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# MSC IN SIGNAL PROCESSING AND COMMUNICATIONS: PRE-COURSE READING LIST

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The following textbooks and highlighted chapters are recommended reading prior to the MSc **if you are keen to revise your undergraduate material**. While we do not expect you to be conversant in all the material in these books in advance of starting the degree programme, you may find them useful for obtaining a broad content of the first semester courses. In particular, we fully expect that your undergraduate courses in signal and systems or communication systems courses will cover most of the background expected.

Broadly, this reading list is designed to cover an introduction to

- 1) Relevant mathematics;
- 2) signal processing;
- 3) fundamentals of communications;
- 4) introduction to image processing.

The book by Proakis, namely:

*Proakis J. G. and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, Pearson New International Edition, Fourth edition, Pearson Education, 2013.*

*ISBN13: 9781292025735*

is an excellent revision for material **you may have** undertaken in your undergraduate course. Please note, however, that the subject area is vast and if some material looks unfamiliar, be reassured you will be taught this in Semester 1 (Sem1). Similarly, there are numerous other textbooks that are equally appropriate for pre-course reading, and you should not feel restricted to this list.

## Relevant Mathematics and General DSP Background

The mathematical treatment throughout the MSc modules are kept at a level that is usually within grasp of final-year undergraduate and graduate students, with a background in digital signal processing (DSP), linear system and control theory, basic probability theory, calculus, linear algebra, and a competence in Engineering mathematics. In summary, the courses will generally assume that the students have knowledge of:

1. Engineering mathematics, including linear algebra, manipulation of vectors and matrices, complex numbers, linear transforms including Fourier series and Fourier transforms, z-transforms, and Laplace transforms;
2. basic probability and statistics, albeit with a solid understanding;
3. differential and integral calculus, including differentiating products and quotients, functions of functions, integration by parts, integration by substitution;
4. basic digital signal processing (DSP), including:
  - the notions of deterministic continuous-time signals, discrete-time signals and quantised signals;

- filtering and inverse filtering of signals; convolution;
- the response of linear systems to harmonic inputs; analysing the time and frequency domain properties of signals and systems;
- sampling of continuous time processes, Nyquist's sampling theorem and signal reconstruction;
- and analysing discrete-time signals and systems.

Any text books which cover these general subject areas will be sufficient, but the following books are suggestions if you need pointers.

## Signal Processing Books

1. Proakis J. G. and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, Pearson New International Edition, Fourth edition, Pearson Education, 2013. ISBN13: 9781292025735

In particular, Chapters 1 – 3. Chapter 1 would be useful on motivation.

**Useful for Sem1 modules:** "Discrete-time Signal Analysis" (<http://www.drps.ed.ac.uk/17-18/dpt/cxpgee10018.htm>) and "Probability, Estimation Theory, and Random Variables" (<http://www.drps.ed.ac.uk/17-18/dpt/cxpgee11164.htm>). It will also be useful for Semester 2 modules.

2. Therrien C. W. and M. Tummala, Probability and Random Processes for Electrical and Computer Engineers, Second edition, CRC Press, 2011. ISBN13: 978-1439826980

**Useful for modules:** "Probability, Estimation Theory, and Random Variables" (<http://www.drps.ed.ac.uk/17-18/dpt/cxpgee11164.htm>). It will also be useful for Semester 2 modules.

## Communications

3. "Communication Systems", 5th Edition, by Simon Haykin, Michael Moher, John Wiley and Sons, ISBN-13: 9780471697909

**Useful for module:** Digital Communication Fundamentals (<http://www.drps.ed.ac.uk/17-18/dpt/cxpgee10019.htm>)

## Image Processing

4. "Digital Image Processing", 3rd Ed, by Gonzalez & Woods, ISBN-10: 0132345633, ISBN-13: 9780132345637

In particular: Chapter 1 as general background on images, Sections 2.2 to 2.5 from Chapter 2 for basic details on digital image fundamentals, and Sections 4.1 to 4.4 from Chapter 4 for a basic review of the DFT (this material is also covered in other background books).

**Useful for module:** Image Processing (<http://www.drps.ed.ac.uk/17-18/dpt/cxpgee11021.htm>)

Last updated: March 18  
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