Wrocław University of Science and Technology

Physics

JZL1001913C

summer semester

2020/2021

Wednesday, 18:20 - 19:50

Friday, 18:20 - 19:50

virtual room (ZOOM)

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Outline

- Introduction - Physics rules the world
- Motion phenomena - Kinematics
- Motion phenomena - Dynamics
- Rotational motion
- Harmonic motion
- Gravitational field
- Relativistic phenomena
- **Basics of Thermodynamics**
- **Principles of Thermodynamics**
- **Fluids Statics**
- **Electrostatics**
- **Electric current**
- **Magnetic field**
- **Vibrations and electromagnetic waves**

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Thermodynamics

- short rewiev

Pressure $P = F/S$	Unit 1 Pascal $=1N/m^2$
Heat capacity <value depends on materia>	Unit J/kg/K
Heat $Q = mc\Delta T$	Unit 1 kg * J/kg/K * K = = J
Heat of change $Q = m\Delta T$	Unit 1 kg * J/kg = J

Quantities:

- Temperature
- Pressure
- Heat
- Specific heat capacity
- Heat of fusion/vaporation

The ideal gas law

PV = nRT

Process	Important point to remember
isothermal	Constant T, $\Delta U = 0$, $Q=W$
isovolumetric(isochoric)	Constant V, $W = 0$, $\Delta U=Q$
Isobaric	Constant P, $\Delta U = Q- (-P\Delta V)$
adiabatic	Nothing is Constant, $Q = 0$, $\Delta U= -W$

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Fluid Statics

- short rewiev

Pressure $P = F/S$	Unit $1N/m^2$ $= 1\ kg/m/s^2$ = 1 Pascal
Density $d = \rho = m/V$	Unit $1\ kg/m^3$
Hydrostatic Pressure $P = h\rho g$	Unit $1m*kg/m^3*m/s^2$ $= 1\ kg/m/s^2$ = 1 Pa
Surface tension $\gamma = F/l$	Unit 1 N/m
Capillary action $h = \frac{2\gamma cos\theta}{\rho g r}$	Unit 1 kg * J/kg = J

Quantities:

- Density
- Pressure
- Hydrostatic preassure
- Surface tension
- Contact angle

Pascal's Principle in Hydraulic System

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

Archimedes' Principle

$$F_B = w_{fl}$$

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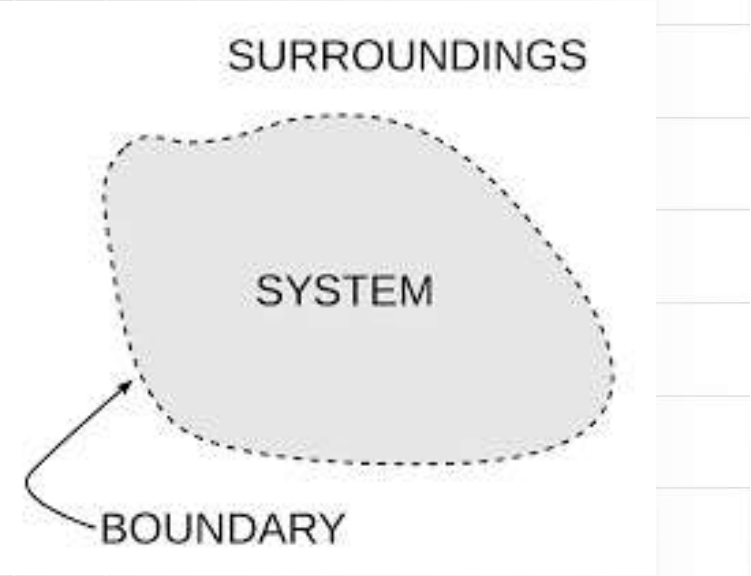
System

In thermodynamics, the system is defined as a definite space or area on which the study of energy transfer and energy conversions is made.

- **Open system:** System in which both mass and energy cross the boundaries of the system.
- **Closed system:** System in which mass does not cross boundaries of the system, though energy may do so.
- **Isolated system:** System in which neither mass nor energy crosses the boundaries of the system.



Boundary

The system and surroundings are separated by a boundary. It may be fixed or movable or imaginary. It will not occupy any volume or mass in space.

Surroundings

Anything outside the system which affects the behavior of the system is known as surroundings.

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Laws of thermodynamics – short review

The laws of thermodynamics govern the way energy is transferred from one state to another. They are:

- ***First law of thermodynamics***: When energy moves into or out of a system, the systems internal energy changes in accordance with the law of conservation of mass.
- ***Second law of thermodynamics***: The state of the entropy of the entire universe, as an isolated system, will always increase over time.
- ***Third law of thermodynamics***: Entropy of a perfect crystal at absolute zero is zero.

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Thermodynamic Processes

Isobaric	Constant pressure $W = P\Delta V$
Isochoric	Constant volume $W = 0$
Isothermal	Constant temperature $Q = W$
Adiabatic	No heat transfer $Q = 0$

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PV Curve