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

THIRD SEMESTER

Sl. No.	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-UEN-T20#	Career Advancement & Skill Development-III-Organizational Behaviour	2	0	0	2
2	TIU-UMA-T201	Mathematics - III	3	1	0	4
3	TIU-UEC-T20#	Environmental Science	2	0	0	0
4	TIU-UEC-T201	Semiconductor Devices	3	1	0	4
5	TIU-UEC-T203	Network Theory	3	1	0	4
6	TIU-UCS-T201	Data Structures and Algorithms	3	0	0	3
B. Practicals						
1	TIU-UEC-L20#	Semiconductor Devices Lab	0	0	3	1.5
2	TIU-UEC-L20#	Network Theory Lab	0	0	3	1.5
3	TIU-UCS-L20#	Data Structures Lab	0	0	3	1.5

4	TIU-UCS-L20#	Numerical Methods Lab	0	0	3	1.5
C. Sessionals						
1	TIU-UES-S299	Entrepreneurship Skill Development	0	0	2	2
Total						25

TIU-UEN-T20#: Career Advancement & Skill Development-III-Organizational Behaviour (Theory)

L-T-P: 2-0-0

Credits: 2

Detailed Syllabus:

French:- Introducing on eself,the adjectives of nationalities, salutations, the verb s'appeler, être and avoir, the numbers from 0 to 1000,the articles définis and indéfinis, the days of the week and the months of the year, adjectives interrogatif, er ending verbs in present tense, the prepositions of place and the prepositions and name of the countries, the basic negation ne...pas, the verbs aimed, adorer,detested and parler and the present tense of the verb aller and the different ways of saying the hour. The family tree.

The activities in the class includes:

Informing about ones identity and giving and demanding personal informations written and verbal, asking someone the price of something in a market or a shop, indicating one's taste and speaking about passion and dreams, speaking about one's city and speaking about one's activities and family.

TIU-UMA-T201: Mathematics – III (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 Laplace, Fourier and Z-transforms and their properties.
2. Use transform calculus to solve differential equations.
3. Understand common numerical methods and apply them to obtain interpolate missing values or approximate solutions to otherwise intractable mathematical problems.

Detailed Syllabus:

UNIT–I: Transform Calculus

Laplace Transform: Evaluation of integrals by Laplace Transform, Solution of initial and boundary value problems. Fourier Series : Periodic functions, Fourier series representation of a function, half range series, sine and cosine series, Fourier integral formula, Parseval's identity. Fourier Transform: Fourier Transform, Fourier sine and cosine transforms.

Linearity, scaling, frequency shifting and time shifting properties. Self reciprocity of Fourier Transform, convolution theorem. Applications to boundary value problems.

UNIT-II: Numerical Methods

Approximations and round off errors, Truncation errors and Taylor Series. Numerical Differentiation, Interpolation – Newton's Forward, Backward, Divided Difference. Numerical Integration – Trapezoidal, Simpson's 1/3rd, Weddle's Rule. Determination of roots of polynomials and transcendental equations by Bisection, Iteration, Newton-Raphson, Regula-Falsi, Secant and Bairstow's method. Solutions of linear simultaneous linear algebraic equations by Gauss Elimination and Gauss-Siedel iteration methods. Curve fitting-linear and nonlinear regression analysis, Application of difference relations in the solution of partial differential equations, Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method.

Recommended Textbooks:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, Wiley, 2006.
2. N. P. Bali and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications, Reprint, 2010.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 35th Edition 2000.
4. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2008.
5. P. Kandasamy, K. Thilagavathy, K. Gunavathi, "Numerical Methods", S. Chand & Company, 2nd Edition, Reprint 2012.
6. S. S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India, 4th Edition, 2005.

TIU-UEC-T20#: Environmental Science

L-T-P: 2-0-0

Credits: 0

Module-1 Introduction: Environment and environmental pollution from chemical process industries, characterization of emission and effluents, environmental Laws and rules, standards for ambient air, noise emission and effluents.

Module-2 Pollution Prevention: Process modification, alternative raw material, recovery of by co-product from industrial emission effluents, recycle and reuse of waste, energy recovery and waste utilization. Material and energy balance for pollution minimization. Water use minimization, Fugitive emission/effluents and leakages and their control-housekeeping and maintenance.

Module-3 Air Pollution Control: Particulate emission control by mechanical separation and electrostatic precipitation, wet gas scrubbing, gaseous emission control by absorption and adsorption, Design of cyclones, ESP, fabric filters and absorbers.

Module-4 Water Pollution Control: Physical treatment, pre-treatment, solids removal by setting and sedimentation, filtration centrifugation, coagulation and flocculation.

Module-5 Biological Treatment: Anaerobic and aerobic treatment biochemical kinetics, trickling filter, activated sludge and lagoons, aeration systems, sludge separation and drying.

Module -6 Solids Disposa l: Solids waste disposal - composting, landfill, briquetting / gasification and incineration.

Recommended Textbooks:
1. A. K. De, “Environmental Chemistry”, New Age
2. G. M. Masters, “Introduction to Environmental Engineering and Science”, Pearson
3. G. S. Sodhi, “Fundamental Concepts of Environmental Chemistry”, Narosa
4. E. Odum, M. Barrick& G. W. Barrett, “Fundamentals of Ecology”, Brooks & Cole

TIU-UEC-T201: Semiconductor Devices (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 principles of semiconductor Physics.
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

Detailed Syllabus:

Module -1: Energy Bands and Charge Carriers in Semiconductors-

Semiconductor fundamentals, crystal structure, Fermi level, Energy-band (E-k) diagram, effective mass, intrinsic and extrinsic semiconductor, carrier concentration, scattering and drift of electrons and holes, drift current, diffusion mechanism, transient response, basic governing equations in semiconductor. (12L)

Module -2: Rectifier and detector diodes-

Physical description of p-n junction, transport equations, current voltage characteristics and temperature dependence, Junction Capacitance, small signal ac analysis, Diode switching, Optical devices & Solar cells, Zener diode, Tunnel diode, photoconductors, PIN photodiode, avalanche photodiode, LED, semiconductor lasers, negative conductance in semiconductors.(12L)

Module -3: Bipolar Junction Transistors-

Physical mechanism, current gain, Equivalent circuits and modeling frequency response of transistors, High voltage and high power transistors, Frequency limitations, High frequency transistors, Power transistors.(12L)

Module -4: Field Effect Transistors-

JFETS and its characteristics, Equivalent Circuit, IGFETS and MOSFETs, MOS structure, flat-band threshold voltages, MOS static characteristics, small signal parameters and equivalent circuit, MOS-capacitors, strong, moderate and weak inversion, short channel

effects, Gate protection of MOSFET, MOS capacitance, scaling laws of MOS transistors, P and N-channel MOSFETS, CMOS and VLSI MOSFETS, BiCMOS devices, Semiconductor sensors and detectors.(12L)

Recommended Textbooks:

1. J. Millman, C. C. Halkias and C. Parikh, "Integrated Electronics", McGraw Hill
2. D. A. Neamen and D. Biswas, "Semiconductor Physics & Devices", Tata McGraw Hill
3. B. G. Streetman and S. Banerjee, "Solid State Electronic Devices", Pearson, 7th edition, 2017
4. S. M. Sze, "Physics of Semiconductor Devices", John Wiley
5. J. Millman and A. Grabel, "Microelectronics", McGraw Hill
6. C.T. Sah, " Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991
7. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.
8. A. K. Maini, "All-in-One Electronic Simplified", Khanna Publishing House

TIU-UEC-T203: Network Theory (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 basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

Detailed Syllabus:

Module-1: Network Solution Methodology & components-

Passive and active components, Series and Parallel Connection of Circuit Elements, Mesh Analysis, Nodal Analysis, Voltage and Current Source, Dependent Sources, Power and Energy, Network Theorems, physical phenomenon and circuit interpretation of network using appropriate models.(6L)

Module-2: Signals:

Significance of eigen function, Fourier transform and Laplace transform of Standard Functions, Transient and steady state response of RC, RL and RLC circuits using Laplace transform. Network equations and solutions using Laplace transform initial conditions. Degenerate networks.(14L)

Module-3 Graph theory & Coupled Circuits:

Basic definitions loop (or tie set), cut-set, mesh matrices and their relationships, applications of graph theory in solving network equations, Magnetic coupling, concept of Self and mutual inductance, Coefficient of coupling, Solution of Problems. (6L)

Module-4 Two-port networks:
Network parameters (z parameters, y parameters, h parameters, ABCD matrix, transmission matrix), Inter-Connection of Two Port Networks, reciprocity theorem, image parameter concepts, balanced/unbalanced transmission lines, lumped-parameter model, characteristic impedance, propagation aspects.(14L)

Module-5: Network functions & Elements of network synthesis:
Driving point function, transfer function, concepts of poles and zeros. Impulse response and convolution, basic concepts of insertion-loss synthesis, Approximation functions for filters - Design of Butterworth and Chebyshev filters.(8L)

Recommended Textbooks:

1. M. A. Van Valkenburg, "Network Analysis", Prentice Hall
2. D. Roy Choudhury, "Networks & Systems", New Age
3. D. Chattopadhyay and P. C. Rakshit, "Fundamentals of Electric Circuit Theory", S. Chand
4. S. M. Durbin, J. E. Kemmerly & W. H. Hayt, "Engineering Circuit Analysis", McGraw Hill
5. C. K. Alexander and M. N. O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill
6. F. F. Kuo, "Network Analysis and Synthesis", Wiley
7. P. Ramesh Babu, "Electric Circuit Analysis", Scitech
8. J. Edminister and M. Nahmi, "Schaum's Outlines in Electric Circuits", McGraw Hill
9. A. Hussain, "Networks and Systems", Khanna Publishing House
10. A. Sudhakar and S. P. Shyammohan, "Circuits and Networks", Tata McGraw Hill

TIU-UCS-T201: Data Structures and Algorithms (Theory)
L-T-P: 3-0-0
Credits: 3
Course Outcomes:
At the end of this course, students will demonstrate the ability to
1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Detailed Syllabus: Basic Concepts of Data Representation: Abstract Data Types, Fundamental and Derived Data Types, Representation, Primitive Data Structures
Module1: Introduction to Algorithm Design and Data Structures:

Design and Analysis of Algorithm: Algorithm Definition, Comparison of Algorithms, Top-Down and Bottom Up Approaches to Algorithm Design, Analysis of Algorithm, Complexity Measures in Terms of Time and Space, Structured Approach to Programming.

Module2: Arrays:
Representation of Arrays, Single and Multidimensional Arrays, Address Calculation Using Column and Row Major Ordering, Various Operations on Arrays; Application of Arrays Matrix Multiplication, Sparse Polynomial Representation and Addition.

Module 3: Stacks and Queues:
Representation of Stacks and Queues, Using Arrays and Linked-List; Circular Queues Priority Queue and D-Queue; Applications of Stacks, Conversion from Infix to Postfix and Prefix Expressions, Evaluation of Postfix Expression Using Stacks.

Module 4: Linked Lists:
Singly Linked List, Operations on List, Linked Stacks and Queues, Polynomial Representation and Manipulation Using Linked Lists, Circular Linked Lists, Doubly Linked Lists, Generalized List Structure, Sparse Matrix Representation Using Generalized List Structure.

Module 5: Trees:
Binary Tree Traversal Methods, Preorder, In-Order, Post-Order Traversal (Recursive And Non-Recursive), Algorithms for Above Mentioned Traversal Methods; Representation of Trees and Its Applications Binary Tree Representation of a Tree, Conversion of Forest into Tree, Threaded Binary Trees, Lexical Binary Trees, Decision and Game Trees, Binary Search Tree: Height Balanced (AVL) Tree, B-Trees, B+ Tree.

Module 6: Searching, Sorting and Complexity: Searching:
Sequential and Binary Searches, Indexed Search, Hashing Schemes. Sorting: Insertion, Selection, Bubble, Quick, Merge, Radix, Shell, Heap Sort. Comparison of Time Complexity.

Module 7: Graphs:
Graph Representation, Adjacency Matrix, Adjacency Lists, Traversal Schemes, Depth First Search, Breadth First Search.

Recommended Books:
Main Reading:
1. Horowitch and Sahani, Data Structure using C,
2. Lipshutz, Data Structures with C, Mc-Graw Hill.
Supplementary Reading: 1. Robert Lafore, Data Structures And Algorithms In Java, Sams.
2. A.M. Tennenbaum, Y. Langsam And M. J. Augenstein, Data Structures Using C, PHI, 1996.
3. D. E. Knuth, The Art Of Computer Programming-Vol-I & Vol-II, Narosa Publication.
4. S. Chottopadhyay, D. Ghoshdastider & M. Chottopadhyay, Data Structures Though C Language, First Edition, 2001, BPB Publication

TIU-UEC-L20#: Semiconductor Devices Lab (Practical)
L-T-P: 0-0-3
Credits: 1.5
List of Experiments:

1. Measurement of carrier concentration of a semiconductor by using Hall Voltage method.
2. Measurement of band gap energy of a semiconductor by using Four Probe Resistivity meter.
3. Determination of type of semiconductor by hot probe method.
4. Modeling and simulation of BJT by using Empire or any other software.
5. Study of variation of Junction capacitance with voltage of a p-n junction by using C-V plotter

TIU-UEC-L20#: Network Theory Lab (Practical)
L-T-P: 0-0-3
Credits: 1.5

1. Introduction of Pspice & Verification of Superposition Theorem.
2. Verification of Maximum Power Transfer Theorem.
3. Transient response of Series R-L & R-C Circuit.
4. DC Transient response of R-L-C Circuit.
5. To study of Low Pass & High Pass Filter.
6. To study of Band Pass & Band Stop Filter.
7. To study of Notch Filter.

TIU-UCS-L20#: Data Structures Lab (Practical)
L-T-P: 0-0-3
Credits: 1.5

1. List of Experiments
2. Search an element in an array using linear search
3. Search an element in an array using binary search
4. Implement different sort algortithms
5. Implement linked list and perform various operations.
6. Implement 1-D and 2-D arrays and perform various operations.
7. Implement a stack and perform various operations.
8. Implement linear and circular queues and perform various operations.
9. Implement graphs and perform various operations.

TIU-UCS-L20#: Numerical Methods Lab (Practical)
L-T-P: 0-0-3
Credits: 1.5
List of Experiments

1. Implement bisection method.
2. Implement secant method
3. Implement Newton-Raphson method.
4. Implement Gauss Elimination method.

5. Implement Gauss-Seidal method.
6. Implement Trapezoidal Integration method.
7. Implement Simpsons 1/3rd Integration method.
8. Implement Weddle’s Implementation method.
9. Implement methods to solve differential equations.