EEEG 211 ELECTRONICS ENGINEERING I 3 Credits

Objective: *To extend the students' knowledge and skill in the understanding of practical electronic circuits. Concepts and devices covered in earlier courses as well as new devices will be examined in practical circuit applications.*

Syllabus:

Diodes: PN junction characteristics; Diode characteristics; Applications- half wave and full wave rectifiers (including bridge), DC and RMS output, efficiency, smoothing, ripple factor, conduction angle, and RC filtering; Regulation and Zener diode; LED

Bipolar Junction Transistor: Basic operation of PNP and NPN transistor action; CE, CB and CC configurations; CE characteristics; The CE transistor as a switch and simple amplifier; Thermal instability; Biasing arrangements; Load line and operating point; Saturation and cut-off; Non-linear region distortion; Transistor hybrid parameters; Small signal hybrid equivalent circuit

Field Effect Transistor: Junction field effect transistor (JFET): basic operation, characteristics, and parameters; IGFET (MOSFET): basic operation; Depletion and enhancement MOSFETs; FET as amplifier; Biasing; Small signal FET model

Amplifiers: Basic definition of amplification and gain; Use of decibel; Brief overview of amplifier types; Frequency and phase response; CR network model for transfer function; Multistage amplifiers and coupling; Brief introduction to cascaded amplifier, darlington pair, long tail pair and emitter follower and concept of tuned load; Design of simple single stage amplifier; Use of computer simulation packages.

Power Amplifiers: Class A power amplifier, AC load line; Matching transformer load; Efficiency; Choice of transistor; Amplifier classification (A, B, C); Class B push-pull amplifier, complementary pair, crossover distortion; Integrated circuit power amplifiers (one example)

Operational Amplifiers: Basic parameters of ideal operational amplifier; Derivation of gain for basic inverting and non-inverting amplifiers with feedback; Input offset voltage and current, input bias current, common mode rejection ratio, slew rate, full power bandwidth, and unity gain bandwidth; Integration, differentiation, addition, clipping and comparator circuits.

References:

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

EEEG 202

EEEG 202 DIGITAL LOGIC 3 Credits

Objective: *To introduce students to the fundamental concepts of digital logic*

Syllabus:

Introduction to Digital Systems: Why digital?; Analogue versus digital

Number Systems and Codes: Binary, octal and hexadecimal number systems; Conversion from one number system to another; Representation of negative numbers by signed magnitude representation, radix-complement representation (2's complement and 10's complement), diminished radix-complement representation (1's complement and 9's complement); Addition and subtraction of negative numbers; Binary, hexadecimal and octal numbers; 1's and 9's complements, and 2's and 10's complements; Binary multiplication and division; Problem of overflow in arithmetic operation; Weighted and unweighted binary codes, excess-3 and Gray codes; Error detecting codes (parity); Alphanumeric, ASCII and EBCDIC codes

Boolean Algebra and Logic Gates: Introduction; Postulates of Boolean algebra, associativity, inverse, closure, commutativity, and distributivity; Basic theorems and properties of Boolean algebra and duality; Boolean variables and constants, algebraic manipulation, maxterms, minterms and conversion between them; Two variable Boolean algebra and switching algebra; Digital logic gates; IC digital logic families; An introduction to TTL, ECL, MOS, CMOS, I2L.

Simplification of Boolean Functions: Map method: 2,3, and 4 variable maps; Product of sums simplification; Implementation of digital functions using universal gates (NAND and NOR); Don't care conditions; The tabulation method – detection and selection of prime implicants

Combinational Logic: Introduction; Active level designation for logic gate pins; Useful digital circuits implemented through combinational logic – half and full adders, half and full subtractors, BCD to excess 3 code converter, binary parallel adder, look ahead carry generator, BCD adders, magnitude comparator, decoders, encoders and priority encoders, multiplexers and demultiplexers; Combinational circuit analysis procedures and combination circuit realisation using universal gates; Block diagram transformation of combinational logic circuits implemented by one type of gate to another; Use of multiplexers and decoders for combinational logic design; Introduction to ROM and PLA and their use in combination logic circuits.

Sequential Logic circuits: Introduction; Distinction between combinational and sequential circuits; Bistables, master-slave and edge triggered; Design of clocked bistables; Conversion from one type to another; Analysis of sequential circuit using state diagrams; Bistable excitation tables; Design of sequential circuit using state reduction method (e.g. single mode counter, modulo-n counter)

Registers, Counters and Memories: Introduction; Registers as basic memory blocks; Registers with parallel load, shift registers, bidirectional shift registers with parallel load; Ripple counters, binary and BCD ripple counters, binary counters, binary up/down counters, BCD, Johnson and ring counters; Introduction to memory units, memory address registers and memory buffer registers.

References:

1. M M Mano, Digital Design, Prentice Hall India
2. A P Malvino and D P Leach, Digital Principles and Applications