HOCHSCHULE FURTWANGEN UNIVERSITY HFU

Elective Module

Course

Heat Transfer

Course Code	Workload	Credits/LP	Semester	Frequency of course	Duration
FH 26883	90 h	3		Every semester	1 semester

	Teaching language	Contact hours	Hours of Self-study	Class size
1	German	33,75 h	56,25 h	20

2 Learning outcomes

After successful completion of the course, the students are capable to…

Knowledge (1):
… describe the different methods of averaging temperatures,

Comprehension (2):
… identify and distinguish flow arrangements in heat exchangers,
… list dimensionless numbers of heat transport and interpret them with regard to their physical significance,

Application (3):
… calculate dimensionless numbers and coefficients in heat transfer,
… select the ε,NTU equation appropriate to the flow arrangement and use it to calculate the size of heat exchangers (thermal design),

Analysis (4):
… identify and itemize which mechanisms of heat transfer are relevant or irrelevant in specific applications,

Synthesis (5):
… explain which calculation method (ε,NTU or LMTD) is more appropriate for which task,

Evaluation (6):
… assess whether assumptions underlying calculation methods are met or violated.

3 Content

The course is confined to the fundamentals that a project engineer needs for the thermal design of heat exchangers. This approach is more practical and easier to understand than many textbooks because the path from the apparatus goes step by step to the transport mechanisms instead of the other way around. For this purpose, subfields of heat transfer, such as thermal radiation, are omitted.

Temperature averaging (temporal, cross-sectional, along flow path) – flow arrangements – types of heat exchangers – thermal design (ε,NTU vs. LMTD vs. graphical) – dimensional analysis & numbers – heat conduction – convective heat transport – finned surfaces – fouling.

4	Teaching methods Lecture with calculated examples
5	Prerequisites Basics of engineering thermodynamics (1st and 2nd law; thermodynamic properties); Mathematics 1+2
6	Methods of assessment Oral exam
7	Applicability of course Elective course
8	Lecturer Prof. Dr.-Ing. Rüdiger Kukral
9	Reading list (Core texts and recommended texts) Baehr, H.D.; Stephan, K.: *Wärme- und Stoffübertragung*, 8. Aufl.; Springer-Vieweg (2013) Böckh, P.; Wetzel, TH.: *Wärmeübertragung*, 6. Aufl.; Springer-Vieweg (2015) Incropera, F.P.; DeWitt, D.P.; Bergman, T.L.; Lavine, A.S.: *Principles of Heat and Mass Transfer: International Student Version*, 7. Aufl.; Wiley-VCH (2012) Welty, J.R.; Wicks, C.E.; Rorrer, G.L.; Wilson, R.E.: *Fundamentals of Momentum, Heat and Mass Transfer*, 5. Aufl.; Wiley-VCH (2008)