It start with the curl Maxwell equations:

$$\frac{\partial \vec{B}}{\partial t} + \vec{\nabla} \wedge \vec{E} = 0$$
$$\frac{\partial \vec{D}}{\partial t} - \vec{\nabla} \wedge \vec{H} = 0$$

and the constitutive relations:

$$\vec{D} = \epsilon_0 \vec{E} + \vec{P} \tag{1}$$
$$\vec{H} = -\frac{1}{\mu_0}\vec{B} \tag{2}$$

For linear and isotropic media that do not exhibit temporal and spatial dispersion, $\vec{P} = \epsilon_0 \chi \vec{E}$ and (1) becomes:

$$\vec{D} = \epsilon_0 \tilde{\epsilon}_r \vec{E} \tag{3}$$

$\tilde{\epsilon}_r$ and χ are complex scalar related by $\tilde{\epsilon}_r = 1 + \chi$. $\tilde{\epsilon}_r$ can be calculated from $\tilde{n}$, the complex refractive index of the material, via $\tilde{\epsilon}_r = \tilde{n}^2$. Using (2) and (3), Maxwell's curl equations become:

$$\begin{aligned} \mu_0 \frac{\partial \vec{H}}{\partial t} + \vec{\nabla} \wedge \vec{E} = 0 \\ \epsilon_0 \tilde{\epsilon}_r \frac{\partial \vec{E}}{\partial t} - \vec{\nabla} \wedge \vec{H} = 0 \end{aligned} \tag{4}$$

Expressing (4) in the Fourier domain:

$$- \epsilon_0 \left(Re(\tilde{\epsilon}_r) + jIm(\tilde{\epsilon}_r)\right) j\omega \vec{E} = \vec{\nabla} \wedge \vec{H}$$
$$- j\omega\epsilon_0 Re(\tilde{\epsilon}_r)\vec{E} + \epsilon_0 \omega Im(\tilde{\epsilon}_r)\vec{E} = \vec{\nabla} \wedge \vec{H}$$

Going back in the time domain:

$$\epsilon_0 Re(\tilde{\epsilon}_r)\frac{\partial \vec{E}}{\partial t} + \epsilon_0 \omega Im(\tilde{\epsilon}_r)\vec{E} = \vec{\nabla} \wedge \vec{H}$$

Using different notations:

$$\begin{aligned}\epsilon_r &= Re(\tilde{\epsilon}_r)\\ \sigma &= \epsilon_0 \omega Im(\tilde{\epsilon}_r)\end{aligned}$$

ϵ_r and σ are linked to $Re(\tilde{\epsilon}_r)$ and $Im(\tilde{\epsilon}_r)$. Since $\tilde{\epsilon}_r = \tilde{n}^2$ it is possible to deduce ϵ_r and σ from $\tilde{n} = n + jk$:

$$\begin{aligned}\epsilon_r &= n^2 - k^2\\ \sigma &= 2\epsilon_0 \omega n k\end{aligned}$$

Maxwell's curl equations are finally:

$$\begin{aligned}\mu_0 \frac{\partial \vec{H}}{\partial t} + \vec{\nabla} \wedge \vec{E} = 0\\ \epsilon_0 \epsilon_r \frac{\partial \vec{E}}{\partial t} + \sigma \vec{E} = \vec{\nabla} \wedge \vec{H}\end{aligned}$$