University of Split

Department of Professional Studies

TECHNICAL THERMODYNAMICS

COURSE SYLLABUS

COURSE DETAILS		
Type of study programme	Professional study - 180 ECTS	
Study programme	MECHANICAL ENGINEERING	
Course title	Technical Thermodynamics	
Course code	SKS017	
ECTS (Number of credits allocated)	5	
Course status	Core	
Year of study	Second	
Semester	Third (fall)	
Course Web site	http://www.oss.unist.hr/	
Total lesson hours per semester	Lectures	30
	Practicals	30
	Laboratory exercises & practical demonstration	0
Prerequisite(s)	None	
Lecturer(s)	Department of Mechanical Engineering: Zlatko Jankoski, Ph.D., College professor	
Language of instruction	Croatian, English	

COURSE DESCRIPTION	
Course Objectives:	- understanding basic laws, principles and phenomena in the area of technical thermodynamics - to solve simplified examples of thermodynamic processes - theoretical and practical preparation enabling students to apply the acquired knowledge and skills in professional and specialist courses.
Learning outcomes *On successful completion of this course, student should be able to:*	1. define basic terms, values and laws in the areas of first and second law of thermodynamics, steam and steam power cycles, heat transfer and thermodynamics of moist air, 2. describe methods of implementing thermodynamic laws and phenomena while analysing the operational parameters of simple thermodynamic problems, systems and machines, 3. practically apply thermodynamic tables and diagrams, and equations that define the associated laws 4. calculate and optimise thermodynamic parameters of thermodynamic problems, systems and machines, 5. explain the correlation between different thermodynamic operational parameters, 6. select engineering approach to problem solving based on the acquired physics and mathematical knowledge.
Course content	**Introduction:** Basic concepts of thermodynamics. Fundamental terms. Physical values. Measurement of thermodynamic parameters. Zeroth law of thermodynamics. **First Law of Thermodynamics:** Energy of a system. Specific heat. Work and power. Pressure-volume diagram. First law of thermodynamics. Equation of state. Thermodynamic processes of ideal gases. Compressor and technical work. Enthalpy. Expansion and contraction of matter. **Second Law of Thermodynamics:** Basic concept of thermodynamic cycles. Counter clockwise thermodynamic cycle. Clockwise thermodynamic cycle. Typical thermodynamic cycle (Carnot, Joule, Bryton, Otto, Diesel). Entropy. Second law of thermodynamics. Temperature-entropy diagram. Gas mixture. **Steam and Steam Power Cycles:** Three states of the matter. Steam diagram. Steam tables. Phase change. General steam power cycle. Simple steam cycles (Carnot, Rankine). Improved steam power cycles. Refrigeration cycle. Ideal and real refrigeration cycle. Heat pump cycle. **Heat Transfer:** Principles of heat transfer. Heat conduction. Heat conduction through multilayers wall. Heat convection. Heat radiation. Heat exchangers. Types of heat exchangers. Applications of heat exchangers. **Moist Air:** Properties of moist air. Mollier diagram (enthalpy-entropy). Heating of moist air. Cooling of moist air. Mixing of air streams. Mixing of water and moist air. Drying of materials. Moist measurements.

CONSTRUCTIVE ALIGNMENT – Learning outcomes, teaching and assessment methods

Alignment of students activities with learning outcomes		
Activity	**Student workload ECTS credits**	**Learning outcomes**
Lectures	**30 hours / 1 ECTS**	**1,2,5,6**
Practicals	**30 hours / 1 ECTS**	**3,4,5,6**
Three mid-term exams (preparation and delivery)	**51 hours / 1,7 ECTS**	**1,2,3,4,5,6**
Self-study	**30 hours / 1 ECTS**	**1,2,3,4,5,6**
Office hours and final exam	**9 hours / 0,3 ECTS**	**1,2,3,4,5,6**
TOTAL:	**150 hours / 5 ECTS**	**1,2,3,4,5,6**

CONTINUOUS ASSESSMENT		
Continuous testing indicators	**Performance A_i (%)**	**Grade ratio k_i (%)**
First mid-term exam	**50-100**	**30**
Second mid-term exam	**50-100**	**35**
Third mid-term exam	**50-100**	**35**

FINAL ASSESSMENT		
Testing indicators – final exam (first and second exam term)	**Performance A_i (%)**	**Grade ratio k_i (%)**
Practical exam (written)	**50 - 100**	**50**
Theoretical exam (written and/or oral)	**50 - 100**	**40**
Previous activities (include all continuous testing indicators)	**70 - 100**	**10**
Testing indicators – makeup exam (third and fourth exam term)	**Performance A_i (%)**	**Grade ratio k_i (%)**
Practical exam (written)	**50 - 100**	**50**
Theoretical exam (written and/or oral)	**50 - 100**	**50**
Previous activities (include all continuous testing indicators)	**70 - 100**	**10**

PERFORMANCE AND GRADE		
Percentage	**Criteria**	**Grade**
50% - 61%	*basic criteria met*	**sufficient (2)**
62% - 74%	*average performance with some errors*	**good (3)**
75% - 87%	*above average performance with minor errors*	**very good (4)**
88% - 100%	*outstanding performance*	**outstanding (5)**

ADDITIONAL INFORMATION

Teaching materials for students (scripts, exercise collections, examples of solved exercises), teaching record, detailed course syllabus, application of e-learning, current information and all other data are available by MOODLE system to all students.