ELE 461: SYNTHESIS OF ACTIVE AND PASSIVE FILTERS (elective)

**Credit:** 3 hours.

**Catalog Description:** Principles of network synthesis are introduced. Synthesis techniques are used to design active and passive filters.

**Prerequisites:** ELE 360.

**Textbooks(s) and/or Other Required Materials:** Temes & LAPatra, *Circuit Synthesis & Design*, McGraw Hill, 1977.

**Topics Covered:**

1. Review of network theorems
2. Operational amplifier circuits
3. Transfer functions and frequency response
4. Cascade design with first order circuits
5. Topology
6. PR/Hurwitz Functions
7. Scaling transformations
8. Cauer Synthesis
9. Foster Synthesis
10. Linear phase characteristics
11. Transformer coupling methods
12. Brune tests
13. Lattice structures
14. Prototype and Frequency Transformed Ladders
15. Oscillator applications
16. Non-linearities and parasitics

**Class/Laboratory Schedule:**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>3 hours/week</th>
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<tbody>
<tr>
<td>Lab</td>
<td>none</td>
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**Course Objectives and Relationship to Program Outcomes:**

Synthesize immittance functions, transfer functions and examine physical realizability. Extension of ELE 210, 315 and 355. Integrates with ELE 360 to establish desired communication interface systems.

1. Mathematics applied to communications circuit design. (Outcome A).
2. Circuit System theory presented alongside mathematical models and applications. (Outcome B).
3. Synthesize immittances and transfer functions. (Outcome C).
4. Present unique designs and alternative analysis methods. (Outcome D).
5. Model systems. (Outcome E).
6. Physical realizability examined. (Outcome F).
7. Present design applications with sensitivity concerns. (Outcome G).
8. Establish firm relationships among network theorems and topological consideration. (Outcome H).
9. Recognize synthesis techniques as applicable to communication systems (Outcome I and J).
10. Translate time honored synthesis methods to scaled-down microcircuits. (Outcome K).

Coverage (and level) of ABET Outcomes: A (3), B (3), C (3), D (1), E (3), F (1), G (2), H (1), I (2), J (2) and K (3).

Contribution of Course to meeting the Professional Component:
Engineering Topics: 100%

Date: June 2004.