

**Seth Jai Parkash Mukand Lal Institute of Engineering & Technology (JMIT), Radaur**

**Department of Mechanical Engineering**

**Lesson Plan**

| <b>Name of the Faculty:</b>                                       |                        | Dr. Sonam Sandhu                                                                                                             |                                                                                        |            |
|-------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------|
| <b>Discipline:</b>                                                |                        | B.Tech. Mechanical & Mechatronics Engg. (Additive Manufacturing)                                                             |                                                                                        |            |
| <b>Semester:</b>                                                  |                        | 5 <sup>th</sup>                                                                                                              |                                                                                        |            |
| <b>Subject:</b>                                                   |                        | Heat Transfer                                                                                                                |                                                                                        |            |
| <b>Subject Code:</b>                                              |                        | B24-MMAC-301                                                                                                                 |                                                                                        |            |
| <b>Work Load<br/>(Lecture/Practical)<br/>per week (In hours):</b> |                        | <b>L: 3</b>                                                                                                                  | <b>T: 1</b>                                                                            | <b>P:0</b> |
| <b>S.<br/>No</b>                                                  | <b>Lecture<br/>No.</b> | <b>Topic (Including assignment/Test/Quiz)</b>                                                                                | <b>Pedagogy (PPT/Chalk<br/>and Board/Video<br/>Recording/Activity/<br/>Case Study)</b> |            |
| 1.                                                                | L1                     | Definition of heat, modes of heat transfer, basic laws of heat transfer,                                                     | Chalk and Board /PPT                                                                   |            |
| 2.                                                                | L2                     | Application of heat transfer, simple problems                                                                                | Chalk and Board                                                                        |            |
| 3.                                                                | L3                     | Derivation of heat balance equation - steady one dimensional solution for conduction heat transfer in Cartesian              | Chalk and Board                                                                        |            |
| 4.                                                                | L4                     | Derivation of heat balance equation - steady one dimensional solution for conduction heat transfer in cylindrical geometry   | Chalk and Board /PPT                                                                   |            |
| 5.                                                                | L5                     | Derivation of heat balance equation - steady one dimensional solution for conduction heat transfer in and spherical geometry | Chalk and Board                                                                        |            |
| 6.                                                                | L6                     | Concept of conduction and film resistances,                                                                                  | Chalk and Board                                                                        |            |
| 7.                                                                | L7                     | Steady one dimensional heat conduction with and without internal heat generation the plane slab                              | Chalk and Board                                                                        |            |
| 8.                                                                | L8                     | Steady one dimensional heat conduction with and without internal heat generation the cylindrical shell                       | Chalk and Board                                                                        |            |
| 9.                                                                | L9                     | Steady one dimensional heat conduction with and without internal heat generation the spherical shell                         | Chalk and Board                                                                        |            |
| 10.                                                               | L10                    | Heat convection, basic equations                                                                                             | Chalk and Board                                                                        |            |
| 11.                                                               | L11                    | Boundary layer                                                                                                               | PPT/ Chalk and Board                                                                   |            |
| 12.                                                               | L12                    | Forced convection                                                                                                            | Chalk and Board                                                                        |            |
| 13.                                                               | L13                    | External and internal flows                                                                                                  | Chalk and Board                                                                        |            |

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| 14. | L14 | Natural convective heat transfer                                                                  | PPT/ Chalk and Board |
| 15. | L15 | Dimensionless parameters for forced heat transfer                                                 | Chalk and Board      |
| 16. | L16 | Dimensionless parameters for free convection heat transfer                                        | Chalk and Board      |
| 17. | L17 | Boundary layer analogies                                                                          | Chalk and Board      |
| 18. | L18 | Correlations for forced convection                                                                | Chalk and Board      |
| 19. | L19 | Correlations for free convection                                                                  | Chalk and Board      |
| 20. | L20 | Approximate solutions to laminar boundary layer equations (momentum and energy) for internal flow | Chalk and Board      |
| 21. | L21 | Approximate solutions to laminar boundary layer equations (momentum and energy) for external flow | Chalk and Board      |
| 22. | L22 | Interaction of radiation with materials, definitions of radiative properties                      | Chalk and Board      |
| 23. | L23 | Monochromatic and total emissive power                                                            | Chalk and Board      |
| 24. | L24 | Planck's distribution law,                                                                        | Chalk and Board      |
| 25. | L25 | Stefan Boltzman's law                                                                             | Chalk and Board      |
| 26. | L26 | Wien's displacement law,                                                                          | Chalk and Board      |
| 27. | L27 | Kirchoff's law                                                                                    | Chalk and Board      |
| 28. | L28 | Types of heat exchangers                                                                          | PPT/ Chalk and Board |
| 29. | L29 | Overall heat transfer coefficient, fouling factor                                                 | PPT/Chalk and Board  |
| 30. | L30 | Analysis and design of heat exchangers using logarithmic mean temperature difference              | PPT/Chalk and Board  |
| 31. | L31 | NTU method                                                                                        | Chalk and Board      |
| 32. | L32 | Effectiveness of heat exchangers                                                                  | Chalk and Board      |
| 33. | L33 | Multipass heat exchangers                                                                         | Chalk and Board      |
| 34. | L34 | Applications of heat exchangers.                                                                  | PPT/Video            |

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**Department of Mechanical Engineering**

**Lesson Plan**

| <b>Name of the Faculty:</b>                                       |                        | Dr. Pankaj Sharma                                                                                                              |                                                                                        |            |
|-------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------|
| <b>Discipline:</b>                                                |                        | B.Tech. Mechanical & Mechatronics Engg. (Additive Manufacturing)                                                               |                                                                                        |            |
| <b>Semester:</b>                                                  |                        | 5 <sup>th</sup>                                                                                                                |                                                                                        |            |
| <b>Subject:</b>                                                   |                        | Design of Machine Elements                                                                                                     |                                                                                        |            |
| <b>Subject Code:</b>                                              |                        | B24-MMAC-307                                                                                                                   |                                                                                        |            |
| <b>Work Load<br/>(Lecture/Practical)<br/>per week (In hours):</b> |                        | <b>L: 2</b>                                                                                                                    | <b>T: 4</b>                                                                            | <b>P:0</b> |
| <b>S.<br/>No</b>                                                  | <b>Lecture<br/>No.</b> | <b>Topic (Including assignment/Test/Quiz)</b>                                                                                  | <b>Pedagogy (PPT/Chalk<br/>and Board/Video<br/>Recording/Activity/<br/>Case Study)</b> |            |
| 1.                                                                | L1                     | Definition, Classification of machine design, general consideration in machine design, general procedure in machine design.    | PPT                                                                                    |            |
| 2.                                                                | L2                     | Aesthetic and ergonomic considerations in design, use of standards in design, selection of materials for engineering purposes. | PPT/Case Study                                                                         |            |
| 3.                                                                | L3                     | Mechanical properties of metals                                                                                                | PPT                                                                                    |            |
| 4.                                                                | L4                     | Failures of riveted joint, Strength and efficiency of riveted joint                                                            | PPT/ Chalk and Board                                                                   |            |
| 5.                                                                | L5                     | Failures of riveted joint, Strength and efficiency of riveted joint                                                            | PPT/ Chalk and Board                                                                   |            |
| 6.                                                                | L6                     | Design of boiler joints (longitudinal) as per I. B. R.                                                                         | Chalk and Board                                                                        |            |
| 7.                                                                | L7                     | Design of boiler joints (Circumferential) as per I. B. R.                                                                      | Chalk and Board                                                                        |            |
| 8.                                                                | L8                     | Eccentrically loaded riveted joints.                                                                                           | Chalk and Board                                                                        |            |
| 9.                                                                | L9                     | Eccentrically loaded riveted joints. (Assignment)                                                                              | Chalk and Board                                                                        |            |
| 10.                                                               | L10                    | Types of welded joints, strength of welds under axial load                                                                     | PPT                                                                                    |            |
| 11.                                                               | L11                    | Types of welded joints, strength of welds under axial load                                                                     | PPT/Chalk and Board                                                                    |            |
| 12.                                                               | L12                    | Types of welded joints, strength of welds under axial load                                                                     | PPT/Chalk and Board                                                                    |            |
| 13.                                                               | L13                    | Welds under eccentric loading.                                                                                                 | Chalk and Board                                                                        |            |
| 14.                                                               | L14                    | Welds under eccentric loading.                                                                                                 | Chalk and Board                                                                        |            |
| 15.                                                               | L15                    | Weld joints subjected to bending moment.                                                                                       | Chalk and Board                                                                        |            |

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| 16. | L16 | Introduction to flexible drives, Types of belts, Belt material                                | PPT/Video            |
| 17. | L17 | Belt tension ratio of flat and V-belt.                                                        | Chalk and Board      |
| 18. | L18 | Belt tension ratio of flat and V-belt.                                                        | Chalk and Board      |
| 19. | L19 | Design procedure flat belt using manufacturer's catalogue, Selection of V-Belts.              | Chalk and Board      |
| 20. | L20 | Design procedure flat belt using manufacturer's catalogue, Selection of V-Belts. (Assignment) | Chalk and Board      |
| 21. | L21 | Shaft design against static load (as per ASME code).                                          | Chalk and Board      |
| 22. | L22 | Design of shaft for torsional rigidity                                                        | Chalk and Board      |
| 23. | L23 | Keys: types of keys, design of square and flat keys.                                          | PPT/Video            |
| 24. | L24 | Types of clutches                                                                             | PPT/Video            |
| 25. | L25 | Torque transmitting capacity, friction materials                                              | PPT/ Chalk and Board |
| 26. | L26 | Design of friction type: single disc, multi-disc and cone clutches.                           | Chalk and Board      |
| 27. | L27 | Design of friction type: single disc, multi-disc and cone clutches.                           | Chalk and Board      |
| 28. | L28 | Design of friction type: single disc, multi-disc and cone clutches. (Assignment)              | Chalk and Board      |
| 29. | L29 | Types of rolling contact bearing, selection of bearing-type.                                  | PPT/Video            |
| 30. | L30 | Static and dynamic load carrying capacity, equivalent bearing load, load-life relationship    | PPT/Video            |
| 31. | L31 | Selection of ball bearings from manufacturer's catalogue.                                     | Chalk and Board      |
| 32. | L32 | Selection of ball bearings from manufacturer's catalogue.                                     | Chalk and Board      |
| 33. | L33 | Basic modes of lubrication, Raimondi and Boyd method for journal bearing                      | PPT/Video            |
| 34. | L34 | Bearing design-selection of parameters, bearing materials                                     | Chalk and Board      |
| 35. | L35 | Bearings failure causes and remedies. (Assignment)                                            | PPT                  |

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| <b>Name of the Faculty:</b>                                      |             | Dr. Gagandeep Chawla                                                              |      |                                                                     |
|------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------|------|---------------------------------------------------------------------|
| <b>Discipline:</b>                                               |             | B.Tech. Mechanical & Mechatronics Engg. (Additive Manufacturing)                  |      |                                                                     |
| <b>Semester:</b>                                                 |             | 5 <sup>th</sup>                                                                   |      |                                                                     |
| <b>Subject:</b>                                                  |             | Sensors & Actuators                                                               |      |                                                                     |
| <b>Subject Code:</b>                                             |             | B24-MMAC-309                                                                      |      |                                                                     |
| <b>Work Load<br/>(Lecture/Practical)<br/>per week (Inhours):</b> |             | L: 3                                                                              | T: 0 | P: 0                                                                |
| S. No                                                            | Lecture No. | Topic (Including assignment/Test/Quiz)                                            |      | Pedagogy ( PPT/Chalk and Board/Video Recording/Activity/Case Study) |
| 1.                                                               | L1          | <b>Introduction to Sensors:</b><br>Overview of sensors, Classification of Sensors |      | PPT/Chalk and Board                                                 |
| 2.                                                               | L2          | Selection of sensors                                                              |      | PPT/Chalk and Board                                                 |
| 3.                                                               | L3          | Proximity Sensors                                                                 |      | PPT/Chalk and Board                                                 |
| 4.                                                               | L4          | Pneumatic sensors                                                                 |      | PPT/Chalk and Board                                                 |
| 5.                                                               | L5          | Light Sensors                                                                     |      | PPT/Chalk and Board                                                 |
| 6.                                                               | L6          | Ultrasonic Sensors                                                                |      | PPT/Chalk and Board                                                 |
| 7.                                                               | L7          | Digital Optical Encoder                                                           |      | PPT/Chalk and Board                                                 |
| 8.                                                               | L8          | Recent Trends-Smart Pressure Transmitters                                         |      | PPT/Chalk and Board                                                 |
| 9.                                                               | L9          | <b>Applications of Sensors:</b><br>Introduction, Automotive Sensors               |      | PPT/Chalk and Board                                                 |
| 10.                                                              | L10         | Flow-rate Sensors                                                                 |      | PPT/Chalk and Board                                                 |
| 11.                                                              | L11         | Pressure Sensors                                                                  |      | PPT/Chalk and Board                                                 |
| 12.                                                              | L12         | Temperature Sensors                                                               |      | PPT/Chalk and Board                                                 |
| 13.                                                              | L13         | Torque and position sensors                                                       |      | PPT/Chalk and Board                                                 |
| 14.                                                              | L14         | Sensors for Manufacturing                                                         |      | PPT/Chalk and Board                                                 |
| 15.                                                              | L15         | Medical Diagnostic Sensors                                                        |      | PPT/Chalk and Board                                                 |
| 16.                                                              | L16         | Sensors for Environmental Monitoring                                              |      | PPT/Chalk and Board                                                 |
| 17.                                                              | L17         | <b>Actuators:</b><br><b>Mechanical Actuators:</b> General aspects, Machine        |      | PPT/Chalk and Board /Video Recording                                |

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| 18. | L18 | Kinematic Link or Element                                                                 | PPT/Chalk and Board<br>/Video Recording |
| 19. | L19 | Kinematic Pair                                                                            | PPT/Chalk and Board<br>/Video Recording |
| 20. | L20 | Kinematic Chain, Mechanism                                                                | PPT/Chalk and Board<br>/Video Recording |
| 21. | L21 | Inversion of Mechanism                                                                    | PPT/Chalk and Board<br>/Video Recording |
| 22. | L22 | Types of Kinematic Chains and their Inversions                                            | PPT/Chalk and Board<br>/Video Recording |
| 23. | L23 | Gear Drive                                                                                | PPT/Chalk and Board<br>/Video Recording |
| 24. | L24 | Belts and Belt Drive                                                                      | PPT/Chalk and Board                     |
| 25. | L25 | Chains and Chain Drives                                                                   | PPT/Chalk and Board                     |
| 26. | L26 | <b>Hydraulic Actuators:</b> General aspects, Hydraulic Power Supply                       | PPT/Chalk and Board                     |
| 27. | L27 | Pumps, Pressure Regulator                                                                 | PPT/Chalk and Board                     |
| 28. | L28 | Linear Actuators, Rotary Actuators                                                        | PPT/Chalk and Board                     |
| 29. | L29 | <b>Pneumatic Actuators:</b> Introduction, Components of a Pneumatic Systems               | PPT/Chalk and Board                     |
| 30. | L30 | Pneumatic Valves                                                                          | PPT/Chalk and Board                     |
| 31. | L31 | Linear and Rotary Actuators                                                               | PPT/Chalk and Board                     |
| 32. | L32 | <b>Transducers:</b> Introduction, Definition of Transducer, Classification of Transducers | PPT/Chalk and Board                     |
| 33. | L33 | Electromechanical Transducers                                                             | PPT/Chalk and Board                     |
| 34. | L34 | Transducers Actuating Mechanisms                                                          | PPT/Chalk and Board                     |
| 35. | L35 | Resistance Transducers                                                                    | PPT/Chalk and Board                     |
| 36. | L36 | Variable Inductance Transducers                                                           | PPT/Chalk and Board                     |
| 37. | L37 | Capacitive Transducers                                                                    | PPT/Chalk and Board                     |
| 38. | L38 | Piezoelectric Transducers                                                                 | PPT/Chalk and Board                     |
| 39. | L39 | Hall Effect Transducers                                                                   | PPT/Chalk and Board                     |
| 40. | L40 | Thermoelectric Transducers                                                                | PPT/Chalk and Board                     |