Tema 2: Principiul I al termodinamicii $C_V = \frac{i}{2}R; C_P = \frac{(i+2)}{2}R;$

$V = const.: \quad L = 0,\ \Delta U = \frac{i}{2}(P_2V_2 - P_1V_1), \Delta U = Q;$ *i=5, gaz biatomic*

$T = const.: \quad \Delta U = 0, Q = L = P_2V_2 \ln\frac{V_3}{V_2}\ \ sau\ \ \nu RT_1 \ln\frac{P_1}{P_2};$ *i=3, gaz monoatomic*

$P = const.: \quad L = P(V_1 - V_3), \Delta U = \frac{i}{2}\Delta P\Delta V, Q = \Delta U + L;$ *i=6, gaz polyatomic*

$Proces\ adiabatic: T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}, unde\ \gamma = \frac{(i+2)}{i};\ \ L = -\Delta U = -C_V\nu dT = -\frac{i}{2}\nu R\Delta T = -\frac{i}{2}\frac{m}{M}R\Delta T$

Tema 4: Principiul II al termodinamicii. Procese reversibile și ireversibile

$$\eta = \frac{L}{Q_1} = \frac{Q_1 - Q_2}{Q_1}, Q_1 - primit, Q_2 - cedat;\ \ \eta_C = \frac{T_1 - T_2}{T_1};\ \ L_+ = L_{12} + L_{23} + \cdots + L_n;\ \Delta S = \int_1^2 \frac{\delta Q}{T};\ \ \varepsilon = \frac{Q_2}{Q_1 - Q_2} - coef.frig.;$$

$$\Delta S = C_V \ln\frac{T_2}{T_1} + R\ln\frac{V_2}{V_1};\ \ S = C_V \ln P + C_P \ln V + S_0;\ \ S = C_P \ln T + R\ln P + S_0;\ \ \Delta S = m_1 c \ln\frac{\theta}{T_1} - m_2 c \ln\frac{T_2}{\theta};\ \ \theta = \frac{m_2T_2 + m_1T_1}{m_1 + m_2};$$

$$T = const.:\ \ \Delta S = \frac{m}{M}R\ln\frac{V_2}{V_1};\ \ V = const.:\ \ \Delta S = \frac{m}{M}C_V \ln\frac{T_2}{T_1};$$

Tema 5-6: Electrostatica

$$F = \frac{1}{4\pi\varepsilon_0\varepsilon} * \frac{q_1q_2}{r^2}; E = \frac{1}{4\pi\varepsilon_0} * \frac{q}{r^2};\ F = qE; L = q(\varphi_1 - \varphi_2) = \frac{q_1q_2}{4\pi\varepsilon_0}\left(\frac{1}{r_1} - \frac{1}{r_2}\right); dE = \frac{dq}{\omega r_0 r^2}\ \ , dq = \tau dl, dl = Rd\alpha;$$

$$Ecuatia\ Poisson:\ \ \Delta\varphi = -\frac{\rho}{\varepsilon_0};\ \ Ecuatia\ Laplace\ \Delta\varphi = 0;$$

$$Teorema\ lui\ Gauss:\ \ dom\ I: r < R, \oint_S EdS = \frac{q_i}{\varepsilon_0};\ \ dom\ II: R \le r \le 2R;\ \ dom\ III: r \ge 2R;\ \ E = \frac{\delta R^2}{\varepsilon_0 r^2};\ E_{tot} = E_1 + E_2 + \cdots + E_n$$

$$Potențial:\ \ \varphi = \frac{\tau}{4\varepsilon_0};\ d\varphi = \frac{dq}{4\pi\varepsilon_0 R};\ \ \Psi = \sum_{i=0}^{n} q_i\,;\ \ \ \sum_{i=0}^{n} q_i = \rho V = \rho\pi R^2 x, x - lung.cilind.;\ \ D = \frac{\rho x}{2}, D - deplas.camp.electric.$$

Tema 9: Curentul electric continuu

$$I = \frac{q}{t}\ ;\ \ I = \frac{\varepsilon}{R + r};\ \ \varepsilon = \frac{L_{ext}}{q}\ ;\ \ L = qU;\ \ U_{12} = \varphi_1 - \varphi_2 + \varepsilon_{12};\ \ I = \frac{\varphi_1 - \varphi_2 + \varepsilon}{R}\ ;\ \ L = Q = \int_0^\tau I^2Rdt = \int \frac{U^2}{R}dt = \int IUdt\ ;$$

$$I = kt;\ \ W = jE = \delta E^2;\ \ \delta = \frac{1}{p};\ \ \ L.Kirhoff: \sum_k I_k = 0\,, \sum_k I_kR_k = \sum_1 \varepsilon_i\,;$$

Tema 10: Câmpul magnetic

$$d\phi = BdS\ cos\alpha, \phi_B = BS;\ \ dB = \frac{\mu_0\mu I}{4\pi r^2}dl\ sin\alpha; dS = adx; \varepsilon_i = -\frac{d\phi}{dt}\ sau - \frac{LdI}{dt};\ F_L = qvB\ sin\alpha;\ F_A = IBl\ sin\alpha\,;\ \ L_{ext}\ = I(\phi_1 - \phi_2);$$

$$M = P_mB\ sin\alpha;\ P_m = IS;\ \ \phi = LI;\ \ \varepsilon_i = -\frac{NdI}{dt};\ \ \Psi = BSN\ cos\alpha; d\bar{S} = dS * \bar{n};\ \ B = B_1 + B_2 + \cdots + B_n;\ \ B = kqv\frac{sin\alpha}{r^2}\ , k = \frac{\mu_0}{4\pi}$$

$$Solenoid: \begin{cases} B_{int} = \dfrac{\mu_0 IN}{l} \\ B_{ext} = 0 \end{cases};\ \ c.circular(inel)\ B = \frac{\mu_0\,I}{2R}\ , P_m = \pi R^2 L;\ \ c.finit\ B = \frac{\mu_0\mu I}{4\pi B} * (cos\alpha_1 - cos\alpha_2); c.infinit\ B = \frac{\mu_0\,I}{4\pi d};$$

Tema 12: Câmpul electromagnetic

$$W = \frac{LI^2}{2}\ ;\ \ W = \frac{\mu_0\mu VH^2}{2};\ \ L = \mu_0\mu n^2V;\ \ w = \frac{W}{V};\ \ w = \frac{BH}{2} = \frac{B^2}{2\mu_0\mu};\ \ I = \frac{\varepsilon}{R}\ ;$$

Tema 13-14: Oscilații

$x = A\ sin(\omega t + \alpha);\ x = x_m \cos(\omega t + \alpha)\,; S = A\cos\alpha\,; tg\varphi = \dfrac{A_1 \sin\varphi_1 + A_2 \sin\varphi_2}{A_1 \cos\varphi_1 + A_2 \cos\varphi_2};\ \varphi_2 - \varphi_1 = \pm 2m\pi - max = \pm(2m+1) * \pi - min$

$$E_c = \frac{kAo^2}{2}\cos^2(\omega_0 t + \alpha);\ \ E_p = \frac{kAo^2}{2}\sin^2(\omega_0 t + \alpha);\ E = E_c + E_p = \frac{kAo^2}{2}, k = m\omega o^2;$$

$p.elastic\ F = -kx\ ; T = 2\pi\sqrt{\dfrac{m}{k}};$

$p.fizic\ M = I\varepsilon;\ \ L_r = \dfrac{I}{ml};\ \ T = 2\pi\sqrt{\dfrac{I}{mgl}} = 2\pi\sqrt{\dfrac{L_r}{g}};$

$p.mate\ M = -mgl\ sin\varphi;\ \ T = 2\pi\sqrt{\dfrac{l}{g}};$

$os.neamort\ \ S = A_0 \sin(\omega_0 + \alpha)\,;$

$os.amort\ S = A_0 e^{-\beta t}\sin(\omega t + \alpha)\,; A = A_0 e^{-\beta t}, N = \dfrac{t}{T}; \delta = \beta t = \dfrac{T}{t}$

$os.fortate\ \ S = A\sin(\omega t + \alpha)\,; F = F_0 \cos\Omega t\,;\ \ A_{rez} = \dfrac{f_0}{2\beta\omega};\ \ \omega = \sqrt{\omega_0^2 - \beta^2};\ \ \dfrac{k}{m} = \omega_0^2;\ \dfrac{r}{m} = 2\beta;\ \ \dfrac{F_0}{m} = f_0;$

$Formula\ lui\ Thompson : T = 2\pi\sqrt{LC}; I_{max} = q_{max}\sqrt{\dfrac{1}{LC}};\ \ U_{max} = \dfrac{q_m}{C} = \sqrt{\dfrac{L}{C}}I_{max};$

Tema 15: Unde in medii elastic

$$\lambda = vT; E = \rho g^2(m.Young);\ \ \ \tau = \frac{x}{v}\ ; g = \frac{\omega}{k};\ \ \lambda = \frac{2\pi}{k}; v = \sqrt{\frac{k}{\rho}};\ \ j = \rho A^2\omega^2\sin^2(\omega t - kx + \varphi)\,v\ \ (Vect.lui\ Umov)$$