

# Course Description

## 4044 - RF Engineering IV

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| <b>Course Code:</b>    | 4044   |
| <b>Course Title</b>    | RF Engineering IV  |
| <b>Academic Year:</b>  | 2007   |
| <b>Semester:</b>       | 1  |
| <b>Lecturer:</b>       | Dr. C.J. Coleman   |
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### Aims

This course aims to provide a foundation for the areas of RF electronics, antennas and radio wave propagation.

### Outcomes

At the end of the course students should be able to:

1. Design and analyse power amplifiers and simple microwave circuits.
2. Design and analyse a range of antennas.
3. Perform basic RF propagation calculations.

### Assumed knowledge

ELEC ENG 3018 RF Engineering III

### Delivery Methods

24 hours of lectures and tutorials

### Assessment:

Written examination 1.5 hours (55%),

2 tests (15% each) and

3 laboratory sessions (5% each) .

## **COURSE OUTLINE : 4044 RF ENGINEERING IV**

- Revision of transmission lines.
- Microstrip lines.
- The use of transmission lines for matching and filtering. S matrix circuit theory and amplifier design using S parameters
- The design of power amplifiers.
- Revision of waves (including polarisation and dispersion).
- Introduction to propagation (reflection, refraction and diffraction).
- Elementary waveguide theory.
- Radiation fields.
- Wire antennas (including loops, dipoles and monopoles).
- The concepts of effective length, directivity and gain.
- The Friis equation.
- Influence of environment upon antenna performance.
- Broadband antennas.
- Introduction to array antennas (including the log periodic dipole array).
- Aperture antennas (including patch designs)

### **COURSE NOTES or TEXTBOOKS**

#### *Textbook:*

Coleman, C.J.: "An introduction to radio frequency engineering" (2004, Cambridge University Press).

#### *Reference Books*

1. Balanis, Constantine A.: "Antenna theory: analysis and design" (Harper and Row, New York, 1982). Recommended
2. Stutzman, W.L. and Thiele, G.A., "Antenna Theory and Design", 2 nd Edition, Wiley. Reference
3. Pozar, D.M., "Microwave Engineering" (Wiley, 1998) Reference
4. Pozar, "Microwave and rf design of wireless systems (Wiley, 2001). Reference

### **Graduate Attributes**

- GA1 An advanced level of knowledge and understanding of the theory and practice of Electrical and Electronic, Computer Systems or IT&T Engineering and the fundamentals of science and mathematics that underpin these disciplines.
- GA2 A commitment to maintain an advanced level of knowledge throughout a lifetime of engineering practice and the skills to do so.
- GA3 The ability to apply knowledge in a systematic and creative fashion to the solution of practical problems.

- GA4 A commitment to the ethical practice of engineering and the ability to practice in a responsible manner that is sensitive to social, cultural, global, legal, professional and environmental issues.
- GA5 Interpersonal and communication skills for effective interaction with colleagues and the wider community.
- GA6 An ability to work effectively both independently and cooperatively as a leader, manager or team member with multi-disciplinary or multi-cultural teams. GA7 An ability to identify, formalise, model and analyse problems.
- GA8 The capacity to design, optimise, implement, test and evaluate solutions.
- GA9 An ability to plan, manage and implement solutions that balance considerations of economy, quality, timeliness and reliability as well as social, legal and environmental issues.
- GA10 Personal attributes including: perseverance in the face of difficulties; initiative in identifying problems or opportunities; resourcefulness in seeking solutions; and a capacity for critical thought.
- GA11 Skills in the use of advanced technology, including an ability to build software to study and solve a range of problems.
- GA12 A commitment to the highest standards of professional endeavour and the ability to take a leadership role in the community.
- GA13 An ability to utilise a systems approach to design and operational performance.
- GA14 Understanding of the principles of sustainable design and development.

These programs also foster the graduate attributes of the University of Adelaide and the Institution of Engineers Australia. These should be read in conjunction with the list above.

### **Assessment of Graduate Attributes**

Attributes GA1, GA3, GA7, GA8, GA10, GA11, GA12 and GA13 will be assessed through the tests, laboratories and the examination. The laboratory sessions will test, to some degree, attributes GA5, GA6 and GA9. Issues concerning GA2 and GA4 will be raised during lectures, but not assessed.