1. **Course number and name**  
EE 321: Circuits II

2. **Credits and contact hours**  
3 credits, 3 contact hours per week

3. **Instructor’s or course coordinator’s name**  
Sandip Roy

4. **Textbook, title, author, and year**  
*Other supplemental materials*  
Also, lecture notes are provided to the students.

5. **Specific course information**  
   a. **Brief description:** EE 321 enhances the students’ introduction to linear circuit analysis toward a systematic solution and design methodology, based on differential-equation formalisms. This general circuit analysis serves as a starting point toward an introduction to core tools in systems and signals analysis for electrical engineers.  
   b. **Prerequisites or corequisites:** Completion of Circuits I (EE 261) and Differential Equations with grade of C or better, or permission of instructor.

6. **Specific Goals and Objectives:**  
EE 321 provides a development of core systems and signals concepts, and their application to linear circuits analysis and design. By the end of the course, students should be able to  
   a) write differential-equation models for linear circuits, and to put these circuit differential equations into standard, state-space-, and Laplace-domain forms;  
   b) solve linear differential equations or circuits using several methods, including the method of undetermined coefficients, the convolution-based approach, Laplace-domain solutions, and state-space-based solutions (by computer);  
   c) understand core system-theory concepts and constructs such as the transfer function, frequency response, and impulse response;  
   d) design and analyze filter circuits;  
   e) understand the operation of mutual inductors, as an additional circuit component;  
   f) understand and be able to apply several mathematical techniques underlying systems/signal analysis, including Laplace-domain analysis, Fourier Series, and Fourier Transforms.

By the end of the course, students should be able to:  
- Apply circuits-engineering principles to analyze linear dynamic circuits (Outcomes 1a-1e)  
- Design linear dynamic circuits that meet performance specifications such as filter and time-domain specification (Outcomes 2a-2g)
● Communicate motivations, methods, and outcomes for circuit design tasks such as filter design (Outcomes 3a-3e)
● Work in teams to analyze and design circuits (Outcome 5b)
● Apply knowledge and information to analyze/design circuits (Outcomes 6a, 6c)

7. Brief List of Course Topics
   • Developing differential-equation models for linear circuits
   • Solving differential equations using the method of undetermined coefficients
   • Using convolution to solve circuits/differential equations
   • Solving circuits and differential equations by computer using the state-space form
   • New circuit elements: mutual and ideal transformers
   • Laplace Transform mathematics
   • Solving circuits and differential equations using Laplace transforms
   • Core system-theoretic concepts: transfer function and impulse response
   • Frequency response (including drawing and interpreting Bode plots)
   • Design of filter and amplifier circuits
   • Fourier series: mathematics
   • Fourier series: application to circuits and systems analysis
   • Fourier transforms: introduction