Reading instructions

Familiarity with the following concepts:

Stationarity, conditional orthogonality, innovation process, Wold decomposition, wandering subspaces, Wiener process, Wiener filter, whitening filter, causal and non-causal filters, orthonormalizable processes, factorizable, Hardy spaces, purely non-deterministic, purely deterministic, outer and inner functions, minimum phase, observability, constructibility, reachability, controllability, minimality, internal (Markovian) splitting subspace, backward system, forward and backward predictor spaces, junk spaces, frame space, the set $\mathcal{P}$, the set $\mathcal{P}_0$, the Riccati inequality, perpendicular intersection, splitting subspace, scattering pair, uniform choice of basis.

Section 2.2 and 2.4 contains some subspace and projection theorems that should be well understood as they are used throughout the rest of the book.

Knowledge of the following theorems, and, in some cases, their proofs.

- Theorem 3.2.1 "Herglotz, Bochner - Existence of the spectral distribution function"
- Theorem 3.3.1 "Existence of stochastic measure"
- Theorem 3.5.1 (proof scalar case) "Linear functional representation in the Hilbert space of white noise"
- Theorem 3.5.5 "Connection between different spectral representations"
- Lemma 4.1.4 (proof - the correct version is in the list of changes) "Best linear estimator when the observation process is white"
- Theorem 4.2.1 "Spectral factorization - when is a process orthonormalizable"
- (Theorem 4.4.1)
- Theorem 4.5.4 (proof idea) "Wold - innovation representation of p.n.d. processes"
- Theorem 4.5.8 "Wold decomposition - p.n.d and p.d. decomposition"
- Theorem 4.6.8 "Outer spectral factors and relation to all other analytical spectral factors"
- Proposition 6.2.1 (proof) "Positivity of the reachability grammian "
- (Proposition 6.2.3)

- Theorem 6.3.1 (proof) "Backward model state space representation"
- Theorem 6.4.3 "How the structural function relates the forward and backward transfer functions"
- Theorem 6.6.2 (proof) "Characterization of observability and constructibility"
- Theorem 6.6.4 "Characterization of stochastic minimality"
- Theorem 6.1 (proof idea) "The Positive Real Lemma"
- Theorem 6.9.3 "Convergence of the predictor covariance matrix"
- Theorem 7.2.4 "Characterization of perpendicular intersection"
- Proposition 7.3.1 "The predictor spaces are minimal splitting subspaces"
- Theorem 7.3.6 "Characterization of splitting subspaces in terms of perpendicularly intersecting subspaces"
- Proposition 7.3.7 "Uniqueness of scattering pairs for internal splitting subspaces"
- Theorem 7.4.1 "Scattering pairs as extended past and future spaces"
- Theorem 7.4.3 "Minimal Markovian Splitting subspace algorithm"
- Theorem 7.4.9 "Observability and Constructibility of Markovian splitting subspaces"
- Proposition 7.4.5, 7.4.6 and 7.4.15 "The predictor spaces and the frame space are Markovian splitting subspaces"
- Theorem 7.7.3 "Ordering of the family of minimal splitting subspaces"
- Theorem 8.1.2 (proof) "Shift structure of the Markovian splitting subspaces"
- Theorem 8.1.3 "Forward and backward generating processes and the splitting subspace representation"
- (Theorem 8.2.3)
- Theorem 8.3.1 "Dual pair of realizations for Markovian splitting subspaces"
- Theorem 8.4.8 "P.d. and p.n.d. decomposition for Markovian representations"
- Proposition 8.5.1 "Different minimality concepts and their relations"