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

SIXTH SEMESTER

Sl. No.	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-UEN-T30#	Career Advancement & Skill Development-VI-SAP	2	0	0	2
2	TIU-UEC-T302	Digital Communication	3	0	0	3
3	TIU-UEC-T304	Digital Signal Processing	3	0	0	3
4	TIU-UEC-T306	Computer Networking	3	0	0	3
5	TIU-UEC-T30#	CMOS Design	3	0	0	3
6	TIU-UEC-E30#	Elective - I	3	0	0	3
B. Practicals						
1	TIU-UEC-L30#	Digital Communication Lab	0	0	3	1.5
2	TIU-UEC-L30#	DSPLab	0	0	3	1.5
3	TIU-UEC-L30#	Computer Networking Lab	0	0	3	1.5

C. Sessionals						
1	TIU-UES-S398	Entrepreneurship Skill Development	0	0	2	2
Total						23.5

Elective - I

TIU-UEC-E30#: Mobile Communications

TIU-UEC-E30#: Information Theory and Coding

TIU-UEC-E30#: Optoelectronics and Optical Fibre Communications

TIU-UEN-T30#: Career Advancement & Skill Development-VI-SAP
L-T-P: 2-0-0
Credits: 2
Detailed Syllabus:
Employment Mentorship & Grooming -1

Module 1: i). Industry requirements from a student , ii). selection procedure in industry along with a few industry sector examples,

Module 2: i). Procedure to search jobs online, ii). preparing strategy for targeted job roles

Module 3: Corporate resume preparation

Module 4 : i). Job market description for ECE, ii). How to identify the correct job role for one self, iii).Discussion for selected few job roles in multiple areas such as, embedded systems, wireless, VLSI, data science

TIU-UEC-T302: Digital Communication
L-T-P: 3-0-0
Credits: 3
Course Outcomes:

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

1. Analyze and compare different digital modulation schemes for their efficiency and bandwidth and bit error rates.
2. Understanding the basics of information theory.

Detailed Syllabus:
Module-1
Digital signals and their spectra; Concepts of information and entropy;

Module-2
Source coding: Coding theorem, fixed length codes; variable length codes; Quantization of signals; Waveform coding techniques: PCM, DPCM, ADPCM, DM, ADM;

Module-3
Baseband transmission: intersymbol interference, noise, eye pattern, BER analysis, Optimum filtering, equalization techniques; Clock recovery;

Module-4
Line coding techniques: Binary and multilevel line codes; Digital modulation schemes: Binary modulation schemes- ASK, PSK, FSK, DPSK; M-ary modulation schemes: QPSK, pi/4 QPSK, MSK; QAM: generation and demodulation schemes, carrier recovery techniques, BER analysis of digital modulation systems; Shannon's capacity theorem and spectral efficiency of digital modulation schemes.

Recommended Textbooks:

1. R. G. Gallager, "Principles of Digital Communications", Cambridge.
2. H. Taub, D. L. Schilling and G. Saha, "Principles of Communication Systems", McGraw Hill.
3. W. Tomasi, "Electronic Communication Systems: Fundamentals through Advanced", Pearson.
4. S. Haykin, "Digital Communications Systems", Wiley.
5. S. Haykin and M. Moher, "Communication Systems", Wiley.
6. B. P. Lathi and Z. Ding, "Modern Digital and Analog Communication Systems", Oxford.
7. G. Kennedy, B. Davies and S. R. M. Prasanna, "Electronic Communication Systems", McGraw Hill.
8. A. B. Carlson and P. B. Crilly, "Communication Systems". McGraw Hill
9. B. Sklar, "Digital Communications: Fundamentals and Applications", Prentice Hall
10. R. N. Mutagi, "Digital Communications: Theory, Techniques and Applications", Oxford.
11. R. Singh and S. Sapre, "Communication Systems: Analog and Digital", Tata McGraw Hill.
12. D. Mitra, "Analog and Digital Communications", Tata McGraw Hill

TIU-UEC-T304: Digital Signal Processing
L-T-P: 3-0-0
Credits: 3
Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain.
2. Get the response of an LSI system to different signals.
3. Design of different types of digital filters for various applications..

Detailed Syllabus:

Module-1: Introduction

Limitation of analog signal processing, advantage of digital signal processing, different type of discrete signal and system, concept of linearity, causality ,stability of the system, frequency domain representation and Fourier transform.

Module-2: Processing of continuous time signal

Sampling and discrete time processing of continuous time signal,Decimation and Interpolation.

Module-3: Discrete Fourier transform

DFT and its properties, linear filtering methods based on DFT, Filtering of long data sequence, Fast Fourier Transform algorithm using decimation in time and decimation in frequency technique.

Module-4: Filter Design

Design of digital IIR filter using different technique for butterworth and chebyshev filter, Design of FIR filter: different window technique and optimum approximation.

Module-5: Digital signal processor

Architecture and various features of TMS/ADSP, series of digital signal processor; Instruction set and few application of TMS 320CXX.

Recommended Textbooks:

1. J. G. Proakis & D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson
2. S. K. Mitra, "Digital Signal Processing: A Computer Based Approach", McGraw Hill
3. T. J. Cavicchi, "Digital Signal Processing", John Wiley
4. A. V. Oppenheim & R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall
5. L. R. Rabiner & B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall
6. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall
7. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, "Digital Signal Processing", Wiley
8. P. Ramesh Babu, "Digital Signal Processing", Scitech
9. S. Salivahanan, "Digital Signal Processing", McGraw Hill
10. Ashok Ambardar, "Digital Signal Processing", Cengage
11. A. Anand Kumar, "Digital Signal Processing", Prentice Hall of India

TIU-UEC-T306: Computer Networking

L-T-P: 3-0-0

Credits: 3

Course Outcomes:

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

1. Understand the concepts of networking thoroughly.
2. Design a network for a particular application.
3. Analyze the performance of the network.

Detailed Syllabus:

Module-1

Introduction to networks and layered architecture. Data communication concepts, transmission media and topology, multiplexing.

Module-2

Circuit switching and packet switching, data link layer, layer 2 switches and ATM switches, SONET/SDH.

Module-3

Medium access control. CSMA CD, TDMA, FDMA, CDMA. Network layer and addressing, IP version 4 and 6.

Module-4

Routing algorithms.Transmission layer, TCP and UDP. Congestion control techniques. WAN, ATM. Internetworking.Wireless communications.Network management and security.

Recommended Textbooks:

1. B. A. Forouzan, "Data Communication & Networking", McGraw Hill.
2. W. Stallings, "Data and Computer Communications", Pearson.
3. A. S. Tanenbaum, "Computer Networks", Pearson.
4. J. F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition
5. L. Peterson and B. Davie, "Computer Networks – A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5th Edition.
6. D. Comer, "Computer Networks and Internet/TCP-IP", Prentice Hall.
7. T. Viswanathan, "Telecommunication Switching System and Networks", Prentice Hall of India.
8. S. Keshav, "An Engineering Approach to Computer Networking" , Pearson Education.

TIU-UEC-T30#: CMOS Design

L-T-P: 3-0-0

Credits: 3

Course Outcomes:

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

1. Design different CMOS circuits using various logic families along with their circuit layout.
2. Use tools for VLSI IC design.

Detailed Syllabus:

Review of MOS transistor models, Non-ideal behavior of the MOS Transistor.Transistor as a switch. Inverter characteristics, Integrated Circuit Layout: Design Rules, Parasitics. Delay:

RC Delay model, linear delay model, logical path efforts. Power, interconnect and Robustness in CMOS circuit layout. Combinational Circuit Design: CMOS logic families including static, dynamic and dual rail logic. Sequential Circuit Design: Static circuits. Design of latches and Flip-flops. (36L)

Recommended Textbooks:

1. N. H. E. Weste and D. M. Harris, "CMOS VLSI design: A Circuits and Systems Perspective", 4th Edition, Pearson Education India, 2011.
2. C. Mead and L. Conway, "Introduction to VLSI Systems", Addison Wesley, 1979.
3. J. Rabaey, "Digital Integrated Circuits: A Design Perspective", Prentice Hall India, 1997.
4. P. Douglas, "VHDL: programming by example", McGraw Hill, 2013.
5. L. Glaser and D. Dobberpuhl, "The Design and Analysis of VLSI Circuits", Addison Wesley, 1985.
6. S.-M. Kang and Y. Leblebici, "CMOS Digital Integrated Circuits and Design", Tata McGraw Hill
7. P. E. Allen and D. R. Holberg, "CMOS Analog Circuit Design", Oxford
8. R. L. Geiger, P. E. Allen and N. R. Strader II, "VLSI Design Techniques and Digital Circuits", McGraw Hill

Elective - I

TIU-UEC-E30#: Mobile Communications

L-T-P: 3-0-0

Credits: 3

Course Outcomes:

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

1. Understand the working principles of the mobile communication systems.
2. Understand the relation between the user features and underlying technology.
3. Analyze mobile communication systems for improved performance.

Detailed Syllabus:

Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards. (2)

Signal propagation-Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate. (12)

Capacity of flat and frequency selective channels. Antennas- Antennas for mobile terminal-monopole antennas, PIFA, base station antennas and arrays. (4)

Multiple access schemes-FDMA, TDMA, CDMA and SDMA. Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM. (6)

Receiver structure- Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme. (6)
MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. Performance measures- Outage, average snr, average symbol/bit error rate. System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA. (6)

Recommended Textbooks:

1. T. S. Rappaport, "Wireless Communications Principles and Practice", 2nd edition, Prentice Hall, 2002.
2. G. L. Stüber, "Principles of Mobile Communications", 3rd edition, Springer, 2013.
3. M. K. Simon and M. -S. Alouni, "Digital Communications over Fading Channels", Wiley, 2002.
4. M. Plätzold, "Mobile Fading Channels", Wiley, 2002.
5. A. J. Goldsmith, "Wireless Communications", Cambridge, 2005.
6. A. F. Molisch, "Wireless Communications", Wiley, 2011.
7. D. Tse and P. Viswanath, "Fundamentals of Wireless Communications", Cambridge, 2005.
8. R. Prasad, "OFDM for Wireless Communication Systems", Artech House, 2004.
9. S. Haykin and M. Moher, "Modern Wireless Communications", Pearson, 2011.
10. V. K. Garg and J. E. Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.
11. V. K. Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.
12. William C. Y. Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd edition, Tata McGraw Hill, 1995.
13. Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London, 1997.
14. A. K. Jagannatham, "Principles of Modern Wireless Communication Systems", McGraw Hill, 2015.
15. I. Saha Misra, "Wireless Communication and Networks", Prentice Hall of India, 2010.
16. S. Kumar, "Wireless Communication Fundamentals and Advanced Concepts", River Publications, 2015.
17. W. C. Y. Lee, "Mobile Cellular Telecommunications Systems", McGraw Hill, 1990.
18. W. C. Y. Lee, "Mobile Communications Design Fundamentals", Prentice Hall, 1993.
19. Raymond Steele, "Mobile Radio Communications", IEEE Press, New York, 1992.
20. A. J. Viterbi, "CDMA: Principles of Spread Spectrum Communications", Addison Wesley,1995.
21. J. G. Proakis and M. Salehi, "Digital Communications", McGraw Hill, 5th edition, 2008.

Elective - I

TIU-UEC-E30#: Information Theory and Coding

Course Outcomes:

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

1. Understand the concept of information and entropy.
2. Understand Shannon's theorem for coding.
3. Calculation of channel capacity.
4. Apply coding techniques.

Detailed Syllabus:

Basics of information theory, entropy for discrete ensembles; Shannon's noiseless coding theorem; Encoding of discrete sources. (12)

Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels. (14)

Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolutional arithmetic codes. (10)

Recommended Textbooks:

1. T. M. Cover and J. A. Thomas, "Elements of Information Theory", Wiley, 2006.
2. N. Abramson, "Information and Coding", McGraw Hill, 1963.
3. M. Mansurpur, "Introduction to Information Theory", McGraw Hill, 1987.
4. R. B. Ash, "Information Theory", Prentice Hall, 1970.
5. Shu Lin and D. J. Costello Jr., "Error Control Coding", Prentice Hall, 1983.
6. R. Bose, "Information Theory, Coding and Cryptography", Tata McGraw Hill, 2008.

Elective - I

TIU-UEC-E30#: Optoelectronics and Optical Fibre Communications

L-T-P: 3-0-0

Credits: 3

Course Outcomes:

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

1. Understand the principles fiber-optic communication, the components and the bandwidth advantages.
2. Understand the properties of the optical fibers and optical components. Understand operation of lasers, LEDs, and detectors.Analyze system performance of optical communication systems.
3. Design optical networks and understand non-linear effects in optical fibers.

Detailed Syllabus:

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. (4)

Different types of optical fibers, Modal analysis of a step index fiber.

Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR. (8)

Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties. (6)

Optical switches - coupled mode analysis of directional couplers, electro-optic switches. (6)
Optical amplifiers - EDFA, Raman amplifier. (6)
WDM and DWDM systems. Principles of WDM networks. (4)
Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solition based communication. (2)

Recommended Textbooks:

1. G. Keiser, "Fibre Optic communication", McGraw-Hill, 5th Ed. 2013 (Indian Edition).
2. T. Tamir, "Integrated optics", (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
3. J. Gowar, "Optical communication systems", Prentice Hall India, 1987.
4. S. E. Miller and A. G. Chynoweth, eds., "Optical fibres telecommunications", Academic Press, 1979.
5. G. Agrawal, "Nonlinear fibre optics", Academic Press, 2nd Ed. 1994.
6. G. Agrawal, "Fiber optic Communication Systems", John Wiley and sons, New York, 1997
7. F.C. Allard, "Fiber Optics Handbook for engineers and scientists", McGraw Hill, New York (1990).
8. J. M. Senior, "Optical Fiber Communications: Principles and Practice", Pearson
9. A. Ghatak and K. Thyagarajan, "An Introduction to Fibre Optics", Cambridge
10. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prentice Hall

TIU-UEC-L30#: Digital Communication Lab
L-T-P: 0-0-3
Credits: 1.5
List of Experiments:

1. To study of ASK modulation/demodulation.
2. To study of FSK modulation/demodulation.
3. To study of PSK modulation/demodulation.
4. To study of QPSK modulation/demodulation.
5. To study of pulse code modulation.

TIU-UEC-L30#: DSP Lab
L-T-P: 0-0-3
Credits: 1.5
List of Experiments:

1. Generate Different Types Of Waveform Using MATLAB
2. Convolution of two user input discrete signals having unequal number of terms.
3. Find out the DFT of any input sequence using Direct MATLAB codes.
4. Find out Poles and Zeros from a given transfer function.

TIU-UEC-L30#: Computer Networking Lab
L-T-P: 0-0-3

Credits: 1.5

List of Experiments:

1. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP .
3. Implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Take a 64 bit playing text and encrypt the same using DES algorithm.
7. Write a program to break the above DES coding
8. Using RSA algorithm encrypts a text data and Decrypt the same