REFLECTOR ANTENNA DESIGN AND ANALYSIS

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The course will give an introduction to the design and analysis of single and dual reflector antennas, center-fed as well as offset. After a brief review of the analysis methods commonly employed for space- and earth-station reflector antennas, the basis design principles will be presented. First, the single and dual spot-beam antennas are considered with the relationship between size, feed illumination, directivity, and sidelobe levels. The influence of struts and sub-reflector or feed blockage will be discussed. The origin of cross-polarization in offset designs will be addressed and it will be shown how to improve the polarization characteristics in single reflector systems by using polarization grids and in dual reflectors by employing the compensation principles of Dragone and Mizuguchi.

The design of contoured-beam antennas for space application will be illustrated by a shaped reflector design, where surface shape is determined by optimizing a spline expansion until a desired radiation pattern over a prescribed coverage area is achieved. Important steps in the design phase will be emphasized, and the corrugated feed horn design principles will be briefly touched upon.