Course Title: Electronics Engineering I
Course Code: EEEG 211
Credit Hours: 3

Course Description:
This course intends to extend the students' knowledge and skill in the understanding of electronic circuits and devices. Overall concepts and devices covered in earlier courses as well as new devices will be examined in practical circuit applications.

Course Contents:

Unit 1: Introduction
Introduction to electronics, Overview of electronic devices and circuits: Linear and Non linear, Low frequency and high frequency, Low power and high power.

Unit 2: Diodes
PN junction characteristics; Ideal and Practical Diode; I-V characteristics; I-V Characteristic of Germanium (Ge), Silicon (Si) and Gallium Arsenide (GaAs) diodes; Forward and reverse bias; Transition and diffusion capacitance; Diode configuration (Series, Parallel and Hybrid), Load line analysis; Large signal and small signal model, Applications- half wave and full wave rectifiers (including bridge), DC and RMS output, efficiency, Smoothing, Ripple factor, Conduction angle, and RC filtering; Clippers, Clampers and Voltage multiplier. Special purpose diode- Zener diode and its characteristics, Zener diode as regulator; Light emitting diode, Schottky diode, Varicap diode

Unit 2: Bipolar Junction Transistor
Introduction of bipolar devices and bipolar junction transistor (BJT), pnp and npn transistor construction and mode of operation, graphical representation of transistor characteristics; Active mode operation. Common Base (CB) - circuit, input characteristic, output characteristic, current gain characteristic. Common Emitter (CE) - circuit, input characteristic, output characteristic, current gain characteristic. Common Collector (CC) - circuit, input characteristic, output characteristic, current gain characteristic. BJT biasing- DC load line and bias point, Fixed bias configuration, voltage divider bias configuration, collector feedback configuration, emitter follower configuration, Bias stabilization of transistor, AC analysis of BJT circuit- AC load line, Transistor model and parameters; CE, CB and CC circuit analysis, Early effect; Ebers Moll model. Application- switch and amplifier

Unit 3: Field Effect Transistor
Introduction of Field Effect Transistor (FET), Metal Oxide Semiconductor Field Effect Transistor (MOSFET) structure and operation, Types of MOSFET, Current voltage characteristic, MOSFET large signal and small signal model, MOSFET as an amplifier and switch; biasing in MOSFET amplifier, Junction field effect transistor (JFET)- Construction, Basic operation and Characteristics

Unit 4: Electronic Amplifiers Basics

Basic definition of amplification and gain; Brief overview of amplifier types- Voltage amplifiers, Current amplifiers, Trans-conductance amplifiers, Trans-resistance amplifiers, Design procedure of low frequency amplifier using BJT and MOSFET- Biasing, Small signal parameter, Gain and impedance calculation, Amplifier with negative feedback- Negative feedback concept and effect. Miller's effect and pole

Unit 5: Power Amplifiers

Overview of efficient amplifier for high power application, Power Amplifier Classes- A, AB, B, C. Class A amplifier, Efficiency; Class B amplifier, Efficiency; Output impedance of amplifier and impedance matching, Harmonic distortion in power amplifier, Linearity and efficiency trade off in high power design.

Unit 6: Operational Amplifiers

Overview of differential pair and differential amplifier, Basic parameters of ideal Operational Amplifier (Op. Amp); Ideal and practical Characteristic of Op- Amp, Derivation of gain for basic inverting and non-inverting amplifiers with feedback; Concept of voltage follower and negative ground, Op-Amp Application- Integration, Differentiation, Addition, Clipping and comparator circuits

References:

1. D. L. Schilling, C. Belove, *Electronic Circuits*, McGraw Hill Book Company
2. R. Boylestad, L. Nashelsky, *Electronic Devices & Circuit Theory 6th Ed*, PHI
3. H. Taub, D. L. Schilling, *Digital Integrated Electronics*, McGraw Hill Book Company
4. A. S. Sedra, K. C. Smith, *Microelectronic Circuits*, CBS College Publishing, USA, 1987.
5. R A Gayakwad, *Op-Amp and Linear Integrated Circuits*, PHI, Delhi, 1993

Evaluation:

In-Semester Evaluation: 50%
End-Semester Evaluation: 50%