

K. D. K. COLLEGE OF ENGINEERING, NAGPUR

Department of Mechanical Engineering

Session 2017 – 2018

Department: Mechanical Engineering Subject: Heat Transfer

Sub. Code No. : BEME504T Period/ Week: 03 + 01

Semester: Fifth Semester

| Lecture No. | Teaching Unit Code | Contents |
|-------------|--------------------|---|
| UNIT NO. 01 | | |
| 1 | 101 | Introduction to basic modes of heat transfer, conduction, convection & radiation. Laws of heat transfer & conservation of energy requirement. |
| 2 | 102 | General heat conduction equation in cartesian, coordinates. |
| 3 | 103 | General heat conduction equation in cylindrical coordinates. |
| 4 | 104 | General heat conduction equation in spherical coordinates. |
| 5 | 105 | One dimensional steady state heat conduction equation for the plane wall, cylinder and sphere,. |
| 6 | 106 | One dimensional steady state heat conduction equation for the plane wall, cylinder and sphere |
| 7 | 107 | Overall heat transfer coefficient, Thermal resistance of composite structure, contact resistance, |
| 8 | 108 | Variable thermal conductivity, critical thickness of insulation. |
| UNIT NO. 02 | | |
| 9 | 201 | Conduction with internal heat generation for plane wall, cylinder. |
| 10 | 202 | Conduction with internal heat generation for cylinder and sphere. |
| 11 | 203 | Extended surface, types of fins. Fins of uniform cross section area, temperature distribution. |
| 12 | 204 | Fins heat transfer rate, fin efficiency & effectiveness. |
| 13 | 205 | Error in temperature measurement. |
| 14 | 206 | Unsteady state heat transfer, lumped heat capacity analysis, |
| 15 | 207 | lumped heat capacity analysis |
| 16 | 208 | Heisler's charts. Biot Number, Fourier's Number & its significance. |
| UNIT NO. 03 | | |
| 17 | 301 | Forced convection, physical significance of non-dimensional parameter. |
| 18 | 302 | Flow of high, moderate & low Prandtl number, fluid flow over a flat plate. |
| 19 | 303 | Concept of hydrodynamics & thermal boundary layer thickness, local and average heat transfer coefficient. |
| 20 | 304 | Empirical co-relations for external through conduits. |
| 21 | 305 | Empirical co-relations for internal flow through conduits. |
| 22 | 306 | Empirical co-relations for laminar flows through conduits. |
| 23 | 307 | Empirical co-relations for turbulent flow through conduits. |
| 24 | 308 | Dimensional analysis applied to forced convection. |

| UNIT NO. 04 | | |
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| 25 | 401 | Free or natural convection. |
| 26 | 402 | Grashoff's number, Rayleigh number, flow over horizontal and vertical plate, |
| 27 | 403 | Empirical Co-relations for cylinders and spheres, |
| 28 | 404 | heat transfer with phase change, pool boiling curve & regimes of pool boiling, |
| 29 | 405 | Film & Drop wise condensation, laminar film condensation on vertical surface, |
| 30 | 406 | Film & Drop wise condensation, laminar film condensation on on horizontal tubes, |
| 31 | 407 | Effect of super heated & non-condensable gases on condensation heat transfer, |
| 32 | 408 | Dimensional analysis applied to free or Natural convection. |
| UNIT NO. 05 | | |
| 33 | 501 | Radiation, spectrum of radiation, black body radiation, radiation intensity, |
| 34 | 502 | laws of radiation-Kirchoffs, Plancks, Weins displacement law, Stefan Boltzmann & Lamberts Co-sine law. |
| 35 | 503 | Emissivity, Absorbivity, Transmissivity, Reflectivity, Radiosity, Emissive power, Irradiation. |
| 36 | 504 | Radiation network, radiation exchange between parallel plate cylinder & sphere, |
| 37 | 505 | shape factor & its laws, |
| 38 | 506 | Radiation between parallel plates, cylinder. |
| 39 | 507 | Radiation between cylinder & spheres. |
| 40 | 508 | Radiation shields. |
| UNIT NO. 06 | | |
| 41 | 601 | Heat exchanger : Classification, |
| 42 | 602 | overall heat transfer coefficient, fouling factor, |
| 43 | 603 | LMTD & effectiveness, |
| 44 | 604 | NTU method of heat exchanger analysis for parallel, counter flow & cross flow arrangement, |
| 45 | 605 | design aspect of heat exchangers, |
| 46 | 606 | Introduction to compact heat exchanger, |
| 47 | 607 | Heat Pipe, |
| 48 | 608 | Introduction to mass transfer. |