Syllabus for 4 Year B. Tech Course in Electronics and Communication Engineering

FOURTH SEMESTER

Sl. No.	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-UEN-T20#	Career Advancement & Skill Development-IV-Behavioural Science	2	0	0	2
2	TIU-UMA-T20#	Probability and Statistics	3	1	0	4
3	TIU_UEC-T202	Analog Electronic Circuits	3	1	0	4
4	TIU_UEC-T204	Digital Electronics and Logic Design	3	1	0	4
5	TIU-UEC-T206	Signals and Systems	3	0	0	3
6	TIU-UEC-T20#	Microprocessor and Microcontrollers	3	0	0	3
B. Practicals						
1	TIU-UEC-L202	Analog Circuits Lab	0	0	3	1.5
2	TIU-UEC-L204	Digital Electronics Lab	0	0	3	1.5
3	TIU-UEC-L20#	Microprocessor Lab	0	0	3	1.5

C. Sessionals						
1	TIU-UES-S298	Entrepreneurship Skill Development	0	0	2	2
Total						26.5

TIU-UEN-T20#: Career Advancement & Skill Development-IV-Behavioural Science (Theory)

L-T-P: 2-0-0

Credits: 2

Detailed Syllabus:

French:

The present tense of the verb faire and some professions in masculine and feminine and , the ir verbs in present tense and their conjunctions and text based on the same, the re verbs in present tense and the prepositions, the prepositions and the time and the daily activities, the verb pronominal and the expressions of frequency, the present tense of the verbs pouvoir, vouloir, devoir, the articles contracted ,the past tense, the near future and the future tense, the vocabulary related to vacations, food, shopping, clothes and visiting France.

The activities in the class are as follows:

Speaking about one's daily routine, saying the hour and time , speakind Nd writing about his or her shopping and recounting a vacation well spent, informing someone one's future projects and plans and activities and writing a letter from a various and cultural activities.

TIU-UMA-T20#: Probability & Statistics (Theory)

L-T-P: 3-1-0

Credits: 4

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand representation of random signals.
2. Investigate characteristics of random processes.
3. Make use of theorems related to random signals.
4. To understand propagation of random signals in LTI systems.

Detailed Syllabus:

UNIT – I: Probability

Probability: Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence. Random Variables: Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments. Distributions: Uniform, Binomial, Geometric, Poisson, Exponential, Gamma, Normal distributions. Functions of a random variable. Joint Distributions: Joint, marginal and conditional distributions, product moments, correlation, independence of random variables.

Random process. Stationary processes. Mean and covariance functions. Ergodicity.Transmission of random process through LTI. Power spectral density.

UNIT-II: Statistics

Graphical representation of data, Frequency distributions, measures of central tendencies – mean, median, mode, measures of dispersion – standard deviation, variance, Measures of skewness and kurtosis, Bivariate data, Principle of Least Squares, curve fitting.

Recommended Textbooks:

1. A. Papoulis and S. U. Pillai, “Probability, Random Variables and Stochastic Processes”, McGraw Hill.
2. D. C. Montgomery and G. C. Runger, “Applied Statistics and Probability for Engineers”, Wiley.
3. S. Ross, “A First Course in Probability”, Pearson.
4. A. Leon-Garcia, “Probability, Statistics and Random Processes for Electrical Engineering”, Pearson.
5. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
6. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
7. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Stochastic Processes”, UBS Publishers
8. E. Kreyszig, “Advanced Engineering Mathematics”, Wiley
9. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall
10. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley
11. N. P. Bali and M. Goyal, “A textbook of Engineering Mathematics”, Laxmi Publications
12. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers
13. T. Veerarajan, “Engineering Mathematics”, Tata McGraw-Hill
14. H. K. Dass, “Advanced Engineering Mathematics”, S. Chand

TIU-UEC-T202: Analog Electronic Circuits (Theory)

L-T-P: 3-1-0

Credits: 4

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design ADC and DAC.

Detailed Syllabus:

Module -1: Introduction to Electronic circuits-

Diode & their Applications: rectifier circuits (half-wave and full wave rectifiers, rectifiers with
capacitor filter), voltage regulator (using Zener diode), voltage multipliers, clipper(amplitude limiter) circuits, clamper circuits.(6L)

Module -2: Bipolar Junction Transistors and their Applications:

Structure and modes of operation, n-p-n and p-n-p transistor, DC analysis of both transistor circuits, Transistor Biasing and Stability, Q-point, BJT as an amplifier, small signal equivalent circuits, single-stage BJT amplifier, BJT as a switch.(8L)

Module -3 Metal Oxide Semiconductor Field-Effect Transistors and their Applications-

Structure and physical operation of n-type and p-type MOSFET, MOSFET biasing circuits, MOSFET as an amplifier, small-signal equivalent circuits, single-stage MOSFET amplifier, MOSFET as a switch.(10L)

Module -4 Feedback Amplifiers & Oscillators-

Feedback concept, negative & positive feedback, voltage/current, series/shunt feedback, Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators.(6L)

Module -5: Operational Amplifier (Op Amp) –

Ideal op amp; inverting amplifier, amplifier with a T-network, effect of finite gain, summing amplifier; non-inverting configuration, voltage follower; op-amp applications like current-to-voltage converter, voltage-to-current converter, difference amplifier, instrumentation amplifier, integrator and differentiator, Current mirror circuit, Active Filter Design using op-amp, .(8L)

Module -6: Power amplifiers -

Class A, B, AB, C, Conversion efficiency, Tuned amplifier, Multivibrator- Monostable, Bistable, Astable multivibrators using BJT, Monostable and astable operation using 555 timer Special Functional Circuits- VCO and PLL (10L)

Recommended Textbooks:

1. J. Millman, C. C. Halkias and C. Parikh, "Integrated Electronics", McGraw Hill
2. P. Horowitz & W. Hill, "The Art of Electronics", John Wiley
3. R. Boylestad & L. Nashelsky, "Electronic Devices & Circuit Theory", Pearson
4. T. L. Floyd, "Electronic Devices", Pearson
5. P. C. Rakshit & D. Chattopadhyay, "Electronics: Fundamentals & Applications ", New Age
6. A. Malvino, "Electronic Principles", McGraw Hill
7. R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson/Prentice Hall of India
8. A. S. Sedra & K. C. Smith, "Microelectronic Circuits", Oxford University Press
9. D. A. Neamen, "Electronic Circuits: Analysis and Design", McGraw Hill

10. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill, 1992.
11. Paul R. Gray and Robert G.Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley
12. S. Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, McGraw Hill
13. L. K. Maheshwari, “Analog Circuits”, Laxmi Publications
14. A. K. Maini, “Analog Circuits”, Khanna Publishing House

TIU-UEC-T204: Digital Electronics and Logic Design (Theory)
L-T-P: 3-1-0
Credits: 4
Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. Design and analyze combinational logic circuits.
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder.
3. Design & analyze synchronous sequential logic circuits.
4. Use HDL & appropriate EDA tools for digital logic design and simulation.

Detailed Syllabus:
Module-1: Number System and Codes:
Decimal, binary, octal and hexadecimal number systems and their arithmetic operations, conversion of one number system to another, Signed and floating point representations of binary numbers, 1’s complement and 2’s complement representations, Binary codes, natural BCD codes, Excess-3, Gray codes, Alphanumeric Code, code conversion- from one code to another. (6L)

Module-2: Logic Gates, Boolean Algebra & Basic logic families:
NOT, AND, OR, NAND, NOR, XOR and XNOR –operations, truth tables and Venn diagram representations, universal gates, postulates and laws of Boolean algebra, De Morgan’s theorem, minterms and maxterms, SOP and POS forms, Switching algebra, Minimizing functions using K- maps, Minimization using QM method, Different logic families: TTL, ECL, CMOS. (I2L)

Module-3: Combinational and arithmetic logic circuits:
Adders/subtractors circuit using logic gates, fast adder, magnitude comparator, multiplexer demultiplexers, encoders, decoders, priority encoders, parity generator and checkers, BCD adder and subtractor. (8L)

Module-4: Sequential Logic Circuits:
Flip flops and latches, S-R, J-K, D and T type flip-flops and their conversions, master-slave configuration, edge triggered and level triggered clock, registers, shift registers, synchronous and asynchronous counters, ring and Johnson (twisted ring) counters, Modulus Counter. (8L)

Module-5: Memory and Programmable Logic Devices:
ROM, PROM, RAM-SRAM, DRAM, EPROM, EEPROM, Flash ROM, Programmable and gated array devices for designing combinational circuits PAL, PLA, PLD, CPLD, FPGA with examples. (6L)

Module-6: Finite State Machines:
Finite state machine state transition diagrams and state transition tables, Moore amp; Mealy machine state diagram, state variable, state table and state minimization, design of state machines using combinational logic circuits and memories. (6L)

Recommended Textbooks:

1. D. P. Leach and A. Malvino, "Digital Principles and Applications", McGraw Hill
2. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill
3. D. L. Schilling and H. Taub, "Digital Integrated Electronics", McGraw Hill
4. V. K. Puri, "Digital Electronics", Tata McGraw Hill
5. S. Salivahanan and S. Arivazhagan, "Digital Circuits & Design", Vikas
6. T. L. Floyd, "Digital Fundamentals", Pearson
7. M. Morris Mano & M. D. Ciletti, "Digital Design", Prentice Hall
8. V. Kumar, "Digital Technology", New Age
9. D. Ray Chowdhury, "Digital Circuits", Platinum Publishers.
10. J. M. Yarbrough, "Digital Logic Applications & Design", Vikas
11. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
12. W.H. Gothmann, " Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
13. D.V. Hall, "Digital Circuits and Systems" , Tata McGraw Hill, 1989
14. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition, 2012.
15. A. Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall
16. R. Anand, "Digital System Design using VHDL", Khanna Publishing House
17. J. Bhaskar, "A VHDL Primer", Pearson
18. J. Bhaskar, "A VHDL Synthesis", Pearson

TIU-UEC-T206: Signals & Systems (Theory)
L-T-P: 3-0-0
Credits: 3
Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. Analyze different types of signals.
2. Represent continuous and discrete systems in time and frequency domain using different transforms.
3. Investigate whether the system is stable.
4. Sampling and reconstruction of a signal.

Detailed Syllabus:

Module-1: Types of signals: -

Introduction to signals, Periodic & non periodic, analog & digital, deterministic & random, energy & power signals. Fourier analysis: Fourier series representation of periodic signals, Fourier transform & their properties, singularity function, unit impulse, unit step et**c.** Application of Fourier transform for analysis of LTI networks, the concept of frequency in continuous & discrete time domain, LTI system: Causality, stability, Introduction to Fourier series for discrete time periodic signals, discrete Fourier transform, DFT as a linear transformation, properties of DFT such as convolution, multiplication.

Module-2: Time and frequency characterization

Magnitude phase representation of Fourier transform, frequency response of LTI systems, time domain properties of ideal frequency selective filters, time domain and frequency domain aspects of non ideal filters.

Module-3: Random variable & process:

Random variable, random process. Correlation function (auto & cross) cumulative distribution function. Probability density function, joint cumulative & distribution and probability density function. System response to random signals: Filtered random process lowpass and bandpass; Basic concept of optimum filtering: Wiener Hopf filter.

Module-4: Sampling

Sampling theorem, reconstruction of signals from samples. Effect of sampling, continuous and discrete time signals, transformation of the independent variable. Continuous and discrete time systems.

Module-5: Introduction to Z transform

Region of convergence, properties of z-transform, inverse z-transform using different technique, its application.

Module-6: System modeling:

Modeling in terms of differential equation, state variables, transfer function(using Laplace Transform); concept of impulse and step response.

Recommended Textbooks:

1. A. V. Oppenheim, A.S. Willsky and W. H. Nawab, “Signals and Systems”, Prentice Hall
2. R. F. Ziemer, W. H. Tranter and D. R. Fannin, "Signals and Systems - Continuous a Discrete", 4th edition, Prentice Hall, 1998.
3. A. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B. P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6. S. Haykin and B. Van Veen, “Signals and Systems”, Wiley

7. E. W. Kamen and B. S. Heck, “Fundamentals of Signals and Systems: Using the Web and Matlab”, Pearson.
8. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Pearson.
9. P. Ramesh Babu, “Digital Signal Processing”, Scitech
10. H. P. Hsu, “Schaum's Outlines in Signals and Systems”, McGraw Hill
11. Robert A. Gabel and Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
12. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
13. Ashok Ambardar,"Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.
14. A. Anand Kumar, “Signals and Systems”, Prentice Hall of India
15. Tarun Rawat, “Signals and Systems”, Oxford University Press
16. Rishabh Anand, “Signals and Systems”, Khanna Publishing House
17. B. P. Lathi, “Signal Processing and Linear Systems”, Oxford University Press
18. I. J. Nagrath, S. N. Sharan, R. Ranjan and S. Kumar, “Signals and Systems”, Prentice Hall of India

TIU-UEC-T206: Microprocessors and Microcontrollers (Theory)
L-T-P: 3-0-0
Credits: 3
Course Outcomes:
At the end of this course students will demonstrate the ability to

1. Do assembly language programming.
2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
3. Develop systems using different microcontrollers.
4. Understand RSIC processors and design ARM microcontroller based systems.

Detailed Syllabus:
Module-1: Introduction:
Evolution of microprocessors and microcontrollers, memory devices, number system, architecture, interrupts instruction set and assembly language programming of 8085 microprocessor.

Module-2: 8086/8088 Microprocessor:
Pin assignments, minimum and maximum mode, architecture, addressing modes, interrupts, instruction format, instruction set and assembly language programming, introduction to 8087 math coprocessor.

Module-3: Peripheral Devices and Their Interfacing:
Introduction, memory and I/O interfacing, data transfer schemes, programmable peripheral interface (8255), programmable DMA controller (8257, 8237A), programmable interrupt controller (8259), programmable communication interface (8251), programmable

counter/interval timer (8253 and 8254), special purpose interfacing devices, elements and circuits for interfacing.

Module-4: Microcontrollers:
Architecture, instruction set and assembly language programming of 8051 microcontroller, introduction to 8096/8097 microcontroller. Data Acquisition System: Sample and Hold (S/H) circuit, multiplexer, signal conditioner, A/D and D/A Converters, multi-channel data acquisition system.

Module-5:
Applications: Measurement and control of electrical and physical quantities, case studies

Recommended Textbooks:

1. R. Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Penram
2. D. A. Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.
3. P. K. Ghosh and P. R. Sridhar, “0000 to 8085: Introduction to Microprocessors for Engineers and Scientists”, PHI Learning
4. D. V. Hall, “Microprocessors and Interfacing”, McGraw Hill
5. K. M. Bhurchandi and A. K. Ray, “Advanced Microprocessors and Peripherals”, Tata McGraw Hill
6. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson
7. K. Ayala, “The 8051 Microcontroller”, Delmar Cengage Learning
8. Krishna Kant, “Microprocessor and Microcontrollers”, Prentice Hall of India
9. Raj Kamal, “8051 Microcontrollers”, Tata McGraw Hill

TIU-UEC-L202: Analog Circuits Lab (Practical)
L-T-P: 0-0-3
Credits: 1.5
List of Experiments:

1. Positive & Negative clipper circuit.
2. Positive & Negative biased clipper circuit.
3. Positive & Negative clamper circuit.
4. Voltage doubler & voltage Tripler circuit.
5. a) OP-AMP offset null adjustment
   b) OP-AMP non inverting Amplifier.
6. OP-AMP inverting Amplifier.
7. OP-AMP as a unity gain follower.
8. OP-AMP as low pass filter.

TIU-UEC-L204: Digital Electronics Lab (Practical)
L-T-P: 0-0-3

Credits: 1.5

List of Experiments:

1. Familiarization with logic gates such as Basic, Universal and Exclusive gates.
2. Realization of NOT, OR, AND, XOR, XNOR Gates Using Universal Gates.
3. a) Gray to Binary Conversion & Vice-Versa.
   b) Code Conversion between BCD And Excess-3.
4. a) Odd and Even Parity Generation And Checking.
   b) 4-Bit Comparator Circuit.
5. Design of Combinational Circuit To Drive Seven-Segment Display.
6. Design of Combinational Circuits Using Multiplexer.
7. a) Adder/ Subtractor Circuits Using Full-Adder Using IC And/ Or Logic Gates.
   b) BCD Adder Circuit Using IC And/ OR Logic Gates.
8. Realization Of S-R, J-K, And D Flip Flops Using Universal Logic Gates.
9. Realization of Asynchronous Up/Down Counter.
10. Realization of Synchronous Mod-N Counter

TIU-UEC-L204: Microprocessor Lab (Practical)

L-T-P: 0-0-3

Credits: 1.5

List of Experiments:

1. Addition of two 8 bit numbers.
2. Subtraction of two 8 bit numbers.
3. 1’s complement of a number.
4. 2’s complement of a number.
5. Left shift of a number.
6. Multiplication of two 8 bit numbers.
7. Finding the sum of 8 bit numbers [Array].
8. Division of two 8 bit numbers.
9. Largest number in an array of data.
10. Use of instruction sets RLC,RAL,RRC,RAR.