Preface

The material covered in this web based course is fairly basic and is included in the syllabi of most of the universities in India with undergraduate programs in the ECE/IT disciplines. The course material has been divided into three parts.

The first three chapters, dealing with the mathematical background required for the course, constitute part I. In the opinion of the author, a thorough understanding and ability to manipulate and apply this material is very essential for a proper understanding of the principles of communication presented in part II and III. In fact, this material is also quite useful in the study of digital communication, the subject matter of another course under the NPTEL program.

Part II also consists of three chapters (Ch 4 to 6) and deals with modulation techniques: linear modulation (Ch 4), angle modulation (Ch 5) and pulse code modulation, and its variants DPCM and DM (Ch 6).

Part III consists of a single chapter (Ch 7). The mathematical tools developed in part I and the communication principles discussed in part II have been put together to arrive at the noise performance of various modulation techniques. Though the mathematical tools developed in part I have been used extensively in the development of the theory in part II and part III, detailed explanations have been provided to make the concepts and ideas clearly understandable and results and analyses intuitively meaningful. To cite a few of these: frequency translation, errors in the coherent demodulation of SSB, aliasing in the sampling process, exchange of bandwidth and signal-to-noise ratio in wideband FM.

Though the theory presented in the course is fairly standard and can be found in the text/reference books cited in appropriate chapters, we have made use of the capabilities of the medium to explain various concepts/results with the help of animations and audio demonstrations.

Flash animation has been used for the following:

1. Gibbs phenomenon
2. Oscilloscopic display of bandlimited white noise with different sweep speeds
3. Carrier plus noise signal at the input and the output of a PLL.

Audio demonstration can be found on the following:

1. Time scaling property of the Fourier transform
2. White noise driving a loud speaker
3. Effect of frequency and phase errors in the coherent demodulation of DSB-SC and SSB
4. The effect of aliasing in speech and music

In addition, quite a few figures shown in the text are the ones that have been generated on an experimental setup. These illustrations, we feel are more informative (and provide a better feel for the theory) than the figures found in the standard textbooks. Wherever necessary, we have also provided the output of a spectrum analyzer, a very useful tool in the study of principles of communication.

In any course of this kind, examples and exercises are a must. We feel that we have included enough examples so as to enable the student to understand the material, even in situations where adequate classroom teaching is not available. Exercises given range from fairly simple to somewhat involved. By going through the examples and working out the exercises, we feel that the candidate should be in a comfortable position to appear for competitive examinations such as GATE, UPSC, etc.

Every effort has been made to see that there are no errors (typographical or otherwise) in the material presented. However, it is still possible that there are a few errors (serious or otherwise). The author would be thankful to the readers if they are brought to his attention at the following e-mail address: vvrao@ee.iitm.ac.in.

These will be promptly acknowledged and efforts would be made to incorporate the required corrections.