Semester:	4				
Course Code:	EE2820				
Course Name:	Applied Electronics				
Credit Value:	3 (Notional hours: 150)				
Pre-requisites:	none				
Core/Optional	Core				
Hourly Breakdown	**Lecture**	**Tutorial**	**Practical**	**Assignment**	**Independent Learning & Assessment**
	32	7	6	6	99

Course Aim: This course is aimed at providing essential fundamental knowledge and skills to design and implement electronic circuits for common practical applications.

Intended Learning Outcomes:

- **describe** the characteristics of an operational amplifier.
- **explain** the operation of analogue electronic circuits based on operational amplifiers.
- **design** electronic circuits.
- **Implemen**t electronic designs.

Course Content:

- **Operational Amplifiers (OPAMP)**

The ideal OPAMP, open-loop gain, input resistance and output resistance. Characteristics of real Op-Amps: open-loop transfer function, voltage gain, bandwidth, slew rate, power bandwidth, clipping, offset voltages and currents, rejection ratios.

- **OPAMP Applications**

Linear applications: (Inverting and Non- Inverting amplifiers, Differential and Summing amplifiers, Integrators and Differentiators), Nonlinear applications (precision rectifiers, peak detectors, Schmitt-trigger comparator and logarithmic amplifiers).

- **Active Filters**

Low-pass, high-pass, band-pass and band-stop sections, Butterworth, Chebyshev, Elliptic and Bessel functions, circuit realization of single pole and two-pole transfer functions; frequency and impedance scaling. Implementation of filters using OPAMPs.

- **Data conversion circuits**

Analog to Digital converters: definitions, codes, LSB, MSB, linearity, differential linearity, offset and gain errors, missing codes; Counting converters: successive approximations, single-and-dual slope converters, flash converters, delta-sigma converters; Sample-and-hold circuits, sampling rate selection and setting, integrating an analog signal to a digital system.

Digital to Analog converters: definitions, codes, LSB, MSB, linearity, differential linearity, offset and gain errors; weighted resistor D/A converter; R/2R ladders and D/A converters; weighted current source converters; integrating a digital signal to an analog system.
Clock synchronizing the Analog to Digital and Digital to Analog conversion operations using system clock signals.

➢ **Oscillators**

Basic concepts and definitions; Wien-bridge oscillator

➢ **Circuit modeling and simulation**

Introduction to electronic Computer Aided Design (CAD) tools, dc analysis, ac analysis, transient analysis; simulation control options, built-in-solid-state device models, device parameter control libraries, Designing electronic circuits.

➢ **Logic Circuits**

SOP and POS representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions, don't care conditions.
Flip flops, latches, edge triggered flip flops, master slave flip flops. Flip flop applications in data storage, shift registers and counters.
Timing diagrams

Teaching /Learning Methods:
Lectures, Tutorials, Practical Work, and Assignments

Assessment Strategy:

Continuous Assessment	Final Assessment		
40%	60%		
Details: Assignments/Tutorials/Quizzes 25 %, Practical Work 15 %	Theory (%) 60	Practical (%)	Other (%)

Recommended Reading:

- Robert F. Coughlin, Frederick F. Driscoll, (2001) "Operational Amplifiers and Linear Integrated Circuits", 6th Edition, Prentice Hall
- Maurizio Di Paolo Emilio, (2013) "Data Acquisition Systems – From Fundamentals to Applied Design", Springer