

Introduction to Radar Systems

(Presented in three increasing levels of detail)

Stony Brook University, in partnership with Robert A Shade, Systems Engineering Consultant is pleased to present this series of Radar Processing programs.

The Advancement of computing power available in small machines has enabled significant advances in the way Radar Systems operate and the tasks they can carry out in real time. In this course, the applications and advantages of Modern Radar Processing is discussed. The underlying mathematical principles are introduced and a number of relevant applications are presented. In particular the advantages and techniques of multi-mode radars is emphasized. Attendance at this course is recommended as way of introducing employees of companies currently developing or utilizing Radar systems to achieve a fuller understanding of what techniques are available for the multitude of tasks demanded of modern Radars. This course is designed for engineers and managers possessing at least minimal understanding of mathematics and electrical engineering. At the completion of the workshop the student will have a basic understanding of the fundamentals of modern radar processing, how it is applied and the insight to see how it applies to his own products and services. Interested students will be encouraged to attend a more detailed series of lectures that will provide more depth on the subject.

Note* - While it is also recommended for Level I of the series, *Introduction to Radar Systems, 3rd Edition* is a required text for Level II and Level III. Please purchase this material to experience the full benefits of the program.

Introduction to Radar Systems, 3rd Edition
Merrill I. Skolnik
McGraw-Hill Higher Education
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Special Offer: Register for all three levels of Introduction to Radar Systems and pay a specially reduced fee of \$1495

Course Title: *Introduction to Radar Systems - Level I*

Fee: \$325

The Program

- Signals and Systems
- Basic Pulse Radar Operation
- Down Conversion for Digital radar Signal Processing
- Signal Synthesis
- Overview of FFTs (Fast Fourier Transform) and IFFTs
- Principles of Detection of Signals in Noise
- Principles of Time Domain vs. Frequency Domain Signal Detection
- Doppler radar processing
- Simple Applications including Synthetic Aperture Radar and radar imaging

Who Should Attend? Corporate Officers, Technical Managers and Engineers who have not studied Radar or who are in need of a refresher

Duration: 4 Hours (1 Session)

Prerequisites: Technical degree with some engineering background.

Text: Recommended - *Introduction to Radar Systems, 3rd Edition*

Course Title: *Introduction to Radar Systems - Level II***Fee:** \$675**The Program**

Level II will cover all the topics in level including the underlying mathematics and derivations of the processes. More mathematical details will be included to more rigorously explain the processing principles. Topics to be included are:
Mathematical basis of Signals and Systems

- Basic Fourier Analysis
- Sampling and A/D conversion
- Signal Synthesis
- Antenna Design
- Mathematics of FFTs and IFFTs
- Principles of Time Domain vs. Frequency Domain Signal Processing
- Filtering Concepts
- Principles of Detection of Signals in Noise
- Examples of System design and trade-offs for pulsed Doppler radars and SAR and imaging radars

Who Should Attend? Managers and Engineers who have do not have an in depth background in radar theory or who are in need of a refresher.

Duration: 12 Hours (3 Sessions at 4 Hours Each)

Prerequisites: Level I plus a technical degree with some engineering background

Text: Required - *Introduction to Radar Systems, 3rd Edition*

Course Title: *Digital Signal Processing - Level III***Fee:** \$675**The Program**

Level III will continue the explorations started in Level II. It will cover all the topics in levels I and II with additional mathematical formalism. Examples worked out in MATLAB will be shown. Mathematical techniques used for antenna design will be explained. Continuous time, discrete time and discrete time/frequency Fourier processing will be explained. Several different approaches to Pulse Doppler signal processing will be covered Some concepts of Filter Design will be included at this level. Hardware implementations will be introduced. Examples of the design of several existing radar systems will be discussed and analyzed Signal detection will be covered with more emphasis on the real-time algorithms and the statistical nature of the detection process including the concepts of false alarm rate calculation and reduction.

Signals and Systems

- Sampling and A/D conversion
- Details of Fourier Analysis
- Signal Synthesis
- Choice of Antenna type and Antenna Design
- Application of FFTs and IFFTs
- Statistical Detection of Signals in Noise
- Principles of Time Domain vs. Frequency Domain Signal Processing
- Filtering Design Concepts
- Advanced examples including Doppler filter processing and ground mapping

Who Should Attend? Electronics and Software Engineers who need to apply these principles to their products.

Duration: 12 Hours (3 Sessions at 4 Hours Each)

Prerequisites: Level I and Level II plus an engineering or mathematics degree.

Text: Required - *Introduction to Radar Systems, 3rd Edition*

To Register: For schedules and to register, please visit our website at: www.licet.org

For further information about this or any of our other courses, please email; sbucet@stonybrook.edu