**Department of Mechanical Engineering**

**Course Plan**

**Sub Name: ME8693-HEAT AND MASS TRANSFER**

**Year/Sem: III / VI**

**Staff Name: Mr.VEERAPANDIAN.K**

**Academic Year: 2022-2023**

**EVEN Semester**

**UNIT I - CONDUCTION**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **TOPICS** | **Lecture Hours** | **Book /**  **Chapter/**  **Pages** | **Teaching Aids/ Method** | **Instructional Delivery Level** | **CO** | **PO/ PSO** |
|  | 1.1.General Differential equationof Heat  Conduction | 1 | RB2/ch1/Pg-3-8 | PPT | Remember | CO1 | PO1/  PSO1 |
|  | 1.2.Cartesian and Polar  Coordinates | 2 | RB2/ch1/ Pg-11-16 | BB | Understand | CO1 | PO1/  PSO1 |
|  | 1.3.OneDimensional Steady StateHeat Conduction | 3 | RB2/ch1/ Pg-16 | BB | Understand | CO1 | PO1/  PSO1 |
|  | 1.4.Plane and Composite Systems | 4,5 | RB2/ch1/ Pg-18-22 | BB | Understand | CO1 | PO1/  PSO1 |
|  | 1.5.Conduction with  Internal Heat Generation | 6,7 | RB2/ch1/ Pg-23-29 | BB | Understand | CO1 | PO1/  PSO1 |
|  | 1.6.Extended Surfaces | 8,9 | RB2/ch1/ Pg-31-37 | ACTIVITY | Understand | CO1 | PO1/  PSO1 |
|  | 1.7.Unsteady Heat Conduction | 10,11 | RB2/ch1/ Pg-38-56 | BB | Apply | CO1 | PO1/  PSO1 |
|  | 1.8.Lumped Analysis | 12,13 | RB2/ch1/ Pg-57-66 | BB | Analysis | CO1 | PO1/  PSO1 |
|  | 1.9.Semi Infinite and  Infinite  Solids | 14 | RB2/ch1/ Pg-68-72 | BB | Analysis | CO1 | PO1/  PSO1 |
|  | 1.10.Use of Heisler’s  charts | 15 | RB2/ch1/ Pg-73-89 | BB | Analysis | CO1 | PO1/  PSO1 |

**Activities:**

**Step 1:** Different types of fins collected.(CPU Mother board,IC Engine block)

**Step 2:** Fins categorized and identified by its shape.

**Step 3:** Type of heat transfer identified and opted formula choosen by It’s shapes.

**Step 4:** The teacher will correct their assignments and discuss about their mistakes.

**UNIT II- CONVECTION**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **TOPICS** | **Lecture hours** | **Books/ Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/ PSO** |
|  | 2.1.Free and Forced  Convection | 16,17,18 | RB2/ch2/ Pg-90-120 | BB | Remember | CO2 | PO1/ PSO1 |
|  | 2.2.Hydrodynamic and  Thermal Boundary Layer | 19,20,21 | RB2/ch2/ Pg-121-143 | BB | Understand | CO2 | PO1/ PSO2 |
|  | 2.3.Free and Forced Convection during  external flow over Plates | 22,23,24 | RB2/ch2/ Pg-144-160 | BB | Remember | CO2 | PO1/ PSO1 |
|  | 2.4.Free and Forced Convection during  external flow over  Cylinders | 25,26,27 | RB2/ch2/ Pg-162-173 | BB | Understand | CO2 | PO1/ PSO2 |
|  | 2.5.Free and Forced Convection in  Internal flow through tubes | 28,29,30 | RB2/ch2/ Pg-174-189 | BB | Understand | CO2 | PO1/ PSO2 |

**Activities:**

**Step 1:** A rectangle plate should be taken.

**Step 2:** Plate heated by heat source.

**Step 3:** Air blown over the plate.

**Step 4:** Temperature distribution taken in different location of plate.

**UNIT III - PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **TOPICS** | **Lecture Hours** | **Books / Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/ PSO** |
|  | 3.1.Nusselt’s theory of  condensation | 31,32 | RB1/ch5/ Pg-170-174 | PPT | Remember | CO3 | PO3/ PSO1 |
|  | 3.2.Regimes of Pool boiling an Flow boiling | 33 | RB1/ch5/ Pg-175-176 | activity | Understand | CO3 | PO3/ PSO2 |
|  | 3.3.Correlations in boiling  and condensation | 34,35 | RB1/ch5/ Pg-176-177 | BB | Apply | CO3 | PO3/ PSO2 |
|  | 3.4.Heat Exchanger Types | 36,37 | RB1/ch5/ Pg-177-198 | PPT | Understand | CO3 | PO3/ PSO2 |
|  | 3.5.Overall Heat Transfer  Coefficient | 38,39 | RB1/ch5/ Pg-230-236 | BB | Apply | CO3 | PO3/ PSO2 |
|  | 3.6.Fouling Factors | 40,41 | RB1/ch5/ Pg-249-250 | BB | Apply | CO3 | PO3/ PSO1 |
|  | 3.7.Analysis – LMTD method | 42,42 | RB1/ch5/ Pg-250-253 | BB | Understand | CO3 | PO3/ PSO2 |
|  | 3.8.NTU method | 43,44 | RB1/ch5/ Pg-253-290 | BB | Apply | CO3 | PO3/ PSO2 |

**Activities:**

**Step 1:** take water in a metal bucket.

**Step 2:** heat the tub by bucket.

**Step 3:** watch the movements.

**Step 4:** bubbles will form, develop and evaporate.

**UNIT IV - RADIATION**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.**  **No.** | **TOPICS** | **Lecture Hour** | **Books referred/ Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/**  **PSO** |
|  | 4.1.Black Body Radiation | 45,46 | RB2/ ch4/ Pg-110 | BB | Remember | CO4 | PO3/  PSO1 |
|  | 4.2.rey body radiation | 47,48 | RB2/ ch4/ Pg-112-120 | BB | Understand | CO4 | PO3/  PSO2 |
|  | 4.3.Shape Factor | 49,50 | RB2/app B/ Pg-121-132 | BB | Understand | CO4 | PO3/  PSO2 |
|  | 4.4.Electrical Analogy  Radiation | 51,52,53 | RB2/ ch4/ Pg-133-139 | BB | Understand | CO4 | PO3/ PSO2 |
|  | 4.5.Shields. | 54,55,56 | RB2/ ch4/ Pg-140-154 | PPT | Understand | CO4 | PO3/ PSO2 |
|  | 4.6.Radiation through gases. | 57,58,59,  60 | RB2/ ch4/ Pg-155-164 | ACTIVITY | Understand | CO4 | PO3/  PSO2 |

**Activities:**

**Step 1:**.Take a hot metal plate.

**Step 2:** Locate the plate in to atmosphere air.

**Step 3:** Measure the temperature near the plate and away from plate.

**Step 4:** Radiation identified.

**UNIT V – MASS TRANSFER**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.**  **No.** | **TOPICS** | **Lecture Hour** | **Books referred/ Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/**  **PSO** |
|  | 5.1.Basic Concepts | 61,62 | RB1/ch14/ Pg-259-261 | PPT | Understand | CO5 | PO3/ PSO1 |
|  | 5.2.Diffusion Mass  Transfer | 63,64 | RB1/ch14/ Pg-265-286 | BB | Remember | CO5 | PO3/ PSO2 |
|  | 5.3.Fick’s Law of  Diffusion | 65,66 | RB1/ch14/ Pg-265-286 | BB | Remember | CO5 | PO3/ PSO2 |
|  | 5.4.Steady state Molecular  Diffusion | 67,68 | RB1/ch14/ Pg-365-384 | BB | Understand | CO5 | PO3/ PSO2 |
|  | 5.5.Convective Mass  Transfer | 69,70 | RB1/ch14/ Pg-365-384 | BB | Understand | CO5 | PO3/ PSO2 |
|  | 5.6.Momentum, Heat and Mass TransferAnalogy. | 71,72 | RB1/ch14/ Pg-388-431 | BB | Remember | CO5 | PO3/ PSO2 |
|  | 5.7.Convective Mass  Transfer Correlations. | 73,74,75 | RB1/ch14/ Pg-433-450 | PPT | Remember | CO5 | PO3/ PSO2 |

**Content beyond syllabus**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Topics** | **Lecture hours** | **Books / Chapter** | **Teaching aids** | **Instructional Delivery Level** | **PO / PSO** |
|
| 1 | Condensation on different Shape-Analysis | 76,77 | RB2/ch8/ Pg-100-109 | PPT | Understand | PO3/  PSO3 |  |  |

**Signature of the Staff Signature of the HOD**