ELE2213 INSTRUMENTATION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
The course enables students to acquire knowledge and skills on electrical instrumentation and measurements.

Course Objectives
By the end of the course students should be able to:
- Understand the construction, operation and characteristic of electrical instruments
- Use electrical instruments to measure various quantities

Detailed Course Content:

Review of Measurement Specifications: **[4 Hours]**
Standards, units. Absolute and relative measurement. Instrument specifications range, resolution, accuracy, linearity, etc.
Analogue Instruments: **[8 Hours]**
Moving coil, moving iron instruments. Electrostatic and induction meters. Ballistic galvanometer, Grasso flux meter.
Digital Instruments: Multimeters, data analysers, signal synthesisers. Counters and timers.
Transducers: **[6 Hours]**
Transduction methods resistance and reactance change, electromagnetic, semiconductor, digital, thermo-electric. Measurement of displacement, velocity and acceleration, time and frequency, light, temperature, volume, pressure, flow and force.
Analogue Data Processing: **[9 Hours]**
The operational amplifier; characteristics, configurations. Analogue computer hardware, data handling operations and circuits. Simulation of differential equations and transfer functions.
Data Acquisition and Conversion: **[10 Hours]**
Sampling theorem, quantisation, multiplexing, filtering sample and hold. ADC circuits dual slope, parallel comparator, successive approximation voltage-to-frequency, etc, ADC specifications. DAC circuits R-2 ladder, weighted resistor, etc. DAC specifications.
Computerized Measurement and Control Systems: **[8 Hours]**
Measurement and control configurations. Instrument control with the GPIB IEEE) bus. Measurement and control algorithms; running averages, deviations, PID.

Mode of Delivery
The course will be taught by using lectures, tutorials and assignments.

Assessment
Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, laboratories, tests)	40%
Final examination	60%
Total	100%

Learning Outcomes

The student will:

- Acquire knowledge of the type of measuring instruments and be able to appreciate why certain instruments are m ore favourable in a particular environment and requirement (accuracy or precision among others);
- Understand the types of errors that occur during measurement and how best they can be minimised during experimental setup.
- Acquire concepts on sensors and their use in design of automated systems.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40
% Final examination	60
% **Total**	**100%**

Recommended Books and References

[1] Allan S. Morris, *Measurement and Instrumentation Principles,* 3rd ed., Butterworth Heinemann,
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[2] *K. Ogata, Discrete- Time Control Systems*

Possible Lecturers:
Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere