Course Goal: The overall goal of this course is to provide understanding of the concept, theory and design principles of the electromagnetic wave propagation and transmission lines which find applications in microwave engineering and wired/wireless communication systems.

Prerequisite: Electrical Engineering 340 (Electrostatic and magnetostatic field theory using vector notation; Coulomb's Law, Gauss' Law and potential theory. Solutions to Poisson's and Laplace's equations; capacitance and inductance, Maxwell's equations)

Lecture Hours: Wednesday and Friday (4.00PM-5.15PM), Location: P-148

Course Synopsis: Transmission lines are used to connect different microwave devices and components in designing microwave circuits and systems for wireless communication applications. Similarly, understanding of the electromagnetic wave propagation in different types of propagation media is very critical for successful transmission and reception of radio wave/microwave signals and to realize a wireless/wired communication system. In view of the above, this course aims to cover the advanced topics in applied electromagnetics theory which includes the topics such as the electromagnetic wave propagation, transmission line theory, Smith chart, different types of transmission line media, and brief introduction to the antennas (time permitting).

Course Contents:

1. **Review**: Laws governing Maxwell Equations, static and time-varying forms of Maxwell Equations in point and integral forms, and phasor representations
2. **Electromagnetic Wave Propagation**: Electromagnetic wave propagation in different media such as lossless & lossy dielectrics, and good conductors (including skin depth), plane waves in free space, power flow and Poynting Theorem, reflection of plane waves at normal and oblique incidences, and scattering parameter in microwave circuits.
3. **Transmission Line Theory**: Distributed transmission line parameters, Coaxial line, wave propagation in transmission lines based on basic circuit theory, transmission line equations, input impedance of a lossy or lossless transmission line terminated by a load impedance different from the line characteristic impedance, Smith chart and its use for solving transmission line problems involving impedance and admittance parameter.
4. **Transmission Line Media**: Principle and design of simple microstrip transmission lines, introduction to stripline and co-planar waveguides transmission lines, Wave propagation in rectangular waveguide, electric and magnetic fields equations and field patterns for the fundamental modes in rectangular waveguide, power transmission and attenuation
5. **Introduction to Antennas**: Radiation mechanism of antennas such as the Hertzian dipole, half-wavelength dipole, quarter wavelength monopole, small loop antennas, fundamental parameters for characterizing antennas, concept of linear and planar array antennas, Friis and Radar equations, and electromagnetic interference and compatibility.

Reference Books:

Evaluation Criteria: Final letter grade will be determined from the student’s overall performance in following course components. The weighting of each of the components is as given below:

<table>
<thead>
<tr>
<th>Components</th>
<th>Value</th>
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<tbody>
<tr>
<td>1) Quizzes (10-15 minutes)</td>
<td>10% (4 quizzes)</td>
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<tr>
<td>2) Assignments</td>
<td>15% (4 assignments)</td>
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<tr>
<td>3) 2 Mid-term Tests (75 minutes each,)</td>
<td>35% (1st; 15% &amp; 2nd; 20%)</td>
</tr>
<tr>
<td>4) Project Report/Discussion</td>
<td>10% (Report 8%+Discussion 2%)</td>
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<tr>
<td>5) Final Examination (May 12, 3.30-5.30PM)</td>
<td>30%</td>
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Last day of the class: May 8, 2014

Course for 1st Mid-term Test: Course contents covered in the class before this test (OPEN BOOK)

Course for 2nd Mid-term Test: Course covered in the class before 2nd tests (OPEN BOOK)

Course for Final Exam: Course contents covered in the class during complete course (OPEN BOOK)

Note: If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.

General Rules:

(i) Attendance in the class, Quizzes, and meeting the submission deadlines of assignments and report are ESSENTIAL for the successful completion of this course.
(ii) Make-up schedules for the mid-term tests and final examination are NOT allowed.
(iii) Students are encouraged to discuss and help each other on assignments, but any form of plagiarism is NOT permitted.
(iv) Assignments should be clearly written or typed on A4-sheet. Late assignments are NOT permitted. Both quizzes and assignments will be graded and returned.
(v) Project topic will be assigned before first mid-term test. Additional information will be made available at the time topics are assigned.
(vi) Any form of cheating in the mid-term tests, and final examination will NOT be tolerated. If anybody caught cheating, a Grade, F will be assigned automatically.

Instructor:
Prof. Satish K. Sharma, Ph. D., Office: E202D
Telephone: (619)-594-0241 Email: ssharma@mail.sdsu.edu

Office Hours: Wednesday and Friday 2.00PM to 3.00PM or by appointment.