

***Digital Audio, DSP, and Synthesis Fundamentals***  
**PROGRAM OF STUDY**

**READING**

1. Dobrian, “How Digital Audio Works” in *MSP Topics and Tutorials*.
2. Burke, et al. *Music and Computers*:
  - 1.1 Ch. 1: “The Digital Representation of Sound, Part One: Sound and Timbre”
  - 1.2 Ch. 2: “The Digital Representation of Sound, Part Two: Playing by the Numbers”
3. Dodge, “Signal Flowcharts,” “Amplitude Modulation,” “Ring Modulation,” “Vibrato Simulation by Frequency Modulation,” and “FM Synthesis” in *Computer Music*.

**DSP (MSP TUTORIALS 1-5 & 7-11)**

4. Cycling ‘74, “Tutorials 1-5 & 7-11” in *MSP Topics and Tutorials*:

*Fundamentals*

- 3.1 Tutorial 1: Test Tone  
Topics: MSP intro., DAC and ADC, audio drivers, looping and interpolating oscillators  
MSP Objects: **cycle~**
- 3.2 Tutorial 2: Adjustable Oscillator  
Topics: Building signal processing networks, digital distortion, fade in/out  
MSP Objects: **line~**, **+~** and **\*~**,
- 3.3 Tutorial 3: Wavetable Oscillator  
Topics: Wavetables, buffers, envelopes and noise  
MSP Objects: **ezdac**, **buffer~**, **noise~**, and **phasor~**
- 3.4 Tutorial 4: Routing Signals  
Topics: Wave interference (beats), absolute vs. relative amplitude, and phasors  
MSP Objects: **send~**, **receive~**, **gate~**, AtodB patcher
- 3.5 Tutorial 5: Turning Signals On and Off  
Topics: Classic waveshapes (sine, sawtooth, square and triangle), harmonic and inharmonic spectra  
MSP Objects: **begin~**, **mute~**, **pass~**, **pcontrol**, **selector~**, and harmonics patcher

*Synthesis Fundamentals*

- 3.6 Tutorial 7: Additive Synthesis
- 3.7 Tutorial 8: Tremolo and Ring Modulation
- 3.8 Tutorial 9: Amplitude Modulation
- 3.9 Tutorial 10: Vibrato and FM
- 3.10 Tutorial 11: Frequency Modulation

**References**

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- Burk, Phil, Larry Polansky, Douglas Repetto, Mary Roberts and Dan Rockmore. *Music and Computers: A Theoretical and Historical Approach*. Emeryville, CA: Key College Publishing, 2005.
- Dobrian, Chris. *MSP Topics and Tutorials*. Palo Alto, CA: Cycling 74, 2006.
- Dodge, Charles and Thomas A. Jerse. *Computer Music: Synthesis, Composition and Performance*, Second Edition. New York: Schirmer, 1997.
- Roads, Curtis. *The Computer Music Tutorial*. Cambridge, MA: MIT Press, 1996.