This is a cheat sheet for the RL-MPC tutorial.

Keep this handy and also feel free to chime in during the tutorial for clarification :-)

Reinforcement learning

s, s'	State	s_t, s_{t+1}
a	Action	a_t
p	State transition probability	$s' \sim p\left(s'\middle\vert s, a\right)$
r	Reward	$r_t = r(s_t, a_t)$
π	Policy	$a \sim \pi(a\vert s),\ a = \pi(s)$
γ	Discount factor	$\gamma \in [0, 1]$
G_t	Discounted return	$G_t = \sum_{k=0}^{\infty} \gamma^k r_{t+k}$
Q^π	State-action value function	$Q^\pi(s, a) = \mathbb{E}\left[G_0 \middle\vert_{a_0=a}^{s_0=s}\right]$
$Q^\star$	Optimal value function	The above, but better
V^π	Value function	$V^\pi(s) = \mathbb{E}\left[G_0 \middle\vert s_0 = s\right]$
$V^\star$	Optimal value function	$V^\star(s) = \max_a Q^\star(s, a)$
$\pi^\star$	Optimal policy	$\pi^\star(s) = \arg\max_a Q^\star(s, a)$

Control

x	State	x_t
u	(Control) input	u_t
f	State transition function	$x_{t+1} = f(x_t, u_t)$
ℓ	(Stage) cost	$\ell(x, u) = x^T M x + u^T R u$
K	Gain matrix	$u = -Kx$

Acronyms

RL	Reinforcement learning
MPC	Model predictive control
LQR	Linear quadratic regulator
PID	Proportional-integral-derivative