INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

COURSE OUTLINE

<table>
<tr><td>Kulliyyah</td><td>Engineering</td></tr>
<tr><td>Department</td><td>Mechatronics Engineering</td></tr>
<tr><td>Programme</td><td>B. Eng. (Mechatronics)</td></tr>
<tr><td>Course Title</td><td>Mechatronics Engineering Lab III</td></tr>
<tr><td>Course Code</td><td>MCT 3229</td></tr>
<tr><td>Status</td><td>Core</td></tr>
<tr><td>Level</td><td>3</td></tr>
<tr><td>Credit Hours</td><td>1</td></tr>
<tr><td>Contact Hours</td><td>3</td></tr>
<tr><td>Pre-requisites (if any)</td><td></td></tr>
<tr><td>Co-requisites (if any)</td><td>MCT 3222, MCT 3234</td></tr>
<tr><td>Teaching Methodology</td><td>Laboratory demonstration and project.</td></tr>
<tr><td>Method of Evaluation</td><td>
<table>
<tr><th>LO</th><th>Method</th><th>%</th></tr>
<tr><td>1,2,3,4,5,6,7</td><td>Reports</td><td>40</td></tr>
<tr><td>1,2,3,5,6</td><td>Laboratory tests</td><td>40</td></tr>
<tr><td>3,5,6,7,</td><td>Design and Simulation Projects</td><td>20</td></tr>
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<tr><td>Instructor(s)</td><td>TBD</td></tr>
<tr><td>Semester Offered</td><td>Every Semester</td></tr>
<tr><td>Synopsis</td><td>Introduction to practical aspects of Analog Electronics and Control systems. This course covers electric signal generation, rectifiers, filters, AD/DA and DA/AD converters; and modeling of physical systems, control system using op-amp, controllers/compensator design and simulation.</td></tr>
<tr><td>Course Objectives</td><td>The objectives of this course are to:
1. Expose students to the practical aspects of analog electronics and control systems.
2. Introduce students to practical aspects of integrated circuit (IC) and its applications.
3. Expose students to simulation software (PSPICE, MATLAB, etc) for simulation of electronic circuits and control systems.
4. Expose students to control systems experiments.</td></tr>
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Learning Outcomes	Upon completion of this course, students will be able to: 1. Design and implement analog circuits for specific applications. 2. Evaluate circuit performance using software tools. 3. Validate mathematical model of physical systems through experiments. 4. Design and implement closed loop control system for target applications. 5. Design and implementation of controllers using both hardware and software tools. 6. List safety rules and laboratory procedures for conducting experiments. 7. Perform experiments in groups and present reports individually or in group as required.

Content Outlines

Week	Topics	Task/Reading
1	Level comparators, hysteresis comparators and windows detectors.	Lab Manual Exp. 1
2	Waveform generation with OP-AMPs and integrated circuits, IC Timers (555).	Lab Manual Exp. 2
3	Half wave and full wave precision rectifiers, and instrumentation amplifier.	Lab Manual Exp. 3
4	Active filters: implementation of low pass, high pass and band pass filters with operational amplifiers.	Lab Manual Exp. 4
5	Modulation Circuits: Amplitude modulation and demodulation, frequency modulation and demodulation.	Lab Manual Exp. 5
6	Design of phase looked loops (PLL) and PLL applications	Lab Manual Exp. 6
7	Analog to digital converter and digital to analog converter circuits.	Lab Manual Exp. 7
8	Mathematical modeling of physical systems.	Lab Manual Exp. 8
9	Use of Matlab and control toolbox for simulating control system performance and behaviors.	Lab Manual Exp. 9
10	Application of operational amplifiers in control systems, implementation of PID controllers.	Lab Manual Exp. 10
11	Study of a closed loop velocity control loop.	Lab Manual Exp. 11
12	Study of a feedback position control loop.	Lab Manual Exp. 12
13	Design a position control system and performance study.	Lab Manual Exp. 13
14	Design of compensators for control system and performance study.	Lab Manual Exp. 14

References	**Required:** Lab. Manuals **Recommended:** Coughlin, R. F., & Driscoll, F.F., (2001). *Operational Amplifiers and Linier Integrated Circuits*, (6th ed.), Prentice Hall. Dorf, R.D., & Bishop, R.H., (2001). *Modern Control Systems*, (9th ed.), Prentice Hall. Dorsey, J., (2002). *Continuous and discrete control systems*, (1st ed.), MC Graw Hill. Razavi, B., (2002). *Design of analog CMOS Circuit*, (1st ed.), MCGraw-Hill.
Proposed Start Date (Semester)	Semester I, 2007-2008
Batch of Student to be affected	2005 intake and onwards

Prepared by:	**Checked by:**	**Approved by:**
(Dr. M.A.S. Kamal)	**(Assoc. Prof. Dr Raisuddin Khan)**	**(Prof. Ahmad F. Ismail)**

Course Assessment Matrix: MCT 3229

Course Learning Outcomes	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6	Outcome 7	Outcome 8	Outcome 9	Outcome 10	Outcome 11	Outcome 12	Outcome 13
1. Design and implement analog circuits for specific applications.	3	1	3	3	3	3							
2. Evaluate circuit performance using software tools.	2	1	3	3	2	2							
3. Validate mathematical model of physical systems through experiments.	2	1	2	3	3	3							
4. Design and implement closed loop control system for target applications.	3	1	3	3	3	3							
5. Design and implementation of controllers using both hardware and software tools.	3	1	3	3	3	3		3					
6. List safety rules and laboratory procedures for conducting experiments.		1									2	3	3
7. Perform experiments in groups and present reports individually or in group as required.								3	3				

*1=objective addresses outcome slightly, 2=moderately, 3=substantive

The educational outcomes of the programmes conducted by the Kulliyyah are as follows:

1. The ability to acquire and apply knowledge of mathematics, science, and engineering fundamentals.
2. To have acquired a broad based education necessary to understand the impact of engineering solutions in a global and societal context.
3. The ability to have in-depth understanding and technical competency in relevant engineering.
4. The ability to undertake problem identification, formulation and solution.
5. The ability to design a system, component, or process for operational performance.
6. The ability to design and conduct experiments, as well as to analyze and interpret data.
7. The ability to understand the principles of sustainable design and development.
8. The ability to effectively communicate orally, in writing and using multimedia tools.
9. The ability to function effectively as an individual and in group with the capacity to be a leader or manager as well as an effective team member.
10. The ability to recognize the need for life long learning and possess the ability to pursue independent learning for professional development.
11. The ability to understand the social, cultural, global and environmental responsibilities of a professional engineer, and the need for sustainable development.
12. The ability to understand and commit to professional and ethical responsibilities.
13. The ability to understand the expectations of an engineer who practices in an industrial or governmental organization.