



UNIVERSITY OF ZAGREB
FACULTY OF MECHANICAL ENGINEERING AND
NAVAL ARCHITECTURE

Chair of water and environmental engineering

Laboratory for water, fuels and lubricants

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Laboratory instruments and systems for water analyses:

	Analytical instrument	Manufacturer	Model / Components	Description / Use
1	Total Organic Carbon (TOC) Analyzer	Shimadzu	TOC-V _{CPH} (+ Autosampler ASI-V ; Total nitrogen measuring unit TNM-1)	The TOC-V _{CPH} is a PC controlled high-sensitivity analyzer that measures the amount of total organic carbon (TOC), total inorganic carbon (TIC), and dissolved organic carbon (DOC). This analyzer is also used to measure the total nitrogen (TN) and total dissolved nitrogen (TDN).
2	UV-Vis Spectrophotometer	Hewlett Packard	8453	PC controlled spectrophotometer that measures the absorbance of liquid samples. Wavelength range: 190–1100 nm
3	High-Performance Liquid Chromatography (HPLC) System	Varian	Varian 9012 Solvent Delivery System	HPLC is an analytical instrument used to separate and quantify components of liquid samples.
			Varian 9050 Variable Wavelength UV-VIS Detector	
			Varian 9300 Autosampler	
			Varian Star 9040 Refractive Index Detector for HPLC	
			Varian Mistral Column Oven	
4	High-Performance Liquid Chromatography (HPLC) System	Shimadzu	SCL-10A VP System Controller	HPLC is an analytical instrument used to separate and quantify components of liquid samples.
			SIL-20A HT Autosampler	
			LC-10AT VP Pump	
			FCV-10AL VP Low Pressure Gradient Valve	
			DGU-14A Degasser	
			SPD-10AV VP UV-VIS Detector	
			SPD-M20A Photodiode Array Detector	
			CTO-10A VP Column Oven	
5	Turbidimeter	HACH	2100AN Turbidimeter	Benchtop turbidimeter for water turbidity measurements (NTU)
6	Turbidimeter	HACH	2100P	Portable turbidimeter for water turbidity measurements (NTU)
7	pH meter	Mettler Toledo	S220 SevenCompact™ pH/Ion Benchtop Meter	Benchtop pH meter for determination of pH values
8	Conductivity Meter	Knick	912X COND	Portable conductivity meter for determination of water conductivity (μS/cm)
9	Laboratory set for water		Burette 50 ml	Determination of water hardness by EDTA

	hardness determination			complexometric titration
10	Silt density index measurement apparatus		Custom made system according to internationally accepted procedures	Determination of the fouling potential of water in ultrafiltration and reverse osmosis systems
11	Apparatus for solids determination in water or wastewater: a. Total Solids (TS) b. Total Dissolved Solids (TDS) c. Total Suspended Solids (TSS) d. Fixed and Volatile Solids e. Settleable Solids f. Total, Fixed and Volatile Solids in Solid and Semisolid samples		Laboratory apparatus in accordance with the requirements of APHA <i>Standard Methods for the Examination of Water and Wastewater</i>	Determination of Solids in water or wastewater according to APHA Methods 2540 in <i>Standard Methods for the Examination of Water and Wastewater</i> : 2540 B. Total Solids (TS) 2540 C. Total Dissolved Solids (TDS) 2540 D. Total Suspended Solids (TSS) 2540 E. Fixed and Volatile Solids 2540 F. Settleable Solids 2540 G. Total, Fixed and Volatile Solids in Solid and Semisolid samples
12	UV/Vis Spectrophotometer	HACH	DR/4000 U	The benchtop spectrophotometer has ultraviolet and visible spectrum analysis capabilities with a range of 190 to 1100 nm, customer calibration, kinetics, time course and multi wavelength readings capabilities. It is used for analyzing chemical compounds in water and wastewater.
13	Floc tester	Aqualytic	AMF 4	Laboratory floc tester is used for conducting jar tests to simulate the coagulation/flocculation process in a water treatment plant and to determine the optimal amount of treatment chemicals.
14	High power ultrasonic device	Hielscher	UP400S	The UP400S (400W, 24kHz) is a powerful device for the sonication of larger samples in the lab, with horn-type ultrasonic transducer. Typical application include: homogenization of liquids and sonochemistry.

Laboratory instruments for fuels and lubricants analyses:

	Analytical instrument	Manufacturer	Model / Components	Description / Use
1	Calorimeter (adiabatic)	IKA	C4000	Determination of higher heating value (HHV) of solid and liquid fuels
2	Viscometer	Atago	VISCO Cat. No 6800	Measurement range of dynamic viscosity: A1: 50 to 200 000 mPa s A2: 100 to 600 000 mPa s A3: 500 to 2 000 000 mPa s
3	Density meter	Anton Paar	DMA 35	Portable digital density meter
4	Cleveland open cup flash point semi-automatic tester	Herzog		This open cup flash point tester is used to determine the flash point and fire point of all petroleum products with flash points above 79 °C and below 400 °C except fuel oils according to ASTM D92 - <i>Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester</i>
5	Pensky-Martens flash point semi-automatic tester	Herzog		This closed cup flash point tester is used to determine the flash point of fuel oils with possible presence of small but significant concentrations of lower flash point substances that may escape detection by ASTM D92. It is used in the temperature range from 40 °C to 370 °C according to ASTM D93 - <i>Standard Test Methods For Flash Point By Pensky-Martens Closed Cup Tester</i>
6	Standard laboratory furnace	Nabertherm	L3/C6	The furnace is used for test method for ash in the analysis sample of coal and coke from coal as well as the ash from solid biomass samples
7	Apparatus for pour point determination			Determination of pour point according to ASTM D97, <i>Standard Test Method for Pour Point of Crude Oils</i>