ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)

Semester VI / ECE/ B.TECH

Sl. No	Sub Code	Subject	Hrs			Credits C
			L	T	P	
	Theory					
1	EC131601	Microcontroller and Applications	3	2	0	4
2	CS131602	Data Structure	3	0	0	3
3	EC131603	Digital Communication	3	2	0	4
4	EC131604	Electromagnetic Field Theory	3	2	0	4
5	EC131605	Microwave Engineering	3	0	0	3
6	CS131606	Computer Communication Network	3	0	0	3
	Practical					
7	EC131611	Microcontroller and Applications Lab	0	0	2	1
8	CS131612	Data Structure Lab	0	0	2	1
9	EC131613	Digital Communication Lab	0	0	2	1
10	EC131615	Microwave Engineering Lab	0	0	2	1
Total			18	6	8	**25**
Total Contact Hours : 32						
Total Credit : 25						

Course Title: MICROCONTROLLER AND APPLICATIONS
Course Code: EC131601
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 =48

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTEL 8051**	Architecture of 8051, block diagram, pin diagram of 8051, functional description of internal units, registers, PSW, internal RAM, ROM, stack, oscillator, clock, reset circuits. I/O Pins, ports and circuits connecting external memory. Addressing modes, instruction set assembly language programs. Delay routines, software time delays, software polled timer, hardware delay. Look up tables.	12
2.	**8051 INTERRUPTS, COUNTERS AND TIMERS**	Serial data interrupt. Serial data transmission /reception and transmission modes. Timer flag interrupt. External interrupt, software generated interrupts. External memory and memory space decoding, expanding I/Os, memory mapped I/O. Interrupt driven serial transmission and reception. Serial data transmission using time delays and polling.	12
3.	**PIC MICROCONTROLLER**	CPU architecture, register file structure, addressing modes, instruction set, programs, MPASM assembler, PIC development Tools. PIC Timer- interrupts-PWM outputs-I/O port expansion, Keypad and display interface, I2CBus, Serial EPROM, Analog to Digital Converter, UART- Special features.	12
4.	**8051 APPLICATIONS**	Interfacing Keyboards Programs for small keyboards and matrix keyboards. Interfacing LCD displays. Measuring frequency and pulse width. Interfacing ADCs & DACs. PID Control Algorithms,8051 Serial data communication modes- Mode 0, Mode 1, Mode 2 and Mode 3. Programs for serial port communication (receive/transmit).	12

Text books/ References:

1. K J Ayala, The 8051 Microcontroller Architecture, Programming and Application, Penram international Publishing (India), 2004.
2. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems, Prentice Hall of India, 2nd Ed,2006.
3. Intel's manual on "Embedded Microcontrollers".
4. John Peatman, Design with PIC Microcontrollers, Pearson Eduction, New Delhi, 2001
5. Udayashankara, 8051 Microcontroller- TMH.

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

Course Title: DATA STRUCTURE
Course Code: CS131602
L-T-P-C: 3-0-0-3

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**LINEAR DATA STRUCTURE- I**	**a) Introduction:** Why we need data structure? Concepts of data structures: Data and data structure, Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. **b) Array:** Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. **c) Linked List**: Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.	8
2.	**LINEAR DATA STRUCTURE- II**	**a) Stack and Queue**: Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeues. Implementation of queue- both linear and circular (using array, using linked list), applications. **b) Recursion:** Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.	7
3.	**NONLINEAR DATA STRUCTURES**	**a) Trees:** Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree- operations (creation,	15

		insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). **b) Graphs**: Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism). Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm (basic idea of greedy methods).	
4.	**SEARCHING, SORTING**	**a) Sorting Algorithms:** Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort. **b) Searching:** Sequential search, binary search, interpolation search.	6

TEXT/ REFERENCE BOOKS:

1. "Data Structures And Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung.
2. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
3. "Data Structures in C" by Aaron M. Tenenbaum.
4. "Data Structures" by S. Lipschutz.
5. "Data Structures Using C" by Reema Thareja.
6. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
7. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
8. Data structure using C, E.Balaguruswamij, TMH

Course Title: DIGITAL COMMUNICATION
Course Code: EC131603
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Introduction to Digital communications, Review of Signals & systems, Random Variables & Stochastic Process. Merits of digital systems.	3
2.	**SIGNAL VECTOR REPRESENTATION**	Analog between signal and vector, orthogonality and orthonormality, basis function, orthogonal signal space, message point, signal constellation, geometric interpretation of signals, likelihood functions, Schwartz inequality, Gram-Schmitt orthogonalization procedure, response of the noisy signals at the receiver, maximum likelihood decision rule, decision boundary, Optimum Correlation receiver, Matched filter receiver, probability of errors, error function, complementary error function.	8
3.	**DIGITAL DATA TRANSMISSION**	Concept of sampling, analog to digital conversion, Pulse code modulation(PCM), quantization, uniform and non uniform quantization, quantization noise, binary encoding, A-Law and μ-Law companding, differential PCM, Delta modulation and adaptive delta modulation. Digital transmission components, source, multiplexer, line coder, regenerative repeater, Concept of line coding—Polar, Unipolar, bipolar, NRZ, RZ, Manchester, Differential encoding and their PSDs, Pulse shaping, Inter symbol Interference(ISI),Eye pattern, Nyquist criterion for zero ISI, Equalizer, Duo binary and modified Duo binary signalling.	12
4.	**DIGITAL MODULATION TECHNIQUES**	Types of Digital Modulation, Coherent and non coherent Binary Modulation techniques, basic digital carrier modulation techniques, ASK, FSK and PSK. Coherent Binary Phase Shift Keying (BPSK), geometrical representation of BPSK signal, error probability of BPSK signal, power spectrum of BPSK. Concepts of M-array Communication, M-array PSK the average probability of symbol error for	14

		MPSK, Power Spectral of MPSK. Quadrature Phase Shift Keying (QPSK), error probability of QPSK signal, generation and detection of QPSK signals, Power spectra of QPSK signals. Coherent Frequency Shift Keying (FSK), Binary FSK(BPSK), error probability of BFSK signals, generation and detection of coherent BFSK signals, power spectra of BFSK signals, Minimum Shift Keying (MSK), Signal constellation of MSK waveforms, error probability of MSK signals, Some performance issues for different digital modulation techniques.	
5.	**INFORMATION THEORY**	Information measure, average information and entropy, Discrete memory less channel (DMC), Mutual information, Channel Capacity Theorem.	6
6.	**SPREAD SPECTRUM TECHNIQUES**	Spread spectrum overview, Pseodonoise, Sequences: Direct sequence spread spectrum system, Frequency Hopping System. Concepts of Multiple access techniques: Frequency Division Multiple Access (FDMA) Time Division Multiple Access (TDMA) Code Division Multiple Access (CDMA)	5

Text Books:

1. Simon Haykin, "Digital Communication" (Wiley India)
2. B.P.Lathi and ZhiDing," Modern Analog and Digital Communication"(Oxford University Press)
3. H. Taub and D.L.Schilling," Principles of Communication Systems," TMH Publishing Co.

Reference Books:

1. B. Sklar and P.K.Ray," Digital Communications Fundamentals and Applications " (Pearson)
2. J.G.Proakis, "Digital Communications" TMH Publishing Co.
3. A. Bhattacharya, "Digital Communication"TMH Publishing Co.
4. Sing and sapre "Communication systems", TMH, 3/e

Course Title: ELECTROMAGNETIC FIELD THEORY
Course Code: EC131604
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**ELECTROSTATICS**	**A. Electrostatic Fields** Coulomb's law, Electric field intensity, Electric fields due to continuous charge distributions, Electric flux density, Gauss's law and its applications, Electric potential, relationship between E and V, Electric dipole and flux lines. . **B. Electric fields in material space** Conductor in field, Polarization in dielectrics, Continuity equation, Boundary conditions at (i) dielectric-dielectric, (ii) conductor-dielectric, (iii) conductor-free space. **C. Electrostatic Boundary-Value Problems** Poisson's and Laplace equations, solution of one dimensional cases, Uniqueness theorem, Resistance and capacitance, Method of image.	16
2.	**MAGNETOSTATICS**	**A. Magnetostatic Fields** Biot-Savart's law, Ampere's Circuital law and its application, Biot-Savart's law and its application, Magnetic flux density, Magnetic scalar and vector potentials. **B. Magnetic Forces, materials** Forces in magnetic field, Force on a current element, Force between two current elements, Force and torque in the current loop, concept of magnetic dipole, magnetic susceptibility, magnetic boundary conditions, inductor and inductance, concept of magnetic energy.	16
3.	**THE ELECTROMAGNETIC WAVE**	Faraday's law, Lenz's law, Transformer and Motional Electromotive forces, Lorentz force equation, Displacement current, Maxwell's equations in differential and integral form with physical interpretations, Maxwell's equations for free space, for static fields, time varying fields (Phasor notation), wave equation in free space, conducting medium, uniform plane waves, Helmholtz equation, intrinsic impedance, wave propagation in lossy dielectric, in good conductors, skin	16

		depth, power and Poynting vector, reflection of plane wave, reflection and transmission coefficient.	

Text Books:

1. Principles of Electromagnetics, 4th Edition, Matthew O H Sadiku, Oxford University Press.
2. Engineering Electromagnetics, 7thEdition-W.H.Hayt & J.A.Buck, Tata-McGraw-Hill
3. Electromagnetic Field Theory & Transmission Lines, G.S.N. Raju, Pearson Education
4. Electromagnetic Waves Shevgaonkar, Tata-McGaw-Hillr –R K

Reference Books:

1. Engineering Electromagnetics, 2nd Edition - Nathan Ida, Springer India
2. Fields & Waves in Communication Electronics, S. Ramo, J. R. Whinnery & T. Van Duzer, John Wiley
3. Electromagnetic Theory & Applications, A. K. Saxena, Narosa Publishing House Pvt. Ltd.
4. Electromagnetics, 2ed Edition – J A Edminister, Tata-McGraw-Hill.
5. Electromagnetic Waves and Transmission Lines- by G.Prasad, J.Prasad and J.Reddy-Scitech.
6. Electromagnetic Fields and Waves- R.Gowri, S.K. Kataria & Sons.

Course Title: MICROWAVE ENGINEERING
Course Code: EC131605
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	RF & Microwave Spectrum, Typical applications of RF and Microwave, Safety considerations	2
2.	**TRANSMISSION LINES**	Introduction, parameters, line equation, input impedance, standing waves, VSWR and reflection coefficient, Smith Chart, Stub matching.	4
3.	**MICROWAVE WAVEGUIDE AND WAVEGUIDE RESONATOR**	Rectangular Waveguide- Design consideration, TE & TM modes, TE10 mode analysis, cut-off frequency, propagation constant, intrinsic wave impedance, phase and group velocity, power transmission, attenuation, waveguide excitation, wall current; Introduction of circular waveguide; Rectangular waveguide resonator- Design consideration, resonant frequency, Q-factor, excitation.	8
4.	**WAVEGUIDE PASSIVE COMPONENTS**	N-port networks-Properties of S matrix, Transmission matrix & their relationships; Microwave passive components and their S matrix representation: Attenuators, matched termination, short circuit, Phase shifter, Directional coupler, Bethe-hole coupler, Magic tee, hybrid ring, Circulators, Faraday rotation, Faraday rotation isolators, resonance isolator, Gyrator; Filters.	5
5.	**MICROWAVE TUBES**	High frequency limitations of conventional tubes, two and multi-cavity Klystron, Reflex Klystron, modes, Magnetron, TWT & BWO; Applications.	4
6.	**SEMICONDUCTOR MICROWAVE DEVICES**	TED (Gunn diode), Tunnel diode, IMPATT, TRAPATT, BARRIT devices, Schottky diode, PIN diode characteristics & applications; Microwave bipolar transistor, Microwave field effect transistor(MESFET), MASER, LASER.	6
7.	**PLANAR TRANSMISSION LINE**	Strip line, Micro-strip lines, Coplanar line, Slot line.	3
8.	**MICROWAVE MEASUREMENT**	Detection of microwave signal, slotted line power, VSWR, frequency, phase, impedance measurement.	4

Text Books:

1. Microwave Engineering, 3rd Ed David M. Pozar, Willey & Sons Inc.
2. Microwaves, K C Gupta, New Age Publishers.
3. Microwave Engineering, A Das & S Das, TMH.
4. Microwave Devices & Circuits, SY Liao, Pearson Education /PHI
5. Principles of Electromagnetics, Matthew N. O. Sadiku, Oxford.

References Books:

1. Microwave Engineering-Passive Circuits, PA Rizzi, Pearson Education.
2. Foundation of Microwave Engineering, 2nd edition, Robert E Collin, McGraw Hill, Inc.
3. Microwave Devices & Circuit Design, GP Srivastava & VL Gupta, PHI
4. Microwave Engineering, Monojit Mitra, Dhanpat Rai & Co.

Course Title: COMPUTER COMMUNICATION NETWORK
Course Code: CS131606
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**NETWORK ARCHITECTURE**	OSI layers –TCP/IP layers, Communication media, Issues in the data link layer - Framing – Error correction and detection –Error control- Flow Control	8
2.	**MEDIUM ACCESS**	CSMA – Ethernet – Token ring – FDDI - HDLC – Bridges and Switches	6
3.	**CIRCUIT SWITCHING VS. PACKET SWITCHING / PACKET SWITCHED NETWORKS**	IP – ARP – RARP –DHCP – ICMP – Queuing discipline – Routing algorithms – RIP – OSPF - Subnetting / Supernetting – CIDR – Inter domain routing – BGP – Ipv6 – ulticasting – Congestion avoidance in network layer	8
4.	**UDP – TCP**	Adaptive Flow Control – Adaptive Retransmission - Congestion control –Congestion avoidance – QOS	6
5.	**EMAIL (SMTP, MIME, IMAP, POP3)**	HTTP – DNS- SNMP – Telnet – FTP – Security – PGP – SSH	8

TEXT BOOKS:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Third Edition, Morgan Kauffmann Publishers Inc., 2003.

REFERENCES:

1. James F. Kuross, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Third Edition, Addison Wesley, 2004.
2. Nader F. Mir, "Computer and Communication Networks", Pearson Education, 2007
3. Comer, "Computer Networks and Internets with Internet Applications", Fourth Edition, Pearson Education, 2003.
4. Andrew S. Tanenbaum, "Computer Networks", Fourth Edition, 2003.
5. William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000
6. Tittel, Computer Networking, Schaum's outline, TMH

PRACTICALS

Course Title: MICROCONTROLLER AND APPLICATIONS LAB
Course Code: EC131611
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO	AIM OF THE EXPERIMENT	HOURS
1	Write a program to add two 16 bit unsigned numbers 2040H and 202BH	3
2	Write a program to generate BCD up counter and send each count to port P1.	3
3	Write a program to find the maximum and minimum of 10 numbers stored in RAM.	3
4	Write a program to convert a 3-digit decimal number into corresponding three ASCII numbers.	3
5	Write a program to generate a square wave of 1KHz frequency on pin P1.0	3
6	Write a program to generate an accurate delay of 1ms using timer and use it to blink an LED with a frequency of 1Hz.	3
7	Write a program to read a keyboard using interrupt method and display the characters on the PC monitor screen	3
8	Write a program to interface a 16x2 character LCD with 8051 microcontroller and display characters on the LCD.	3
9	Write a program to interface a pushbutton momentarily ON switch with 8051 microcontroller using interrupt method and cause it to alternately turn ON/OFF an LED.	3
10	Write a program to interface a pushbutton momentarily ON switch with 8051 microcontroller using polling method and cause it to alternately turn ON/OFF an LED.	3
	TOTAL	**30**

Note: Program number from 1 to 3 will be written using assembly language. Rest of the programs from 4 to 10 will be written in C language and compiled using KEIL C compiler.

Course Title: DATA STRUCTURE LAB
Course Code: CS131612
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO	AIM OF THE EXPERIMENT	HOURS
1	Implementation of Array operations.	1
2	Stacks and Queues (a) Adding and deleting elements (b) Circular Queue: Adding and deleting elements merging problem.	8
3	Evaluation of expressions, operations on multiple stacks and queues.	6
4	Implementation of linked lists (a) Inserting, deleting and inverting a linked list. (b) Implementation of stacks and queues using linked lists.	4
5	Polynomial addition and multiplication	8
	TOTAL	**27**

Course Title: DIGITAL COMMUNICATION LAB
Course Code: EC131613
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO	AIM OF THE EXPERIMENT	HOURS
1	To study Analog to Digital Converter.	3
2	To study Digital to Analog Converter.	3
3	To study data format of a given data NRZ (L), NRZ (M), RZ & Biphase.	3
4	To study PAM & TDM.	3
5	To study Pulse Code Modulation/ Demodulation.	3
6	To study ASK Modulation & Demodulation.	3
7	To study PSK Modulation & Demodulation.	3
8	To study FSK Modulation & Demodulation.	3
9	To study Synchronisation of PCM Transmitter & Receiver.	3
	TOTAL	**27**

Course Title: MICROWAVE ENGINEERING LAB
Course Code: EC131615
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO	AIM OF THE EXPERIMENT	HOURS
1	To study the Microwave Components.	3
2	To study I – V Characteristics of a Gunn Diode Source.	3
3	To study Power & Frequency of a Gunn Diode Source.	3
4	To study the guided wavelength, operating frequency & Cut-off wavelength using Gunn Diode Source.	3
5	To study Power & Frequency of Reflex Klystron.	3
6	To study different Modes of Reflex Klystron.	3
7	To study the guided wavelength, operating frequency & cut-off wavelength using Reflex Klystron Source.	3
8	To study VSWR using Reflex Klystron Source.	3
9	To study Coupling Co-efficient & Directivity for a Directional Coupler using Reflex Klystron Source.	3
10	To study Coupling Co-efficient & Directivity for a Magic Tee using Reflex Klystron Source.	3
11	Measurement of unknown impedance using Smith Chart.	3
	TOTAL	**33**