat,     4th   1st     1st   The Carnot, The ideal Rankine cycle, Superheat,     3rd   Externally irreversible Rankine cycle, Superheat,     5th   1st     1st   Typical layout of steam power plant, Efficiency and heat  | curves,        |
| 3rd   Site selection for hydro power plants, Classification of hy plants,     4th   Storage type hydro power plant and its operation, Estimate availability,     3rd   1st     Selection of water turbines, Combination of hydro power steam plants,     2rd   Advantages and disadvantages of hydro power plants.     3rd   1st     Selection of water turbines, Combination of hydro power plants.     3rd   Numerical Problems     4th   Numerical Problems     4th   Numerical Problems & Assignment -1     4th   1st     The Carnot, The ideal Rankine cycle     3rd   Externally irreversible Rankine cycle, Superheat,     4th   Reheat, Regeneration, internally irreversible Rankine cy water heaters, closed type feed water heaters, 1     5th   1st     Typical layout of steam power plant, Efficiency and heat  | -              |
| 3 <sup>rd</sup> 1 <sup>st</sup> Selection for hydro power plants, classification of hydro power stimulation of hydro power steam plants,     3 <sup>rd</sup> 1 <sup>st</sup> Selection of water turbines, Combination of hydro power steam plants,     2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.     3 <sup>rd</sup> 1 <sup>st</sup> Selection of water turbines, Combination of hydro power steam plants,     2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.     3 <sup>rd</sup> Numerical Problems     4 <sup>th</sup> Numerical Problems & Assignment -1     4 <sup>th</sup> 1 <sup>st</sup> The Carnot, The ideal Rankine cycle     3 <sup>rd</sup> Externally irreversible Rankine cycle, Superheat,     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy water heaters, closed type feed water heaters, 1     5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat   | 1              |
| 3rd4thStorage type hydro power plant and its operation, Estimat<br>availability,3rd1stSelection of water turbines, Combination of hydro power<br>steam plants,2ndAdvantages and disadvantages of hydro power plants.3rdNumerical Problems4thNumerical Problems & Assignment -14th1st1stThe Carnot, The ideal Rankine cycle2ndThe Carnot, The ideal Rankine cycle with Numerical problems3rdExternally irreversible Rankine cycle, Superheat,4th1st1stReheat, Regeneration, internally irreversible Rankine cycle, Superheat,5th1st1stTypical layout of steam power plant, Efficiency and heat   | /dro power     |
| 3 <sup>rd</sup> 1 <sup>st</sup> Selection of water turbines, Combination of hydro power<br>steam plants,2 <sup>nd</sup> Advantages and disadvantages of hydro power plants.3 <sup>rd</sup> Numerical Problems4 <sup>th</sup> Numerical Problems & Assignment -14 <sup>th</sup> 1 <sup>st</sup> 1 <sup>st</sup> The Carnot, The ideal Rankine cycle2 <sup>nd</sup> The Carnot, The ideal Rankine cycle with Numerical pro3 <sup>rd</sup> Externally irreversible Rankine cycle, Superheat,4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy<br>water heaters, closed type feed water heaters, 15 <sup>th</sup> 1 <sup>st</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat   | tion of power  |
| Advantages and disadvantages of hydro power plants.     3 <sup>rd</sup> Numerical Problems     4 <sup>th</sup> Numerical Problems & Assignment -1     4 <sup>th</sup> 1 <sup>st</sup> The Carnot, The ideal Rankine cycle     2 <sup>nd</sup> The Carnot, The ideal Rankine cycle with Numerical pro     3 <sup>rd</sup> Externally irreversible Rankine cycle, Superheat,     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy water heaters, closed type feed water heaters, 1     5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat   | plants with    |
| 4 <sup>th</sup> Numerical Problems     4 <sup>th</sup> 1 <sup>st</sup> 1 <sup>st</sup> The Carnot, The ideal Rankine cycle     2 <sup>nd</sup> The Carnot, The ideal Rankine cycle with Numerical problems     3 <sup>rd</sup> Externally irreversible Rankine cycle, Superheat,     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy     5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat  |                |
| 4 <sup>th</sup> 1 <sup>st</sup> The Carnot, The ideal Rankine cycle     2 <sup>nd</sup> The Carnot, The ideal Rankine cycle with Numerical program     3 <sup>rd</sup> Externally irreversible Rankine cycle, Superheat,     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cycle water heaters, 1     5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat  |                |
| 2 <sup>nd</sup> The Carnot, The ideal Rankine cycle     2 <sup>nd</sup> The Carnot, The ideal Rankine cycle with Numerical pro     3 <sup>rd</sup> Externally irreversible Rankine cycle, Superheat,     4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy     5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat  |                |
| 3rd   Externally irreversible Rankine cycle with Numerical product of the ideal Rankine cycle. Superheat,     4th   Reheat, Regeneration, internally irreversible Rankine cy water heaters, closed type feed water heaters, 1     5th   1st     Typical layout of steam power plant, Efficiency and heat  |                |
| 4 <sup>th</sup> Reheat, Regeneration, internally irreversible Rankine cy water heaters, closed type feed water heaters, 1   5 <sup>th</sup> 1 <sup>st</sup> Typical layout of steam power plant, Efficiency and heat  | oblem          |
| Sthe Ist Typical layout of steam power plant, Efficiency and heat   |                |
| <sup>5<sup>th</sup></sup> I <sup>st</sup> Typical layout of steam power plant, Efficiency and heat  | cle, open feed |
| 2 <sup>nd</sup> Introduction to steam generators. Steam generator control   | rate.          |
|   | 1              |
| <sup>3<sup>rd</sup></sup> Fluidized bed boilers, Modern high pressure boilers   |                |
| <sup>4<sup>th</sup></sup> Supercritical boilers, Ultra supercritical technology, Adva<br>supercritical technology   | anced Ultra    |
| <sup>6<sup>th</sup></sup> I <sup>st</sup> Flue gas de-nitrification and desulphurization, fabric filte baghouses  | ers and        |
| <sup>2<sup>nd</sup></sup> Feed water treatment, Deaeration, Internal treatment,   |                |
| <sup>3<sup>rd</sup></sup> Boiler blowdown, steam purity   |                |
| <sup>4<sup>th</sup></sup> Coal as fuel, classification of coals,  |                |
| 7 <sup>th</sup> I <sup>st</sup> Analysis of coal  |                |
| <sup>2<sup>nd</sup></sup> Coal handling, Dead and live storage,   |                |
| <sup>3<sup>rd</sup></sup> Combustion of coal, combustion equipment for coal bur   |                |
| <sup>4<sup>th</sup></sup> Mechanical stokers, pulverized fuels and burners, Cyclo   | ning           |

| 8 <sup>th</sup>                 | 1 <sup>st</sup> | Low NO <sub>X</sub> burners, Ash handling and disposal, Dust collectors.                         |
|---------------------------------|-----------------|--|
|                                 | 2 <sup>nd</sup> | Heat balance sheet for thermal power plants, environmental aspects of power generations.         |
|                                 | 3 <sup>rd</sup> | Applications of diesel engines in power field  |
|                                 | 4 <sup>th</sup> | Advantages and disadvantages of diesel plants over thermal power plants                          |
| 9 <sup>th</sup> 1 <sup>st</sup> | l <sup>st</sup> | Schematic arrangement of diesel engine power plant, Different<br>systems of diesel power plant   |
|                                 | 2 <sup>nd</sup> | Performance Characteristics, Supercharging, Layout of Diesel Engine<br>power plant.              |
|                                 |                 | Gas turbine cycles, the ideal Brayton cycle, the non-ideal Brayton cycle,e                       |
|                                 | 4 <sup>th</sup> | Modification of the Brayton cycle, Gas turbine characteristics,                                  |
| 10 <sup>th</sup>                | I st            | Combined Cycles: combined cycles with heat recovery boiler, The STAG combined-cycle power plant, |
|                                 | 2 <sup>nd</sup> | Combined cycles with multi-pressure steam, combined cycle for nuclear power plants.              |
|                                 | 3 <sup>rd</sup> | Numerical problems on Gas Turbine  |
|                                 | 4 <sup>th</sup> | Numerical problems on Gas Turbine  |
| 11 <sup>th</sup>                | 1 <sup>st</sup> | Basic theory and terminology, Nuclear fission and fusion processes,                              |
|                                 |                 | Fission chain reaction   |
|                                 | 2 <sup>nd</sup> | Moderation, Fertile materials, Nuclear fuels   |
|                                 | 3 <sup>rd</sup> | General components of nuclear reactor, Different types of reactors                               |
|                                 | 4 <sup>th</sup> | PWR, BWR, GCR  |
| 12 <sup>th</sup>                | 1 st            | LMFBR, CANDU-PHW   |
|                                 | 2 <sup>nd</sup> | India's nuclear power program  |
|                                 | 3 <sup>rd</sup> | Disposal of nuclear waste and related issues   |
|                                 | 4 <sup>th</sup> | Introduction to economics of power generation Different terms and definitions                    |
| 13 <sup>th</sup>                | 1 <sup>st</sup> | Different terms and definitions  |
|                                 | 2 <sup>nd</sup> | Cost analysis, Selection of power plant equipment  |
|                                 | 3 <sup>rd</sup> | Factors affecting economics of generation and distribution of power                              |
|                                 | 4 <sup>th</sup> | Numerical Problems   |
| 14 <sup>th</sup>                | 1st             | Numerical Problems   |
|                                 | 2 <sup>nd</sup> | Performance and operating characteristics of power plants  |
|                                 | 3 <sup>rd</sup> | Calculation of power output;   |
|                                 | 4 <sup>th</sup> | Numerical Problems   |
| 15 <sup>th</sup>                | l st            | Economic load sharing, Tariff for electrical energy.   |
|                                 | 2 <sup>nd</sup> | Numerical on power output, maximum efficiency  |
|                                 | 3 <sup>rd</sup> | Numerical on power output  |
|                                 | 4 <sup>th</sup> |  |
|                                 |                 | Numerical Problems & Assignment -4   |

(Signature of the teacher concerned with date)