Course Syllabi: UEE505: Analog and Digital Systems (L : T : P :: 3 : 1 : 2)

1. **Course number and name**: UEE505: Analog and Digital Systems

2. **Credits and contact hours**: 4.5 and 6

3. **Text book, title, author, and year**

   Text Books / Reference Books

   - *Boylestad R. L., Electronic Devices and Circuit Theory, Pearson Education (2007).*
   - *Millman, J. and Halkias, C.C., Integrated Electronics, Tata McGraw Hill (2006).*
   - *Floyd, T.L. and Jain, R. P., Digital Fundamentals, Pearson Education (2008).*
   - *Tocci, R. and Widmer, N., Digital Systems: Principles and Applications, Pearson Education (2007).*
   - *Neamen, Donald A., Electronic Circuit Analysis and Design, McGraw Hill (2006).*
   - *Sedra A. S. and Smith K. C., Microelectronic Circuits, Oxford University Press (2006).*
   - *Mano, M. M. and Ciletti, M., Digital Design, Pearson Education (2008).*
   - *Kumar, A., Fundamentals of Digital Circuits, Prentice Hall (2007).*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Bipolar Junction Transistor and Field Effect Transistor: Different configurations and their static characteristics; CE configuration as two port network: h–parameters, h–parameter equivalent circuit; Biasing and load line analysis; High frequency operation of BJT; Structure and working of JFET and MOSFET; output and transfer characteristics, Applications of JFET and MOSFET

   Oscillators and Wave Shaping Circuits: Condition for sustained oscillation, R-C phase shift, Hartley, Colpitts, Crystal and Wien Bridge Oscillators, Negative Resistance oscillator; Switching characteristics of diodes and transistors including square wave response, High pass and low pass filters using R-C Circuits; R–L, R–L–C circuits, Attenuators; Clipping and clamping circuits; Clamping circuit theorem; Comparators; Multivibrators.

   Simplification of Boolean Expressions: Quine-McClusky method in SOP and POS forms, determination of prime implications, simplification using Map-entered variables.

   Combinational and Sequential Circuits: Introduction, Adders: Parallel Binary adder, Serial adder, BCD adder, Subtractors, Binary multiplier, Dividers, ALU, Code converters, Magnitude comparators, Parity Generators/checkers, Encoders, Decoders, Multiplexers, Demultiplexer; Introduction of sequential circuits, Flip-flops, Registers: Serial/Parallel in/out, Bi-directional, Universal shift register, Counters: Synchronous, Asynchronous, Decade, Binary, Modulo-n, Shift register counters; Design of Synchronous sequential circuits, FSM, Concept of Moore and Mealy machines, Synchronous detector.

   Memories: Introduction and classification of ROM, ROM organization, Static and Dynamic RAM, DRAM Refreshing, Representative circuits for cells using BJT and FET's, Timing diagrams of memories, Memory expansion using IC's, Flash memory, CCD, Magnetic Memories.

Converters: Digital to Analog conversion, R2R ladder DAC, Weighted Resistor DAC, Analog-Digital conversion, Flash type, Counter type ADC, Dual-slope ADC, Successive approximation type ADC.

Laboratory Work: Series voltage regulator, RC coupled amplifier in CE mode, Use of Bistable, Astable and monostable multivibrator, Hartley and Colpitts Oscillator, shift register and binary counting using JK flip flop, asynchronous/synchronous up/down counters, Variable modulus counters, Usage of IC tester, Computer simulation using EDA tools.

Minor Project: Design of LED lighting system for household application; street lighting system; soft starting of DC machine.

5. Specific goals for the course

After the completion of the course, the students will be able to:

- Design different type of circuits such as rectifiers, clippers, clampers, filters etc.
- Design power supplies and solve problems related to amplifiers and oscillators.
- Design combinational and sequential circuits.
- Differentiate various type of memories and there use in different applications.
- Demonstrate the concept of logic circuits and converters.

6. Brief list of topics to be covered

- Floating-Point Numbers
- Non-Linear Equations
- Linear Systems and Eigen-Values