Kingdom of Saudi Arabia
The National Commission for Academic Accreditation & assessment

COURSE SPECIFICATIONS

Revised November 2011

Course Specification

Institution	**Al Majma'ah University**
College/Department	**Engineering/Electrical**

A Course Identification and General Information

1. Course title and code: 340 EE-Automatic Control Systems
2. Credit hours**: 3 hours**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **B. A. in Electrical Engineering**
4. Name of faculty member responsible for the course **Dr. Abdel-Rahman Al-Qawasmi**
5. Level/year at which this course is offered: level 6 / 3d year
EE221 Signal Analysis & Systems
7. Co-requisites for this course (if any) **None**
8. Location if not on main campus **Al Majma'ah University/Faculty of Engineering \ Room No: 3D (041)**

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

General Outcomes:

c. An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes,
d. An ability to conduct standard tests and measurements; to conduct, analyse, and interpret experiments; and to apply experimental results to improve processes,
f. An ability to identify, analyse, and solve broadly-defined engineering technology problems,Specified outcomes:
E1. The ability to analyze, designs, and implement instrumentation systems,
E2. The ability to apply project management techniques to electrical/electronic(s) systems.
E3. The ability to utilize statistics/probability, transform methods or discrete mathematics in support of electrical/electronic(s) systems.

1. The ability to apply knowledge of mathematics, science and engineering.
2. The ability to use the analysis and design tools of classical linear control in simplified homework problems.
3. The ability to apply modern computer tools such as Matlab and web-based tutoring tools.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g increased use of IT or web based reference material, changes in content as a result of new research in the field)

1. The use Automatic Control Lab to be familiar with different Control systems (linear and feedback)

2. Use power point materials uploaded

3. Use of www.wikipidia.com as non-official reference to get more information about Automatic Control history and the developing of Control systems.

4. Include e-books

C. Course Description

1 Topics to be covered	No of Weeks	Contact hours
Introduction to Control Systems: Examples of Control Systems- Closed-Loop Control versus Open-Loop Control.	1	4 each week
Mathematical Background: Review of Complex Variables and Complex Functions- Laplace Transformation- Solving Linear, Time-Invariant, Differential Equations.	2	4 each week
Modelling of Dynamic Systems: Transfer Function and Impulse-Response Function- Modelling of Electrical, Fluid and Thermal Systems- Signal Flow Graphs.	1	4 each week
Transient and Steady-State Response Analyses: First, Second and Higher-Order Systems- Transient-Response Analysis- Routh's Stability Criterion- Steady-State Errors.	3	4 each week
Root-Locus Analysis: Root-Locus Plots- Positive-Feedback Systems- Conditionally Stable Systems- Control Systems Design by the Root-Locus Method.	2	4 each week
Frequency-Response Analysis: Bode Diagrams- Polar Plots- Nyquist Stability Criterion- Stability Analysis- Closed-Loop Frequency Response.	3	4 each week
Control Systems Design by Frequency Response: Lead Compensation- Lag Compensation- Lag-Lead Compensation.	2	4 each week

2. Course components (total contact hours per semester):		
Lecture: 42 hours	Tutorial: 14 hours	•Introducing the main concepts and theory of automatic control systems. •Understanding the behaviour of systems characterized by linear ordinary differential equations. •Ability to use time and frequency domain design techniques based on above analysis to

		design linear control laws.

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week)

3 hours per week

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- Methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

1. Knowledge of Laplace Transform.
2. To be familiar Ordinary differential equations
3. Knowledge of signal processing analysis

(ii) Teaching strategies to be used to develop that knowledge

1. Reading a variety of texts on Laplace Transform and Differential equations solving theories.
2. Involving students in problem-based and assignment-based activities.
3. Enhancing the solving and design strategies through studying specific Control systems.
4. Using related textbooks and sources such as Journals and electrical magazines to prepare project assignment.
5. Presenting the assignments in the classroom and labs.

(iii) Methods of assessment of knowledge acquired

1. Using the textbook tasks.
2. Writing learning summaries
3. Quizzes, Midterm exams, and final exams.

4. Team projects.
5. Using portfolio assessment and encouraging students to get involved in assessing their own learning.

b. Cognitive Skills

(i) Cognitive skills to be developed

1. Students will demonstrate their ability to model control systems, including: a) obtaining a model from a given experimental outcome, b) translating a model mathematical formulation into an equivalent one.
2. Students will demonstrate their ability to analyse control systems, including: a) obtaining the system output for a given input, b) determining stability, c) finding the steady-state error, d) finding the gain and phase margins
3. Students will demonstrate their ability to design control systems to satisfy predetermined design specification, such as overshoot, settling time, gain and phase margin, etc.

(ii) Teaching strategies to be used to develop these cognitive skills

1. Different Control systems and theories will be discussed during the course time.
2. Solving some case studies related to the course (in lab).
3. Homework assignments.

(iii) Methods of assessment of students cognitive skills

1. Short quizzes in classes.
2. Midterm exam.
3. Evaluation of tutorial reports.
4. Final exam.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

1. Work with the team
2. Communication
3. Good behavior
4. Positivity

(ii) Teaching strategies to be used to develop these skills and abilities

1. Team projects or assignments
2. Workshops
3. Mini seminars prepared by the students to present team projects.
4. Group discussion.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

1. Active class participation reflects the students ability to keep up with the reading schedule
2. Performance on midterms and final exams are evidence of the student's ability to recollect and synthesize information
4. Instructor's assessment of student's performance and seriousness during individual supervision hours

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

1. They will demonstrate their design skills through a Design Project Report, which will include
2. Producing a descriptive abstract and a motivating introduction,
3. Explaining mathematical calculations and the generation of theoretical expectations,
4. Analysing simulation results and their match with theoretical expectations and
5. d) Providing relevant conclusions

(ii) Teaching strategies to be used to develop these skills

1. Individual and group observation.
2. Group discussions
3. Making reports to discuss.

(iii) Methods of assessment of students numerical and communication skills

1. Encouraging self-assessment during the learning process.
2. Providing opportunities for observed practice.
3. Providing feedback.

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

Not Applicable

(ii) Teaching strategies to be used to develop these skills Not Applicable
(iii) Methods of assessment of students psychomotor skills Not Applicable

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	1st midterm	Week 6	20%
2	Participation & Attendance	All **a**long	10%
3	Quizzes & Homework	All **a**long	10%
4	2nd midterm	Week 11	20%
5	Final	Week 15	40%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

1. Weekly office hours (3 hours per week)
2. Exam error analysis in class
3. Feedback for each student
4. Providing weekly guidelines on students' overall performance
5. Teacher's web page.

E. Learning Resources

1. Required Text(s)

Katsuhiko Ogata:"Modern Control Engineering", International Edition, Pearson Education Press, 5th edition, Prentice Hall, 2009

2. Essential References

Richard Dorf and Robert Bishop: "Modern Control Systems" , 11th Edition, 2008.

5- Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) Lecture rooms should be large enough to accommodate 25 students
2. Computing resources Computer - projector system- smart board ..
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) Data show to facilitate going over student papers in class

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching
1. Midterm evaluation feed-back form to increase instructor's awareness of the weak and strong points of the class 2. End of term college evaluation of course by students (to be collected by the department) 3. End-of-term debriefing in class of students and teacher regarding what went well and what could have gone better 4. Small group instructional diagnosis (SGID) whereby instructors exchange classes and gather information from each others' students on specific points outlined by the department and the instructor being evaluated
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department
1. Peer evaluation to asses ability of faculty members to work with their colleagues

2**.** Cass observations by supervisors
3 Processes for Improvement of Teaching 1. Training sessions 2. Workshops to facilitate the exchange of experiences amongst faculty members 3. Regular meetings where problems are discussed and solutions given 4**.** Discussion of challenges in the classroom with colleagues and supervisors 5. Encouragement of faculty members to attend professional development conferences 6. Keep up to date with pedagogical theory and practice 7. Set goals for achieving excellence in teaching at the beginning of each new semester after reviewing last semester's teaching strategies and results
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) 1. Check marking of a sample of examination papers either by a resident or visiting faculty member 2. Arrang**e** with another institution to have two common test items included on an exam and compare marks given 3. Students who believe they are under graded can have their papers checked by a second reader
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. 1. Compare syllabi and course description with other universities (including those on the net) 2. Biannual meetings of faculty members to discuss improvement 3. Have a curriculum review committee to review the curriculum periodically and suggest improvements.