Theory of Computation, CSCI 438 spring 2022
Context-free grammars, pages 101-107, Feb. 9

Context Free Grammar (Def. 2.2, page 102)
G = (V, Σ, R, S)

V - finite set of variables

Σ - finite set of terminal symbols where V and Σ are disjoint ($V \cap \Sigma = \Phi$)

R – finite set of rules (productions), $x \rightarrow y$ where $x \in V$ and $y \in (V \cup \Sigma_\varepsilon)^+$ (Can't use * since something is needed on the right side of the rule.) (Note that ε is needed. If ε was in the language, clearly we would need it. Even if ε wasn't in the language, having it makes writing grammars easier.)

$S \in V$ is the start symbol

Notation and vocabulary:

$w \Rightarrow z$, or w "yields" z, if from w you can get z by applying a rule

$w \Rightarrow^* z$ or say w "derives" z, if from w you can get z by applying 0 or more rules

Relation between a grammar and a language (page 104):
For grammar G = (V, Σ, R, S), the language of G,

$\mathcal{L}(G) = \{w \mid w \in \Sigma^* \wedge S \Rightarrow^* w\}$.