

# GUJARAT TECHNOLOGICAL UNIVERSITY

## B. E. SEMESTER: VI Automobile Engineering

Subject Name: **Automobile Heat Transfer**

Subject Code: **160202**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
4	0	2	6	70	30	50

Sr. No.	Course Contents	Total Hrs
1.	<b>Heat Transfer by Conduction:</b>  Fourier's law. General heat conduction equation in Cartesian coordinates and its transformation to cylindrical. Electrical analogy concept of overall heat transfer coefficient. One-dimensional steady-state heat conduction from plane wall, cylindrical wall and composite wall. Critical thickness of insulation for cylinder and sphere. Heat flow through plane wall with variable thermal conductivity. One dimensional steady state heat conduction with uniform heat generation through plane wall; hollow cylinder and solid cylinder. Heat transfer from extended surfaces. Efficiency and effectiveness in various configuration; unsteady state heat conduction with negligible internal resistance.	10
2.	<b>Heat Transfer by Convection:</b>  Fundamentals of convection. Mechanism of forced convective heat transfer with laminar and turbulent boundary layer. Dimensional and analytical analysis of the process; significance of non dimensional numbers empirical and theoretical co-relations for flat plate, pipe and bank of tubes. Heat transfer by free convection. Effect of surface configuration; mechanism of process and heat transfer correlations.	12
3.	<b>Heat Transfer with change of phase:</b>  Phenomenon of boiling, nucleation, regimes of boiling, phenomenon of condensation, film wise and drop wise condensation on vertical plate, heat pipe.	10

4.	<p><b>Heat Transfer by Radiation:</b></p> <p>Physical mechanism. Surface emission properties, surface irradiation properties, concept of black body. Kirchoff's law of radiation. Intensity of radiation and its relation, radiosity, Lambert's cosine law, Stefan Boltzmann law, Planck's distribution law, Wein's displacement law, Emissivity, real surface behavior, gray surface behaviors, radiation heat exchange between gray bodies, electrical network method for radiant heat exchange between gray and black surfaces, radiation shield.</p>	12
5.	<p><b>Heat Exchangers:</b></p> <p>Classification of heat exchanger. Analysis including LMTD, Effectiveness, fouling mechanism, growth and design to minimize fouling. Small types of heat exchangers.</p> <p>Plate-Fin heat exchangers, construction and configuration, advantages and disadvantages.</p> <p>Heat transfer features, pressure drop, laminar and turbulent flow and thermal performances.</p> <p>Air cooled heat exchanger, construction, fin requirements, pressure drops and overall heat transfer coefficients.</p> <p>Design criteria for air cooled engine: heat transfer &amp; fin design.</p> <p>Heat exchanger test including geometrical similarity, thermal balance and flow test, endurance test.</p>	8
6.	<p>Radiator construction, Engine Cooling system construction, coolant properties. Design parameters for radiator &amp; water pump design, hoses, Thermostat Valve, Radiators Cap, Radiator fan, Radiator Fan shroud, Surge Tank. Design parameters and Synchronization of vehicular Engine cooling system for dissipation of heat generated in Engine.</p>	12

### **Text Books:**

1. Heat and mass transfer by D.S. Kumar, S.K.Kataria & Sons
2. Fundamentals of Heat and mass transfer by Incropera & Dewitt

### **Reference Books:**

1. Heat Transfer by Sukhatme
2. Heat transfer by Gield
3. Heat transfer by kreith, TMH
4. Heat and Mass Transfer by R.K. Rajput, S. Chand & Company Ltd., New Delhi.
5. Heat Transfer – A Practical approach by – Yunus Cengel, Tata McGraw Hill