

**Name of the module: Analog Electronic Circuits**

**Number of module: 361-1-3671**

BGU Credits: 3

ECTS credits:

Academic year: 2013- 2014

Semester: Spring

Hours of instruction: 3 lecture hours per week

Location of instruction: will be defined.

Website: [www.ee.bgu.ac.il/~angcirc](http://www.ee.bgu.ac.il/~angcirc)

Language of instruction: Hebrew

Cycle: First cycle

Position : a core module graduate students that take the circuits , nano , micro and VLSI track at the Department of Electrical and Computer Engineering to be taken on Spring semester

Field of Education: Electrical Engineering

Responsible Department: Electrical and Computer Engineering

General Prerequisites: Recommended – switch-mode DCDC converters (36113671)

Grading Scale: the grading scale would be determined on a scale of 0 – 100 (0 would indicate failure and 100 complete success), passing grade is 65.

Lecturer: Dr. Mor M. Peretz

Contact details: Room 301, Building 33

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Office Hours: Wednesday, 1300 to 1400

Course Description: This course introduces principle of operation, features and characteristics of practical voltage and current feedback operational amplifiers. Topics covered include: DC errors, frequency response in open and closed loop, phase compensation, stability criterion, noise sources, signal to noise ratio, noise figure, and data sheets. Applications of the operational amplifiers such as instrumentation amplifiers, precision rectifiers, RC oscillators, active filters, and switched capacitors filters will be discussed as well.

Aims of the module:(1) to provide students with a sound understanding of concept analog electronic circuits, with emphasis on a main building block – the operational amplifier; and (2) to develop the necessary framework and tools to design and develop analog feedback systems.

Objectives of the module: To provide knowledge of general control issues of analog electronic circuits and introduce the concepts of analog feedback control and the wide range of possible applications using operational amplifiers.

Learning outcomes of the module: On successful completion of the course, the students should be able to:

- (1) Evaluate and design analog feedback systems that are based on operational amplifiers
- (2) Describe the theoretical foundations of feedback theory based on the frequency and time domains
- (3) Address practical applications and challenges of opamp – analog system design

Module evaluation: at the end of the semester the students will evaluate the module, in order to draw conclusions, and for the university's internal needs.

Confirmation: the syllabus was confirmed by the faculty academic advisory committee to be valid on 2013-2014.

Last update: 05.03.2014

Attendance regulation: attendance is not mandatory.

Teaching arrangement and method of instruction: The module consists of lectures.

Assessment:

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|---------------|------|
| 1. Final exam | 100% |
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Work and assignments: No mandatory assignments.

Final exam: at the end of semester.

Time required for individual work: 3 hour per week attendance in class, 1.5 hours per week to review the class material, 25 hours to study to the final exam.

Module Content\ schedule and outlines:

Lectures (3h each):

1. *Ideal Op. Amp, Feedback*
2. *Feedback, CFA, Stability*
3. *DC Errors, Input Impedances*
4. *CMRR, SPICE, Compensation*
5. *External Compensation, SPICE, Slew Rate*
6. *Noise*
7. *Zin, Zout, Instrumentation Amplifier*
8. *Data sheets*
9. *Precision Rectifier, Comparator, Multivibrator*
10. *Multivibrator, Active Filters*
11. *Switched-capacitor Filters*
12. *Multiple amplifier circuits*

Required reading

- [www.ee.bgu.ac.il/~angcirc](http://www.ee.bgu.ac.il/~angcirc)
- Handouts of Prof. Shmuel Ben-Yaakov
- Sergio Franco, "Operational Amplifiers and Analog Integrated Circuits," McGraw- Hill Book Company, 1998. (Second and Third Editions)
- George Clayton and Steve Winder, "Operational Amplifiers," Newnes, 2003 (Fifth Edition)
- Thomas F. Shubert, Ernest H. Kim, "Active and non-linear electronics," John Wiley & Sons, 1996.