

FOS Study Material (Dec 2022)

Telecommunication, Signal and Image Processing (Dr. Sesay); Fundamental Artificial Intelligence and Machine Learning (Dr. Ioannou)

Please note, for the purpose of the FOS exam, both these fields are considered within one area. There will be 3 questions from Telecommunication, Signal and Image Processing and 3 from Fundamental Artificial Intelligence and Machine Learning. You can attempt at most 3 questions of those 6 and will need to attempt at least 1 question in at least 1 more area.

Fundamentals of Probability and Random Processes. Chapter 5 from “Fundamentals of Communication Systems” (2nd Ed.), John G. Proakis Masoud Salehi, Pearson.

Analog-to-Digital Conversion. Chapter 7 (Sections 7.1-7.6) from “Fundamentals of Communication Systems” (2nd Ed.), John G. Proakis Masoud Salehi, Prentice Hall.

Digital Modulation Methods in an Additive White Gaussian Noise Channel. Chapter 8 (Sections 8.1 – 8.7.3) from “Fundamentals of Communication Systems” (2nd Ed.), John G. Proakis Masoud Salehi, Pearson.

Coding for Reliable Communications. Chapter 13 (Sections 13.1- 13.2.3) from “Fundamentals of Communication Systems” (2nd Ed.), John G. Proakis Masoud Salehi, Pearson.

Machine Learning Basics. Chapter 5 from “Deep Learning”, Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press, 2016.

Freely available here: <https://www.deeplearningbook.org/contents/ml.html>

Circuits and Electronics (Dr. Murari)

First and second order circuits. Chapters 7, 8 from Fundamentals of Electric Circuits (5th Ed.), C. Alexander, and M. Sadiku, McGraw-Hill.

Frequency response, Fourier and Laplace transforms. Chapters 14-17 from Fundamentals of Electric Circuits (5th Ed.), C. Alexander, and M. Sadiku, McGraw-Hill.

Bipolar and MOS Transistor circuits. Chapter 7 from Microelectronic Circuits (7th Ed.), A.S. Sedra, and K.C. Smith, Oxford University Press.

RF Circuits and Applied Electromagnetics (Dr. Helaoui)

Electromagnetic fields and waves. Chapters 4, 5, 7-12 from Elements of Electromagnetics (6th Ed.), M. Sadiku, Oxford.

Microwave amplifiers. Chapters 2-4 from Microwave Transistor Amplifiers: Analysis and Design (2nd Ed.), G. Gonzalez, Prentice Hall.

RF and Microwave Circuits. Chapters 1-7, 10, 12 from Microwave Engineering (4th Ed), David M.Pozar, Wiley.

Software Engineering (Dr. Ioannou)

Databases. Chapters 1-15 from Database Systems: A Practical Approach to Design, Implementation and Management (6th Ed.), T. Connolly, and C. Begg, Pearson.

Data structures and algorithms. Chapters 2-5, 7, 9, 10 from Data Structures and Algorithm Analysis in Java, M.A. Weiss. Pearson.

Object-oriented design and design patterns. Chapters 1, 2, 4-6, 8-11 from Object oriented software engineering, practical development using UML and Java, T. Lethbridge, and R. Laganriere, McGraw-Hill.

Biomedical Engineering (Dr. Murari)

Sensors and biopotential electrodes. Chapters 2, 5 from Medical Instrumentation: Application and Design (4th Ed.), J.G. Webster, Wiley.

Origin of biopotentials. Chapter 4 from Medical Instrumentation: Application and Design (4th Ed.), J.G. Webster, Wiley.

Biopotential amplifiers and signal processing. Chapters 3, 6 from Medical Instrumentation: Application and Design (4th Ed.), J.G. Webster, Wiley.

Medical Imaging Systems. Chapter 12 from Medical Instrumentation: Application and Design (4th Ed.), J.G. Webster, Wiley.

Power and Control Systems (Dr. Zareipour – Power Systems and Dr. Carriere – Control Systems)

Please note, for the purpose of the FOS exam, both these fields are considered within one area. There will be 3 questions from Power Systems and 3 from Control Systems. You can attempt at most 3 questions of those 6 and will need to attempt at least 1 question in at least 1 more area.

Power Systems. Chapter 2, 5, 6, 11 from Power System Analysis and Design, J. D. Glover, M. S. Sarma, and T. J. Overbye, Cengage Learning.

Control Systems. Chapters 2, 3, 4, 5, 6, 8 and 13 from Modern Control Systems (13th Ed.), R.C. Dorf, and R.H. Bishop, Pearson.

Computer Engineering (Dr. Murari)

Review of computer architecture, microcontrollers and their instruction sets; Interfacing using common input/output devices – e.g. SPI, GPIO; Strategies for interrupt handling and exception handling; Interfacing combining code using functions implemented in high level and assembly languages; Real time operating systems; Software and hardware optimizations to achieve real time operations; Processor characteristics needed to match the requirements for typical DSP applications; Hardware and software optimization techniques including multiple busses; Super- scalar and other highly parallel instruction sets, critical timing paths; Optimizing compilers and multi-processor operation. Digital Design and Computer Architecture (2nd Ed.), by D. Harris, and S.L. Harris, Morgan Kaufmann Publishers.