INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

भारतीय सूचना प्रौद्योगिकी संस्थान कोटा

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. Syllabus
Batch Admitted in Academic Year 2017-18 onwards

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Table of Contents

Department of Electronics & Communication Engineering

Indian Institute of Information Technology, Kota
Curriculum Scheme of B.Tech. (Electronics and Communication Engineering) Batch Admitted in Academic Year 2017-18 onwards

Semester - I						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST101	Introduction to Computer System and Programming	3	0	0	3
2	ECT101	Digital Electronics	3	0	0	3
3	ECT103	Fundamentals of Electrical Engineering	3	0	0	3
4	HST101	Communication Skills in English	2	0	0	2
5	MAT101	Mathematics - I	3	0	0	3
		Labs				
6	CSP101	Computer Programming Lab	0	0	2	1
7	CSP111	IT Workshop - I	0	0	3	2
8	ECP101	Digital Electronics Lab	0	0	2	1
9	HSP101	English Communication Lab	0	0	2	1
10	OTP101	Creative Arts / Liberal Arts	0	0	1	1
11	OTP103	Introduction to Engineering Creativity, Innovation and Design	0	0	3	2
Total			14	0	13	22

Semester - II						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST102	Data Structures and Algorithms	3	0	0	3
2	CST104	Internet and Web Technologies	3	0	0	3
3	ECT102	Electronic Devices and Circuits	3	0	0	3
4	HST102	Health, Safety and Environment	1	0	0	1
5	HST104	Human Values and Effective Communication	2	0	0	2
6	MAT102	Mathematics - II	3	0	0	3
		Labs				
7	CSP102	Data Structures and Algorithms Lab	0	0	2	1
8	CSP112	IT Workshop - II	0	0	3	2
9	ECP102	Electronic Devices and Circuits Lab	0	0	2	1
10	HSP104	Soft Skill Development Lab	0	0	2	1
11	OTD102	Independent Project	0	0	1	1
Total			15	0	10	21

Indian Institute of Information Technology, Kota
Curriculum Scheme of B.Tech. (Electronics and Communication Engineering) Batch Admitted in Academic Year 2017-18 onwards

Semester - III						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST203	Object Oriented System Design	3	0	0	3
2	ECT201	Microprocessors and Microcontrollers	3	0	0	3
3	ECT203	Analog Electronics	3	0	0	3
4	ECT205	Signals and Systems	3	0	0	3
5	ECT207	Control Systems	3	0	0	3
6	MAT201	Probability and Random Processes	3	0	0	3
		Labs				
7	CSP203	Object Oriented System Design Lab	0	0	2	1
8	CSP211	IT Workshop - III	0	0	3	2
9	ECP201	Microprocessors and Microcontrollers Lab	0	0	2	1
10	ECP203	Analog Electronics Lab	0	0	2	1
Total			18	0	9	23

Semester - IV						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST204	Computer Architecture and Organization	3	0	0	3
2	ECT202	Analog Communication	3	0	0	3
3	ECT204	Measurement and Instrumentation Technology	3	0	0	3
4	ECT206	Electromagnetic Theory	3	0	0	3
5	HST202	Technical Writing and Professional Communication	3	0	0	3
6	MAT202	Information Theory and Coding	3	0	0	3
		Labs				
7	CSP204	Computer Architecture and Organization Lab	0	0	2	1
8	ECP202	Analog Communication Lab	0	0	2	1
9	ECP204	Measurement and Instrumentation Technology Lab	0	0	2	1
10	HSP202	Professional Communication Lab	0	0	2	1
Total			18	0	8	22

Indian Institute of Information Technology, Kota
Curriculum Scheme of B.Tech. (Electronics and Communication Engineering) Batch Admitted in Academic Year 2017-18 onwards

Semester - V						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	ECT301	Digital Signal Processing	3	0	0	3
2	ECT303	Digital Communication	3	0	0	3
3	ECT305	VLSI Design	3	0	0	3
4	ECT307	Transmission Lines and Antennas	3	0	0	3
5		Discipline Elective DL - 5.1 (Pool 1)	3	0	0	3
6		Open Elective OL - 5.1 (Pool 1 or 2)	3	0	0	3
		Labs				
7	ECP301	Digital Signal Processing Lab	0	0	2	1
8	ECP303	Digital Communication Lab	0	0	2	1
9	ECP305	VLSI Design Lab	0	0	2	1
10	ECP307	Transmission Lines and Antennas Lab	0	0	2	1
11		Open Elective OL - 5.1 Lab (Pool 1 or 2)	0	0	2	1
Total			18	0	10	23

Semester - VI						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	ECT302	Embedded Systems	3	0	0	3
2	ECT304	Wireless Communication	3	0	0	3
3	ECT306	Optical Communication	3	0	0	3
4		Open Elective OL - 6.1 (Pool 1 or 2)	3	0	0	3
		Labs				
5	ECD302	Project - I	0	0	6	6
6	ECD304	Technical Presentation - I	0	0	2	1
7	ECP302	Embedded Systems Lab	0	0	2	1
8	HSP304	Business Communication Skills Lab	0	0	2	1
9		Open Elective OL - 6.1 Lab (Pool 1 or 2)	0	0	2	1
Total			12	0	14	22

Indian Institute of Information Technology, Kota
Curriculum Scheme of B.Tech. (Electronics and Communication Engineering) Batch Admitted in Academic Year 2017-18 onwards

Semester - VII						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1		Discipline Elective DL - 7.1 (Pool 1)	3	0	0	3
2		Fractal Elective FL - 7.1 (Pool 3)	1	0	0	1
3		Fractal Elective FL - 7.2 (Pool 3)	1	0	0	1
4		Fractal Elective FL - 7.3 (Pool 3)	1	0	0	1
5		Humanities Elective HL - 7.1 (Pool 4)	3	0	0	3
		Labs				
6	ECD401	Project - II	0	0	6	6
7	ECD403	Technical Presentation - II	0	0	2	1
Total			9	0	8	16

Semester - VIII						
S.No	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1		Discipline Elective DL - 8.1 (Pool 1)	3	0	0	3
2		Discipline Elective DL - 8.2 (Pool 1)	3	0	0	3
3		Fractal Elective FL - 8.1 (Pool 3)	1	0	0	1
4		Fractal Elective FL - 8.2 (Pool 3)	1	0	0	1
5		Fractal Elective FL - 8.3 (Pool 3)	1	0	0	1
6		Fractal Elective FL - 8.4 (Pool 3)	1	0	0	1
7		Fractal Elective FL - 8.5 (Pool 3)	1	0	0	1
8		Fractal Elective FL - 8.6 (Pool 3)	1	0	0	1
9		Humanities Elective HL - 8.1 (Pool 4)	3	0	0	3
Total			15	0	0	15

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST101
Course title : Introduction to Computer Systems and Programming
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to computer systems - Computers, Internet, Web Applications, Hardware, Software, Firmware, System Software, Application Software, Von Neumann Architecture, input devices, keyboard layout, output devices, CPU. Memory: Primary and secondary memory. Semiconductor memory, magnetic memory, optical memory. Disc structure. Operating System, kernel. Number systems, base conversions (decimal, binary, hexadecimal).

Compiler - Compilation process. Compiler and interpreter. Using GCC or Clang.

C Programming – Learning a programming language, 32 keywords in C, identifier, variables, data types (integral and real), keywords -> char, int, short, long, signed, unsigned, const, float, double, sizeof, declarations and assignments, code indentation and readability, input and output using printf and scanf, different format specifiers %c, %d, %ld, %f, %w.p, expressions (arithmetic), branching (if, if-else, else_if ladder), repetitions (for, while, do while loops), keywords -> if, else, for, while, do. Process memory layout - Stack, Heap, Data nad Code segment, different ways to write main(), keywords -> switch, case, default, break. Issues with usage of printf() and scanf(). More input, output functions.

C Programming - Arrays, Strings, 2-dimensional and multi-dimensional arrays, address computations.

C Programming - Structure and Unions, Enumeration, Functions, parameter passing, call-by-value, call-by-reference. Pointers, passing and returning pointer to a structure. Dynamic memory allocation. Command line arguments, Scope – project, file, function, block. Storage classes – keywords: auto, static, extern, register.

C Programming - File handling, reading from and writing to files. File processing functions.

Pre-Processor directives (inclusion, definition, conditional compilation, pragma).
Makefiles. Static and shared libraries.

Text Book(s)

1. Brian W. Kernighan, Dennis M. Ritchie, “The C Programming Language”, Prentice Hall
2. E Balagurusamy, “Programing in ANSI C”, Tata McGraw Hill, 3rd Edition

Reference Book(s)

1. Yashavant P. Kanetkar, “Let us C”, Infinity Science Press, 6th Edition

Department of Electronics & Communication Engineering

Course code : ECT101
Course title : Digital Electronics
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Number base conversion (binary, octal, decimal, hexadecimal), Binary codes (weighted, unweighted, self-complementary), Signed and unsigned binary numbers, complements (1's, 2's, 9's, 10's), Binary arithmetic (addition, subtraction, multiplication, division), Binary logic (positive and negative logic).

Boolean algebra (basic theorems and properties, truth tables, DeMorgan's theorem, duality, operator precedence), Boolean function (canonical and standard forms), Digital logic gates, Boolean function simplification (2 to 4 variable Karnaugh maps, don't care conditions, Quine-McCluskey method), NAND and NOR implementation.

Analysis and design of combinational logic circuits (code conversion, error detector, binary adder and subtractor, look-ahead carry and BCD adders, binary magnitude comparator, decoder, encoder, priority encoder, multiplexer, demultiplexer), Programmable logic devices (design using read only memory, and programmable logic arrays).

Level and edge-triggered flip-flops (RS flip-flop, D flip-flop, JK flip-flop, T flip-flop, timing specifications of flip-flops, characteristic table and equation of flip-flops, excitation table of flip-flops), Analysis of clocked sequential circuits (state table, state diagram, state reduction and assignment), Design of synchronous and asynchronous counters, Shift registers and its timing considerations, Algorithmic State Machines, asynchronous sequential circuits.

Text Book(s)

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Prentice Hall, 4th Edition
2. William Kleitz, "Digital Electronics: A Practical Approach with VHDL", Prentice Hall, 8th Edition

Reference Book(s)

1. John F. Wakerly, "Digital Design: Principles and Practices", Pearson Education, 4th Edition
2. Z. Kohavi, Niraj K. Jha, "Switching and Finite Automata Theory", Cambridge University Press, 3rd Edition
3. Frederick J. Hill, Gerald R. Peterson, "Introduction to Switching Theory and Logic Design", John Wiley, 1st Edition
4. Albert Paul Malvino, Donald P. Leach, "Digital Principles and Applications", Tata McGraw Hill, 6th Edition

Department of Electronics & Communication Engineering

Course code : ECT103
Course title : Fundamentals of Electrical Engineering
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Basic circuit variables and elements (voltage, current, power, independent and dependent voltage and current sources, resistors, capacitors, inductors), Ohm's law, Kirchhoff's laws (KCL and KVL), Current division, Voltage division.

Linear circuit analysis techniques (nodal analysis, mesh analysis), Network theorems (Thevenin's, Norton's, Superposition, Maximum Power Transfer), Source transformations.

Duality, Time-domain transient analysis (natural and forced) of first-order and second-order circuit.

Phasor-domain or frequency-domain steady-state analysis, AC power, Polyphase circuits, Three-phase loads, Frequency response, Basic filters, Resonance, Quality factor and bandwidth.

Magnetic fields, Magnetic flux and flux density, Magnetic circuits, Magnetization curves, Hysteresis loss, Electromagnetic induction, Inductance and magnetic coupling, Ideal transformer, Non-ideal transformer parameters determination, DC machines (DC generator and motor), AC machines (synchronous and induction generators and motors).

Text book(s)

1. Leonard S. Bobrow, Navneet Gupta, "Foundations of Electrical Engineering", Oxford University Press, Asian Edition
2. Allan R. Hambley, "Electrical Engineering Principles and Applications", Prentice Hall, 5th Edition

Reference book(s)

1. Edward Hughes, "Electrical & Electronic Technology", Pearson Education, 10th Edition
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 3rd Edition
3. Vincent Del Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd Edition

Department of Electronics & Communication Engineering

Course code : HST101
Course title : Communication Skills in English
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 2 (2-0-0)
Course prerequisite : None

Syllabus

'Night of the Scorpion'. Prepositions, Tenses.

'Our Urgent Need for Self Esteem'. Subject-verb Agreement, Creative Writing, Informal Letters

'The Diary of a Young Girl'. Vocabulary Building, Common Errors.

'Building an Internet Culture'. Reported Speech, Precis Writing, Conditional sentences.

'The Sporting Spirit'. Active and Passive Voice, Formal Letters and Applications, Phonetics

'Mother Teresa'. Idioms and Proverbs, Job Applications, Resume Writing.

Text Book(s)

1. K. Elango, "Insights: A Course in English Literature and Language", Orient Blackswan Publishers

Reference Book(s)

1. John Eastwood, "Oxford Practice Grammar", Oxford University Press
2. Nanny Tripathi, "English for Engineers", Jaipur Publishing House
3. Raymond Murphy, "English Grammar in Use", Cambridge University Press, 3rd Edition
4. Sydney Greenbaum, "Oxford English Grammar", Oxford University Press
5. Ronald Carter, Rebecca Hughes, Michael McCarthy, "Exploring Grammar in Context -Upper Intermediate and Advanced", Cambridge University Press
6. Martin Hewings, "Advanced Grammar in Use: A Self-study Reference and Practice Book", Cambridge University Press, 2005

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : MAT101
Course title : Mathematics - I
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Partial Differentiation – Partial differentiation, Euler's theorem on homogenous functions, total differentiation, approximate calculation.

Differential Equations – Differential equations of first order and first degree - linear form, reducible to linear form, exact form, reducible to exact form. Linear differential equations of higher order with constant coefficients.

Second order ordinary differential equations with variables coefficients –Homogeneous, exact form, reducible to exact form, change of dependent variable (normal form), change of independent variable, method of variation of parameters.

Vector Calculus – Differentiation and integration of vector functions of scalar variables, Scalar and vector fields, Gradient, Directional derivative, Divergence, Curl. Line integral, Surface integral and Volume integral. Green's, Gauss's and Stokes's theorems (statement only) and their simple applications.

Matrices – Rank and inverse of matrix by elementary transformations, Consistency of linear system of equations and their solution. Eigenvalues and eigenvectors. Cayley-Hamilton theorem (statement only) & its applications.

Finite differences, interpolations and numerical differentiations –Forward, Backward, Central differences and relations between them, Newton's forward, backward interpolation formulas and Stirling's central difference interpolation formulas. Lagrange's interpolation formula, Numerical differentiations using Newton's forward, backward, Stirling's central difference interpolation formulas. Numerical integrations - Trapezoidal rule, Simpson's one-third rule, Simpson's 3/8 rule and Weddle method.

Text book(s)

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publisher
2. Michal Greenberg, "Advanced Engineering Mathematics", Pearson
3. George B. Thomas, Ross L. Finney, "Calculus and Analytic Geometry", Addison-Wesley

Reference book(s)

1. D. W. Jordan, P. Smith, "Mathematical Techniques", Oxford
2. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning, New Delhi
3. B.V. Ramana, "Higher Engineering Mathematics", McGraw–Hill

Department of Electronics & Communication Engineering

Course code : CSP101
Course title : Computer Programming Lab
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Introduction of Computers, Internet, Web Applications, Using LDAP ID and IIITK email. Keyboard layout. Software, System Software, Application Software. Memory - Primary and secondary memory. Types of Operating Systems, kernel. Using gedit and VI text editors. Using GCC or Clang.

C Programming – learning a programming language, simple C programs using keywords-> char, int, short, long, signed, unsigned, const, float, double, sizeof, Declarations and assignments, code indentation and readability, input and output using printf and scanf, different format specifiers %c, %d, %ld, %f, %w.p, expressions (arithmetic).

C Programming – branching (if, if-else, else_if ladder), repetitions (for, while, do while loops), keywords -> if, else, for, while, do. Different ways to write main(). Keywords -> switch, case, default, break. Issues with printf() and scanf(). More input, output functions.

C Programming – Arrays, Strings, 2-dimensional and multi-dimensional arrays, Strings functions.

C Programming – Structure and Unions, Enumeration. Functions, parameter passing, call-by-value, call-by-reference.

C Programming – Pointers, passing and returning pointer to a structure. Dynamic memory allocation. Command line arguments. Scope - project, file, function, block. Storage classes - keywords: auto, static, extern, register.

C Programming – File handling, reading from and writing to files. File processing functions.

Pre-processor directives (inclusion, definition, conditional compilation, pragma). Makefiles. Static and shared libraries.

Text Book(s)

1. Brian W. Kernighan, Dennis M. Ritchie, “The C Programming Language”, Prentice Hall
2. E. Balagurusamy, “Programing in ANSI C”, Tata McGraw Hill, 3rd Edition

Reference Book(s)

1. Yashavant P. Kanetkar, “Let us C”, Infinity Science Press, 6th Edition

Department of Electronics & Communication Engineering

Course code : CSP111
Course title : IT Workshop - I
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 2 (0-0-3)
Course prerequisite : None

Syllabus

IT Workshop – I is a unique course at IIIT Kota wherein students get exposure to various skills building activities. Following activities have been offered in the past:

Shell scripting (Linux) - Introduction to BASH. Implementation of Basic commands and their options (ls, pwd, cd, mkdir, history, echo, man, date). File manipulation commands (cat, head, tail, cp, mv, touch, rm, sort, cut, wc). Searching files (grep, find), Shell Programming (if-then-else-if, else-if ladder, nested if, while loop).

Robotics project (Arduino boards)

Matlab Programming (Linux) - Introduction to Programming (Components of a computer, Working with numbers, Machine code, Software hierarchy, Matrix theory). Programming Environment (MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays). Graph Plots (Basic plotting, Built-in functions, Generating waveforms). Procedures and Functions, Arguments and return values, M-files, Formatted console input-output, String handling. Conditional statements (If, Else, Elseif, Repetition statements: While, For). 1D and 2D signals. Audio and Image processing, load save etc.

Text Book(s)

Reference Book(s)

Department of Electronics & Communication Engineering

Course code : ECP101
Course title : Digital Electronics Lab
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Verification of truth table for various logic gates using TTL ICs (7400, 7402, 7404, 7408, 7432, 7486). Implementation of basic gates (NOT, AND, OR) using universal NAND and NOR gates. Design of four bit Binary to Gray and Gray to Binary code Converter. Design of Half and Full Adder circuits. Design of Half and Full Subtractor circuits. Design of Two bit multiplier. Design of One and Two bit Comparators. Design of Even and Odd parity generator and checker. Design of 2:1 and 4:1 MUX using basic gates. Design of 4:1 MUX using 2:1 MUX. Design a binary to decimal and octal to decimal decoder. Design and verification truth table of flip-flops (SR latch with NOR and NAND Gates, SR flip-flop with control input using NOR and NAND Gates). Design and verification truth table of flip-flops (D, JK and T). Design and implement binary ripple and synchronous up/down counters using flip-flops. Design and implement shift registers using flip-flops.

Text Book(s)

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Prentice Hall, 4th Edition
2. William Kleitz, "Digital Electronics: A Practical Approach with VHDL", Prentice Hall, 8th Edition

Reference Book(s)

1. John F. Wakerly, "Digital Design: Principles and Practices", Pearson Education, 4th Edition
2. Z. Kohavi, Niraj K. Jha, "Switching and Finite Automata Theory", Cambridge University Press, 3rd Edition
3. Frederick J. Hill, Gerald R. Peterson, "Introduction to Switching Theory and Logic Design", John Wiley, 1st Edition
4. Albert Paul Malvino, Donald P. Leach, "Digital Principles and Applications", Tata McGraw Hill, 6th Edition

Department of Electronics & Communication Engineering

Course code : HSP101
Course title : English Communication Lab
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Pronunciation Practice – Practice in Phonetic Symbols (IPA) and Transcription on Language Laboratory software

Language Skills – Practice in Common Errors, Prepositions, Tenses, Passive Voice, Conditional Sentences, Reported speech, Subject-Verb Agreement, Idioms and Proverbs, Resume Writing and Job Applications on Language Laboratory software

Speaking Skills Practice – Self-presentation, Extempore, Just a Minute, Weave a Story Elocution, Expansion of themes and Presentations

Text Book(s)

Reference Book(s)

1. Daniel Jones, "CambridgeEnglish Pronouncing Dictionary", Cambridge, ELBSCambridge
2. J. Sethi, P.V. Dhamija, "A Course in Phonetics and Spoken English", PHI Learning
3. Matthew McKay, Martha Davis, Patrick Fanning, "Messages: The Communication Skills Book", New Harbinger Publications, 3rd Edition
4. Barun K.Mitra, "Personality Development and Soft Skills", Oxford University Press

Department of Electronics & Communication Engineering

Course code : OTP101
Course title : Creative Arts / Liberal Arts
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-1)
Course prerequisite : None

Syllabus

This unique course at IIIT Kota is aimed to allow students to explore creative and artistic dimensions. Following activities have been taken up in the past:

Vocal Music. Rangoli Creation. Poster Making. Cookery Workshop. Invited lectures (Building Self Confidence and a Positive Attitude, Mind-Body Interface). Movie Making. Singing and Dancing. Face Painting. Drama and Play. Social Outreach. Tree Plantation. Indoor and Outdoor Games. Campus Cleanness Drive.

Text Book(s)

Reference Book(s)

Department of Electronics & Communication Engineering

Course code : OTP103
Course title : Introduction to Engineering Creativity, Innovation and Design
Year/Semester : I/I
Branch : CSE, ECE
Course credit (L-T-P) : 2 (0-0-3)
Course prerequisite : None

Syllabus

Creativity is idea producing, innovation is putting ideas to work, and design is the methodic process for innovative solutions. Engineering design should innately be driven by innovation and creativity. The aim of the course 'Introduction to Engineering Creativity, Innovation and Design' is to ignite and nurture creative and innovative potential of aspiring fresh batch of students, seeking careers in technology with a desire to bring about innovative and life improvement changes in society. This course is structured with the purpose of learning through fun and creativity, bringing in curiosity and enthusiasm in line with technical curriculum. This course can be run in workshop mode over weekends. Students will work on a project for a final evaluation.

Text Book(s)

Reference Book(s)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST102
Course title : Data Structures and Algorithms
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction: Concept of Data Structures, Algorithms and ADT (Abstract Data Type), Program v/s algorithms, Execution time and storage space, Complexity - time and space, Asymptotic notations - O(n), Ω(n) Q(n).

Array: Array as storage element, computing address in n-dimensional array. Insertion and Deletion, Searching (Sequential and binary), Sorting (Bubble sort, Insertion, Selection, Merge sort, Quick sort, radix sort), Representation of polynomial and its applications, Representation of Sparse matrix and its applications. Linked lists - Single and double linked lists, Insertion/deletion/searching in linked lists, Comparison of arrays and linked lists, Implementation of circular lists.

Stack and Queue: Stack, Queue, Circular queue, Concept of overflow and underflow, Concept of precedence and associativity in expressions, Resolving precedence of operators and association of operands, Evaluation of Expression - Infix, Prefix & Postfix notations, conversion of expression from one form to other form, Recursion - concepts, use and implementation. Strings, Hash tables (open and close), Dictionary, Sets

Trees: Concept of Trees, Binary and Multiway tree, Representing multiway tree as Binary tree, Tree Traversal, constructing Binary tree from Traversal, BST (Binary Search Tree), threaded and unthreaded BST as data structure, Insertion/Deletion/Search in BST, Heap Tree and Heap sort, Introduction to height balanced tree.

Graphs: Introduction to graphs (directed and undirected), representation of graphs using adjacency matrix and list, Graph Traversals - DFS and BFS, Topological sorting.

Text book(s)

1. Ellis Horowitz, SartajSahni, “Fundamentals of Data Structures”, Computer Science Press
2. R.L. Kruse, “Data Structure and Program Design”, Prentice-Hall India

Reference book(s)

1. A.V. Aho, J.D. Ullman, J.E. Hopcroft, “Data Structures and algorithms”, Addison-Wesley
2. Y. Langsam, M.J. Augenstein, A.M. Tanenbaum, “Data Structures Using C”, Prentice-Hall India
3. M.A. Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Addison-Wesley

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST104
Course title : Internet and Web Technologies
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Internet: Introduction, Evolution of Internet, Internet Applications, Internet Protocol - TCP/IP, UDP, HTTP, Secure Http (Shttp), Internet Addressing – Addressing Scheme – Ipv4 & IPv6, Network Byte Order, Domain Name Server and IP Addresses, Mapping. Internet Service Providers, Web Technologies: Three Tier Web Based Architecture; Jsp, Asp, J2ee, .Net Systems.

HTML CSS and Scripting: HTML – Introduction, Sgml, Dtd (Document Type Definition, Basic Html Elements, Tags and usages, HTML Standards, Issues in HTML, Dhtml: Introduction, Cascading Style Sheets: Syntax, Class Selector, Id Selector Dom (Document Object Model) & Dso (Data Source Object), Approaches To Dynamic Pages: Cgi, Java Applets, Plug Ins, Active X, Java Script – Java Script Object Model, Variables-Constant – Expressions, Conditions- Relational Operators- Data Types – Flow Control – Functions & Objects-events and event handlers – Data type Conversion & Equality – Accessing HTML form elements.

XML: Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents & Data ,Defining Attributes & Entities in the DTD, Defining Parameter Entities & conditional Sections, Resolving a naming conflict, Using Namespaces, Designing an XML data structure, Normalizing Data, Normalizing DTDS.

Internet Security & Firewalls: Security Threats From Mobile Codes, Types Of Viruses, Client Server Security Threats, Data & Message Security,

Website Planning & Hosting: Introduction, Web Page Lay-Outing, Where To Host Site, Maintenance Of Site, Registration Of Site On Search Engines And Indexes, Introduction To File Transfer Protocol, Public Domain Software, Types Of Ftp Servers (Including Anonymous),Ftp Clients Common Command. Telnet Protocol, Server Domain, Telnet Client, Terminal Emulation. Usenet And Internet Relay Chat.

Text Book(s)

1. Craig Knuckles, David Yuen, “Web Applications Technologies Concepts and Real World Design”, John Wiley, 1st Edition
2. Robert W. Sebesta, “Programming with World Wide Web”, Pearson, 6th Edition
3. Daniel Minoli, “Internet & Intranet Engineering”, Tata McGraw Hill.

Reference Book(s)

1. Mark Pilgrim, “Dive Into Python 3”, Apress, 2010
2. W. Jason Gilmore, “Beginning PHP and MySQL: From Novice to Professional”, Apress, 2008

Department of Electronics & Communication Engineering

Course code : ECT102
Course title : Electronic Devices & Circuits
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Types of materials, Characteristics of intrinsic and extrinsic semiconductors, Junction diode and its characteristics, Ideal diode and its applications (half-wave and full-wave rectifiers in voltage regulators, positive and negative clippers, positive and negative clampers, digital logic circuits), Non-ideal diode models, Zener diodes and its applications (clipper, voltage regulator), Diode capacitance and switching times, Types of diodes (LED, Varactor diode, Schottky diode, Photodiode).

Bipolar Junction Transistor (BJT types, operation, configurations, characteristics), Cutoff and saturation operations, BJT switching times, Applications to digital logic circuits (DTL, TTL, ECL, RTL), Phototransistor.

Field Effect Transistor (FET types, operation, configurations, characteristics), Metal-Oxide Semiconductor FET (MOSFET types, their logic gate applications), Complimentary MOSFET (CMOS).

BJT biasing and small-signal analysis of BJT amplifiers, FET biasing and small-signal analysis of FET amplifiers, Frequency response (low-frequency and high-frequency responses of amplifiers), Large-signal power amplifiers (class A, class B, class AB).

Feedback (concept of negative and positive feedback, characteristics of negative feedback amplifiers, negative feedback amplifiers topologies, sinusoidal oscillators), Multivibrators (Bistable, Astable and Monostable).

Text book(s)

1. Leonard S. Bobrow, Navneet Gupta, “Foundations of Electrical Engineering”, Oxford University Press, Asian Edition
2. Jacob Millman, Christos C. Halkias, “Integrated Electronics: Analog and Digital Circuits and Systems”, Tata McGraw Hill

Reference book(s)

1. Adel S. Sedra, Kenneth C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Edition
2. Donald A. Neamen, “Microelectronics: Circuit Analysis and Design”, McGraw Hill, 4th Edition
3. Robert Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall, 7th Edition

Department of Electronics & Communication Engineering

Course code : HST102
Course title : Human Values and Effective Communication
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 2 (2-0-0)
Course prerequisite : None

Syllabus

Report Writing

Business correspondence (letters of enquiry, order, complaints and reply). Notices, Agenda, Minutes of meeting

Vocabulary practice

Human Values - Reading from Textbooks and Discussion

Text book(s)

1. A.P.J. Abdul Kalam, "Wings of fire"
2. O. Henry, "After Twenty Years"
3. R.N. Tagore, "Kabuliwallah"
4. James Herriot, "Excerpts from Let Sleeping Vets Lie"
5. Ernest Hemingway, "Old Man at the Bridge"
6. Katherine Mansfield, "The Garden Party"
7. Abraham Lincoln, "The Gettysburg Address"
8. Hugh Prather, "Excerpts from Notes to Myself"

Reference book(s)

1. Jonathan Weyers, Kathleen McMillan, "The Study Skills Book", Pearson, 2012
2. PushpLata, "Communicate to Conquer: A Handbook of Group Discussion and Job Interviews", PHI Learning
3. NiraKonar, "Communication Skills for Professionals", PHI Learning, 2011
4. KavitaTyagi, Padma Mishra, "Advanced Technical Communication", PHI Learning
5. Sanjay Kumar, PushpLata, "Communication Skills", Oxford, 2011

Department of Electronics & Communication Engineering

Course code : HST104
Course title : Health, Safety and Environment
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 1 (1-0-0)
Course prerequisite : None

Syllabus

Introduction to health and toxicity, various hazards to human health, risk assessment, various acts. Noise and vibration Health effects, exposure and radiation effects, machinery and equipment, electricity at work, Fire and Emergency Egress, Personal Protective Equipment, Accidents and Emergencies.

Safety performance – As per Indian and International standards; Hazard analysis: Cost effectiveness in hazard elimination, logical analysis, HAZOP; Probabilistic reliability considerations, Safety management techniques.

Water, Air and land pollution – Classification and properties of pollutants, sources, control, Water, wastewater and health, pesticides and health, Solid Waste Management, Environmental Acts and Laws, current topics in environmental heath, Role of Information Technology in Environment and human health, Social Issues and the Environment.

Text book(s)

1. "Handbook of Occupational Health and Safety", NSC Chicago, 1982
2. "Encyclopedia of Occupational Health and Safety, Vol. I and II", International Labour Organization
3. Benny Joseph, "Environmental Studies", Tata McGraw Hill publication

Reference book(s)

1. Organization, Geneva, 1985
2. J. McCornick, M.S. Sanders, "Human Factors in Engineering and Design", Tata McGraw Hill, 1982
3. "Accident Prevention Manual", NSC Chicago, 1982
4. H.W. Henrich, "Industrial Accident Prevention", McGraw Hill, 1980
5. F.P. Less, "Loss Prevention in Process Industries", Butterworth, New Delhi, 1986

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : MAT102
Course title : Mathematics - II
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Integral Calculus – Improper integrals, Area and length of curves, Surface area and volume of solid of revolution. Multiple integrals, Change of order of integration

Partial Differential Equation – Formulation and classification of PDE; Linear partial differential equation of the first order (Lagrange's method) Non-linear PDE of the first order.Four standard forms, Charpit's method.

Transforms – Fourier series, Laplace Transform and Convergence, Properties of Laplace Transform, Inverse Laplace Transform, Fourier Transform, Inverse Fourier Transform, Discrete Fourier Transform. Z-Transform, Properties of Z-Transform, Inverse Z-Transform, Relationship between Z-Transform, Laplace Transform and Fourier Transform.

Probability and statistics – Sample space and events, Probability, The axioms of probability, Some Elementary theorems, Conditional probability, Baye's theorem, Random variables, Discrete and continuous. Expectation. Binomial, Poisson & normal distributions related properties. Sampling distributions, Sampling distribution of means. Coefficient of correlation, Regression Coefficient, The lines of regression, The rank correlation

Complex Variable – Limit,Continuity and Differentiability of complex function, Analytic functions, Cauchy-Riemann Equations, Necessary and Sufficient condition for analyticity, Properties of Analytic functions, Laplace Equation, Harmonic Functions, Harmonic Conjugate functions and their Engineering Applications Complex Integration: Line Integral(contour integral) and its properties, Cauchy Integral Formula, Liouville Theorem (without proof), Maximum Modulus Theorems(without proof), Applications of Contour Integration - Evaluation of various types of definite real integrals using contour

Text book(s)

1. R.K. Jain, S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa
2. J. Ravichandran, "Probability and Statistics for Engineers", Wiley India, 2010
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference book(s)

1. R.V. Hogg, J.W. McKean, A. Craig, "Introduction to Mathematical Statistics", Pearson Education India, 6th Edition
2. D.W. Jordan, P. Smith, "Mathematical techniques", Oxford
3. N.P. Bali, Manish Goyal, "A text Book of Engineering Mathematics", Laxmi Publications

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP102
Course title : Data Structures and Algorithms Lab
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Basic concept of C programming, Array, Insertion and Deletion, Searching (Sequential and binary), Sorting (Bubble sort, Insertion, Selection, Merge sort, Quick sort, radix sort), Implementation of polynomial and Sparse matrix

Single and double linked lists, Insertion/deletion/searching in linked lists, Implementation of circular lists.

Stack, Queue, Circular queue, Concept of overflow and underflow, Concept of precedence and associativity in expressions, Resolving precedence of operators and association of operands, Evaluation of Expression: Infix, Prefix & Postfix notations, conversion of expression from one form to other form, Recursion: concepts, use and implementation.

Hash tables (open and close) and collision handing technique

Trees, Tree Traversal, constructing Binary tree from Traversal, BST (Binary Search Tree), threaded and unthreaded BST as data structure, Insertion/Deletion/Search in BST, Heap Tree and Heap sort, height balanced tree.

Graphs (directed and undirected), representation of graphs using adjacency matrix and list, Graph Traversals: DFS and BFS, Topological sorting.

Text book(s)

1. Ellis Horowitz, SartajSahni, "Fundamentals of Data Structures", Computer Science Press
2. R.L. Kruse, "Data Structure and Program Design", Prentice-Hall India

Reference book(s)

1. A.V. Aho, J.D. Ullman, J.E. Hopcroft, "Data Structures and algorithms", Addison-Wesley
2. Y. Langsam, M.J. Augenstein, A.M. Tenenbaum, "Data Structures Using C", Prentice-Hall India
3. M.A. Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Addison-Wesley

Department of Electronics & Communication Engineering

Course code : CSP112
Course title : IT Workshop - II
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 2 (0-0-3)
Course prerequisite : None

Syllabus

IT Workshop – II is a unique course at IIIT Kota wherein students get exposure to various skills building activities. Following activities have been offered in past:

Web Development, Beginning HTML and CSS, Creating HTML Content. Photoshop Basics, CSS, Customizing Colors and Fonts, Styling Web Pages and Navigation. Java Script, Adding Pages to a Website, Responsive design, testing, FTP. Debugging HTML/CSS, Mid Term Evaluation, PHP Basics and Functions, Error Handling, SQL Basics. Integrating PHP with Database - Part1, Integrating PHP with Database - Part2. Building Dynamic Website with PHP - Part1, Building Dynamic Website with PHP - Part2. CloudDeployment

Text Book(s)

1. Craig Knuckles, David Yuen, "Web Applications Technologies Concepts and Real World Design", John Wiley, 1st Edition
2. Robert W. Sebesta, "Programming with World Wide Web", Pearson, 6th Edition
3. Daniel Minoli, "Internet & Intranet Engineering", Tata McGraw Hill.

Reference Book(s)

1. Mark Pilgrim, "Dive Into Python 3", Apress, 2010
2. W. Jason Gilmore, "Beginning PHP and MySQL: From Novice to Professional", Apress, 2008

Department of Electronics & Communication Engineering

Course code : ECP102
Course title : Electronic Devices & Circuits Lab
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Basic measurements using lab equipments (DMM, DSO, function generator, power supply). Basic circuit elements (resistor, capacitor, diode, transistor). I-V characteristics of pn junction and zener diodes. Half-wave and full-wave rectifiers using pn junction diode. Positive and negative level clipper and clamper circuits using pn junction diode. Voltage regulator using pn junction diode with resistive plus capacitive loads. Voltage regulator Zener diode with resistive only load. BJT input and output characteristics in CB and CE configurations. FET output and transfer characteristics in CG and CS configurations. Frequency response of BJT amplifier in CB and CE configurations. Frequency response of FET amplifier in CG and CS configurations. RC phase-shift oscillator and Wien bridge oscillator using BJT.

Text book(s)

1. Leonard S. Bobrow, Navneet Gupta, "Foundations of Electrical Engineering", Oxford University Press, Asian Edition
2. Jacob Millman, Christos C. Halkias, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw Hill

Reference book(s)

1. Adel S. Sedra, Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Edition
2. Donald A. Neamen, "Microelectronics: Circuit Analysis and Design", McGraw Hill, 4th Edition
3. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, 7th Edition

Department of Electronics & Communication Engineering

Course code : HSP102
Course title : Soft Skill Development Lab
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Passages reading and summarizing them, rewriting them with incorporation of new words and phrases. The "Why" exercise? Soft skill development - "Let us hear them speak". Presentations on five topics (a picture speaks the thousand words)

Text Book(s)

1. JaishreeMohanraj, "Let Us Hear Them Speak", Sage texts.
2. P.C. Wren, H. Martin, "English Grammar and Composition", S Chand.

Reference Book(s)

1. "BBC Super Test Assignment English"
2. Handouts from the net

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : OTD102
Course title : Independent Project
Year/Semester : I/II
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-1)
Course prerequisite : None

Syllabus

This unique course at IIIT Kota is aimed to allow students to explore their creative dimension by one Independent Project in the first year. This is an unstructured open-ended course where under the overall supervision of course coordinators, batches of students will be attached to different instructors. The basic aim of this course is to arise creative thinking and impart skills among students, and make them work as a team to implement their own constructive and challenging ideas. At end of the course, each team needs to present their idea in the form of a product and submit a project report as a culmination of their endeavor and investigation.

Text Book(s)

Reference Book(s)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST202
Course title : Object Oriented System Design
Year/Semester : II/III
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

C++: Review of Structured programming in C, Structured versus Object-Oriented programming, Object-Oriented paradigm, Objects, Classes, Methods, Constructors and destroying objects in C++

Object-oriented Analysis: Class diagrams and Object Diagrams, File Handling in C++ and JAVA, Friend Functions, Static member functions in C++ and JAVA

C++: Complex Objects and Classes, Inheritance, Multiple Inheritance, Polymorphism and Virtual Functions, RTTI and Casting types, Function and Operator overloading, Conversion Functions

Java: Methods, Constructors and destroying objects , File Handling, Friend Functions, Static member functions, Inheritance and Abstract Classes in JAVA

Packages, Class path, Interfaces in JAVA, GUI and AWT in Java, complex problems in C++ and Java. Data structure implementations in C++ and Java

Text Book(s)

1. Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing,4th Edition
2. Herbert Schildt, "Java 2 - The Complete Reference", McGraw Hill, 5th Edition

Reference Book(s)

1. Paul Deitel, Harvey Deitel, "C++ How to Program", Pearson, 10th Edition
2. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley, 4th Edition
3. Bruce Eckel, "Thinking in Java", Pearson, 4th Edition

Department of Electronics & Communication Engineering

Course code : ECT201
Course title : Microprocessors & Microcontrollers
Year/Semester : II/III
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Microprocessor, Microcontroller, Microcomputer; 8085 Microprocessor Architecture, Pin Description, Bus concept and organization, Multiplexing and Demultiplexing of Buses; Static and Dynamic RAM, ROM, Memory map; Signals and Timings, Classification of Instructions, Instruction Format, Instruction Set, Addressing Modes.

Assembly Language Programming and Debugging – Simple Assembly Programming, Directives used in Assembly Language, Counter and Time delay, Stack organization and implementation, Macros and Subroutines; Debug and Testing of Assembly Language Programs. Interrupts - Types, Applications and Handling; RST, SIM and RIM Instructions and their uses; 8259 Programmable Interrupt Controller.

Interfacing with 8085 Microprocessor – Interfacing of Simple input/output devices (Switches, LEDs); 8255 Programmable Peripheral Interface; 8254 Programmable Interval Timer; 8279 Keyboard/Display Controller; 8251 USART; 8257 DMA Controller; Memory Interfacing. Serial Interface - RS232C and RS422A; Parallel Interface.

Comparative study of 8086 – Architecture, Instructions & Instruction Format, Addressing.

8051 Microcontroller – Introduction of 8051 family; Block diagram description of AT89C51; Internal Architecture - System Clock and Oscillator Circuits, CPU Registers, SFRs, Memory Map, I/O Ports.

Text book(s)

1. Ramesh S. Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”, Penram Publishers
2. Muhammad Ali Mazidi, D. MacKinlay, “The 8051 Microcontroller & Embedded Systems using Assembly and C”, Pearson Education

Reference book(s)

1. Douglas V. Hall, “Microprocessors and Interfacing”, Tata McGraw Hill
2. Kenneth J. Ayala, “The 8051 Microcontroller – Architecture, Programming and Applications”, Penram Publishers
3. John Uffenbeck, “Microcomputers and Microprocessors – The 8080, 8085 and Z80 Programming, Interfacing and Troubleshooting”, Tata McGraw Hill, 3rd Edition

Department of Electronics & Communication Engineering

Course code : ECT203
Course title : Analog Electronics
Year/Semester : II/III
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Op-amp (symbol, equivalent circuit and its analysis, open loop transfer characteristics), Ideal op-amp based basic configurations (inverting amplifier, non-inverting amplifier, voltage follower, summing amplifier using inverting and non-inverting configurations, differential input-differential output amplifier, difference amplifier, bridge amplifier, instrumentation amplifier, I to V converter, V to I converter, integrator, differentiator, inductance simulation), Practical op-amp IC741 based amplifiers (input impedance, output impedance and gain), Practical op-amp IC741 characteristics.

Basic theory of filters, realization of active filters (transfer function synthesis, Sallen-Key filters, multiple feedback filters, switched capacitor filter).

Log and anti-log amplifiers, analog multipliers, precision circuits (half-wave and full wave rectifiers, positive and negative clipper circuits, positive and negative clamper circuits, peak detector circuits), comparator and Schmitt trigger circuits, sample-and-hold circuits.

Sinusoidal oscillators (oscillators based on phase-shift, Wien bridge, Hartley, Colpitt, crystal), Non-sinusoidal oscillators (square and triangular waveform generators), Multivibrators (bistable, astable, monostable), timer IC555, voltage controlled oscillator IC566, phase-locked loop IC565.

Voltage regulator circuits (Zener regulator, emitter follower regulator, feedback voltage regulator, short-circuit protection, foldback current limiting, thermal shutdown), voltage regulator ICs (IC723, ICs 78XX and 79XX).

Text book(s)

1. L.K. Maheshwari, M.M.S. Anand, "Analog Electronics", Prentice Hall India, 1st Edition
2. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits", McGraw Hill, 2nd Edition

Reference book(s)

1. Adel S. Sedra, Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Edition
2. Ramakant Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Education, 4th Edition

Department of Electronics & Communication Engineering

Course code : ECT205
Course title : Signals and Systems
Year/Semester : II/III
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Continuous-time and discrete-time signals, Signal energy and power, Periodic signals, even-odd signals, exponential and sinusoidal signals, Unit impulse and step functions, continuous and discrete time systems, System classifications, System properties.

Convolution integral and convolution sum, properties of LTI systems, LTI systems described by differential and difference equation, response of LTI systems.

Fourier series representation of continuous and discrete time signals, properties, Fourier Transform representation of continuous-time and discrete time signals, properties, system characterization by linear constant coefficient difference equation.

The Laplace Transform, ROC, properties of Laplace-transform, analysis and characterization of LTI systems using Laplace Transform.

The z-transform, ROC and pole-zeroplot, properties of z-transform, analysis and characterization of LTI systems using z-transform. Stability criterion.

Sampling, types of sampling, Analog to digital conversion, Signal reconstruction.

Text book(s)

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems", Prentice Hall India, 2nd Edition
2. B.P.Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998

Reference Book(s)

1. Simon Haykin, Barry Van Veen, "Signal & Systems", John Willey and Sons, 2nd Edition
2. Won Y. Yang, Tae G. Chang, Ik H. Song, Yong S. Cho, Jun Heo, Won G. Jeon, Jeong W. Lee, Jae K. Kim, "Signals and Systems with Matlab", Springer, 2009.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT207
Course title : Control Systems
Year/Semester : II/III
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to concept of measurement, feedback and automatic control; History of Control, Classification of Systems - linear/non-linear, analog/digital, time invariant/time varying, lumped/distributed parameters; Mathematical modelling for electrical, mechanical and electromechanical systems; Block diagram development, closed loop transfer function, Block diagram reduction examples, Signal flow graph - Mason's gain formula

Open loop and closed loop systems; Effect of degenerative feedback on gain, dynamic response, disturbance signals, sensitivity to parameter variations, linearization; Effect of regenerative feedback; Linear approximation of nonlinear systems; Control systems and their components; Various Test signals in time domain, Response and specifications of first-order and second order systems, Effect of adding pole(s) and/or zero(s), Performance evaluation of controller (proportional, proportional plus integral, proportional plus derivative, proportional plus integral plus derivative), Performance indices

The concept of stability and necessary conditions for it, Hurwitz and Routh stability criteria, The root locus concept and its construction, Frequency response techniques - polar and Bode plots, Correlation between time and frequency responses, Nyquist stability criterion, Closed-loop frequency response, sensitivity analysis in frequency domain

Preliminary considerations for classical design, Realization of basic compensators, Cascade compensation in time and frequency domain, Tuning of PID controllers, Feedback compensation, Robust control system design; Concepts of state, state variable and state model; State models for linear continuous-time systems, Solution of state equations, Concept of controllability and observability

Text book(s)

1. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall, 5th Edition
2. I.J. Nagrath, M. Gopal, "Control Systems Engineering", New Age International Publishers, 5thEdition

Reference book(s)

1. Farid Golnaraghi, Benjamin C. Kuo, "Automatic Control Systems", John Wiley & Sons, 9th Edition
2. R.C. Dorf, R.H. Bishop, "Modern Control Systems", Addison Wesley, 11th Edition

Department of Electronics & Communication Engineering

Course code : ECT209
Course title : Communication Systems
Year/Semester : II/III
Branch : CSE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Basic history of electronic communication systems, Types of communication systems, Analog vs. digital communication, Issues and design aspects of communication systems. Emerging communication technologies.

Classification of signals and useful signal operations. concepts of signal-to-noise ratio, Frequency domain representation of signals using Fourier transform, Important properties of Fourier transform, rate of communication, randomness, redundancy, coding, signal transmission through a linear system, Ideal and practical filters, Energy and power of a signal, Energy and power spectral density, Basic concept of data communication.

Principle of modulation, Generation and demodulation of Amplitude modulated signal, DSB-FC, DSB-SC, SSB-SC, VSB-SC signals, channel bandwidth, Carrier acquisition, Super heterodyne AM receiver. Frequency division multiplexing.

Concept of Angle modulation (frequency modulation and phase modulation), FM transmitter and receivers, Interference and bandwidth considerations in angle modulated systems, Comparison of AM and FM.

Sampling theorem - Signal reconstruction and aliasing; Baseband digital modulation - Pulse analog modulation (Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation), Pulse Digital Modulation (Pulse Code Modulation, Delta Modulation); Digital communication system, M-ary communication, Digital carrier systems - Binary signaling scheme (Amplitude Shift Keying, Phase Shift Keying, Frequency Shift Keying); Digital multiplexing techniques.

Text book(s)

1. B.P. Lathi, “Modern Digital & Analog Communications Systems”, Oxford University Press
2. S. Haykin,"Communications System", John Wiley and Sons, 2001

Reference book(s)

1. J. G. Proakis, M. Salehi, "Communication Systems Engineering", Pearson Education, 2002
2. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001
3. Behrouz A. Forouzan "Data communication and Networking", Tata McGraw Hill, 2007

Department of Electronics & Communication Engineering

Course code : MAT201
Course title : Probability and Random Processes
Year/Semester : II/III
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Probability – Probability Definitions and Axioms, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables

Distribution & Density Functions – Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties.

Expectations – Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, law of large numbers, Central Limit Theorem (Proof not expected).

Stochastic Processes – The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process

Discrete-time Markov Chains (DTMCs) – Definition and examples of Markov Chains, Transition probability matrix, Chapman-Kolmogorov equations; n-step transition and limiting probabilities, ergodicity, stationary distribution, random walk and gambler's ruin problem, applications of DTMCs.

Continuous-time Markov Chains (CTMCs) – Kolmogorov differential equations for CTMCs, infinitesimal generator, Poisson and birth-death processes, stochastic Petri net, applications to queueing theory and communication networks

Text book(s)

1. Athanasios Papoulis, S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", Tata McGraw Hill, 4th Edition
2. Pradip Kumar Gosh, "Theory of Probability and Stochastic Processes", University Press

Reference book(s)

1. Henry Stark, John W. Woods, "Probability and Random Processes with Application to Signal Processing", Pearson Education, 3rd Edition
2. George R. Cooper, Clave D. McGillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd Edition
3. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 1997

Department of Electronics & Communication Engineering

Course code : CSP203
Course title : Object Oriented System Design Lab
Year/Semester : II/III
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Aspect-oriented programming, Dynamic programming, Functional programming, Logic programming, Object-oriented programming, Parallel computing, Event Driven programming. Abstraction, Polymorphism, Inheritance, Classes, Objects, Methods. Constructor, Destructor. Overloading (function and operator), references, friend function, overriding, virtual function, virtual classes, templates, Namespace, Nested and inner classes, Exception handling, Run time type casting, STL (List, Map, Algorithm).

Java Byte code and virtual machine, data types, operators, arrays, objects, constructors, returning and passing objects as parameter, Garbage collection, String Handling, String constructors, special string operations, character extraction searching and comparing strings, Nested Classes, Inheritance, Abstract classes and methods, Using final with inheritance, overloading and overriding methods, Single and Multilevel inheritance, Extended Classes, Access Control, Usage of super. Polymorphism, Package and interfaces, Exception handling with try-throw-catch-finally constructs, String Buffer class, Object class, Cloning Objects, Wrapper Classes, Enumeration Interface, Serialization-Deserialization, Synchronization, Input-Output Streams.

Text Book(s)

1. Bjarne Stroustrup, “The C++ Programming Language”, Addison Wesley, 4th Edition
2. Robert Lafore, “Object-Oriented Programming in C++”, Sams Publishing, 4th Edition
3. Paul Deitel, Harvey Deitel, “Java How to Program”, Pearson, 10th Edition

Reference Book(s)

1. E. Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill, 4th Edition
2. Steve Oualline, “Practical C++ Programming”, O'Reilly, 2003
3. Herbert Schildt, “Java The Complete Reference”, McGraw Hill, 8th Edition

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP211
Course title : IT Workshop - III
Year/Semester : II/III
Branch : CSE, ECE
Course credit (L-T-P) : 2 (0-0-3)
Course prerequisite : None

Syllabus

IT Workshop is a unique course at IIIT Kota wherein students get exposure to various skills building activities. Following activities have been offered in the past:

Python programming: Lab overview, Running The Code. Python Objects, Numbers, Strings, iPython (Jupyter). Tuple, List and Dictionaries, Looping, Control Flow. Doc string, Functions, exception handling, list comprehensions. File handling and libraries/modules. Recursion, Data Exchange Mechanism, PIL (library), REST APIS, Lambda. Object Oriented Programming. Modules, Packages, and Imports. Map, Reduce, Filter, Zip, Enumrate, all(), any(). Python Decorators, Python Generators, Iteration vs Generation. Advanced Python Modules. Collections Module - counter, defaultdict, OrderedDict, namedtuple, Datetime. Python Debugger - pdb, Regular Expressions –re. Introduction to GUIs, Interact, Widget Basics, Widget Events, Widget List, Widget Styling. Capstone Project.

Text Book(s)

Reference Book(s)

Department of Electronics & Communication Engineering

Course code : ECP201
Course title : Microprocessors and Microcontrollers Lab
Year/Semester : II/III
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Data transfer operations using 8085 (Immediate, Direct, Indirect and Register addressing). Flag operations using 8085. Arithmetic and Logical Operations using 8085 (8-bit Addition and Subtraction, One's Complement, Mask Off Most Significant Four Bits, Set Bits, Logical Operations, Packed to Unpacked). Branch Instructions using 8085 (8-bit Multiplication, 8-bit By 8-bit Division, 24-bit Multiprecision Addition, Sum of N elements). Code Conversionusing 8085 (ASCII to Decimal Conversion, BCD to Hex Conversion, Hex to Decimal Conversion, Hex to Binary Form). Array Operation using 8085 (Biggest Number in an Array; Arrange in Descending Order, Number of Zero, Positive and Negative Numbers; Square of a Number). Interfacing peripherals 8255 and 8254 using 8085. Programming with 8086. Programming with 8051.

Text book(s)

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", Penram Publishers
2. Muhammad Ali Mazidi, D. MacKinlay, "The 8051 Microcontroller & Embedded Systems using Assembly and C", Pearson Education

Reference book(s)

1. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill
2. Kenneth J. Ayala, "The 8051 Microcontroller – Architecture, Programming and Applications", Penram Publishers
3. John Uffenbeck, "Microcomputers and Microprocessors – The 8080, 8085 and Z80 Programming, Interfacing and Troubleshooting", Tata McGraw Hill, 3rd Edition

Department of Electronics & Communication Engineering

Course code : ECP203
Course title : Analog Electronics Lab
Year/Semester : II/III
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Inverting amplifier, non-inverting amplifier and voltage follower using op-amp IC741. Adder, subtractor, integrator and differentiator using op-amp IC741. Performance of instrumentation amplifier using op-amp IC741. Second-order active Butterworth filters (low-pass, high-pass, band-pass, band-stop) using Sallen-Key circuit approach based on op-amp IC741. Various precision circuits using op-amp IC741 (half-wave rectifier, full-wave rectifier, positive and negative clippers, positive and negative clampers, peak detector). Zero-crossing detector and Schmitt trigger circuits using op-amp IC741. RC phase-shift and Wien-bridge oscillators using op-amp IC741. Square and triangular waveform generators using op-amp IC741. Monostable and astablemultivibrators operation using timer IC555. Operation of voltage regulator IC723 and IC78XX

Text book(s)

1. L.K. Maheshwari, M.M.S. Anand, "Analog Electronics", Prentice Hall India, 1st Edition
2. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits", McGraw Hill, 2nd Edition

Reference book(s)

1. Adel S. Sedra, Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Edition
2. Ramakant Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Education, 4th Edition

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST204
Course title : Computer Architecture and Organization
Year/Semester : II/IV
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction – Instruction Set Architecture, Von Neumann and Harvard Architecture; RISC versus CISC; Flynn's Classification, System Design Issues - Structure versus behavior, Design Levels: Gate, Register and Processor.

Computer Organization & Design – Basic CPU Organization – General purpose Registers Organization; Stack Organization; Bit-sliced CPU; Accumulator-based CPU Data Representation - Basic Data-type formats; Storage order: Big-endian and Little-endian Instruction Formats - RISC and CISC type; Instruction Types; Instruction Cycle and Machine Cycle. Addressing Modes

Computer Arithmetic – Fixed-Point Arithmetic - Addition and Subtraction of Signed Numbers, Two's Complement 8-bit Adder and Subtractor, Carry Look-Ahead Adder, Ripple-Carry Adder; Multiplication - Shift & Add Multiplier, Two's Complement Multiplier, Array Multiplier, Booth Multiplier; Division - Restoring & Non-Restoring Division, Floating Point Arithmetic - Addition, Subtraction and Multiplication for IEEE 754 standard, Arithmetic-Logic Units - Combinational ALUs and Sequential ALUs (basic concepts)

Processor Design – Logic Design Conventions, Data Path Construction, Hardwired Control versus microprogrammed control, single cycle implementation, multi-cycle implementation, performance enhancement using pipelining, arithmetic and instruction pipelining, pipeline hazards. Pipelining - Instruction & Arithmetic Pipeline, Concept, Structure and Space-time diagram

Memory Organization – Memory Characteristics - Basic Concept, Types, Access modes, 1-D and 2-D Organization; Semiconductor RAM & ROM Memories - Types, Design and Interfacing; Multi-level Hierarchy; Random Access Memory Cache Memories - Features (Cache-coherence), Types, Design issues, Organization, Operation (Read/Write), Address Mapping, Performance issues and Replacement Policies, Communication Methods – Intrasystem versus Intersystem; Buses - Local Bus, Shared Bus, Interconnection Structures; Bus Control - Features and Data Transfers (Synchronous versus Asynchronous), Bus interfacing and Bus Arbitration, I/O Control Methods - Programmed I/O, Interrupt Driven I/O and I/O Processors with an example.

Text book(s)

1. D.A. Patterson, J.L. Hennessy, "Computer Organization and Design", Elsevier, 5th Edition
2. John P. Hayes, "Computer Architecture and Organization", McGraw Hill, 5th Edition

Reference book(s)

1. William Stalling, "Computer Organization and Architecture", Prentice Hall India
2. C. Hamacher, Z. Vranesic, S. Zaky, "Computer Organization", McGraw Hill, 5th Edition
3. A.S. Tanenbaum, "Structured Computer Organization", Prentice Hall India, 4th Edition
4. P. Pal Chaudhuri, "Computer Organization and Design', Prentice Hall India, 3rd Edition

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT202
Course title : Analog Communication
Year/Semester : II/IV
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction of Communication, Concept of Bandwidth, Review of Random Signals, Basic Mechanism & Application of Modulation, Elements of communication - point to point and broadcast. Wired and wireless Communication

Amplitude Modulation – AM Modulation and Demodulation Implementation, Hilbert Transformation, Variations of AM (DSB, SSB, VSB), Frequency Division Multiplexing, Time & Frequency Domain Analysis, Applications, Implementation

Frequency Modulation –Time Domain & Frequency Domain analysis leading to spectrum, Modulation & Demodulation Implementation, FM System Examples

Radio Communication – Transmitters and Homo/Hetero/Superhetrodyne Receivers, Mixer Theory & Implementation, Concept of Intermediate Frequency (Direct Detection, Double IF)
Phase Locked Loop – Analysis, Circuits & Applications - FM Demodulation; Concept of Synchronization in Communication Systems with PLL

Sampling Theory – Time & Frequency Domain Analysis; Sampling Theorem; Samplers, Filtering, Signal Recovery, Low-Pass & Band-Pass sampling

Pulse Modulation Systems (Discrete Analog Modulation) – Pulse Modulation analysis (Time Domain & Frequency Domain), Modulation & Demodulation (PAM, PPM, PWM), Time Division Multiplexing

Performance of Modulation Systems in Presence of Noise – Bandpass Noise, Linear Continuous Wave Modulation with Noise, Exponential CW Modulation with Noise, Analog Pulse Modulation with Noise

Text book(s)

1. S. Haykin,"Communication Systems", John Wiley and Sons, 2001
2. B.P. Lathi, “Modern Digital & Analog Communications Systems”, Oxford University Press

Reference book(s)

1. J. G. Proakis, M. Salehi, "Communication Systems Engineering", Pearson Education, 2002
2. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001
3. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw Hill, 2007

Department of Electronics & Communication Engineering

Course code : ECT204
Course title : Measurement and Instrumentation Technology
Year/Semester : II/IV
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Definition of measurement, types of application of instruments, Functional elements of generalized measurement system, Active/Passive transducers, Analog/Digital mode of operation, Null and Deflection methods. Input output configuration of measurement system, Methods of correction of modifying and interfering inputs. Calibration, Precision, Accuracy, Threshold, Resolution, Hysteresis, Linearity, Sensitivity, Drift, Span, Range, Normal distribution curve, Probable error. Types of excitation inputs; step, ramp and frequency response of First and Second order systems.

Resistive potentiometer, strain gauges, LVDT, Synchros, Variable reluctance, eddy current, Capacitance pick-ups, Piezoelectric & Hall effect transducers, Photoemissive, Photoconductive, Photovolatic, Phototransistor, Methods and applications of fiber optics

Bridge circuits, Op-amps, Instrumentation amplifiers, Chopper amplifier, Carrier amplifiers, Isolation amplifier, Charge amplifier, Analog Filters, Digital Filters, Amplitude modulation/demodulation, Different types of A/D and D/A converters

Measuring translational and rotational velocity (Moving coil moving magnet pickups, Eddy-current magnetic and photoelectric pulse counting, encoders); Force, Torque, shaft power measurement (Bourdon tube, Bellows, Diaphragm, Strain gages, Torsion bar, Dynamometers); Seismic and acoustic measurements (Seismic displacement, velocity and acceleration pickups, sound measurement); High and low pressure measurement (Dead weight gages, manometers, elastic elements, Bridgman, Mcleod, Thermal conductivity, Ionization Gauge); Flow measurement (Obstruction meters, Rotameters, Pitot static tube, Turbine meters, electromagnetic flow meters, ultrasonic flow meters, vortex shedding, laser Doppler velocity meter, Hot wire anemometer, mass flow meter, positive displacement meter); Temperature measurement (Bimetallic, Liquid in glass, pressure thermometer, Thermocouples, RTDs, Thermistors, Semiconductor sensors, Radiation detectors, Radiation thermometers); Level measurement (Direct and indirect methods, ultrasonic, radar, microwave); Viscosity, density pH, humidity measurement

Components of DAS (Data Loggers, elements of DAS)

Text Book(s)

1. E.O. Doeblin, D.Manik, “Measurement Systems: Application and Design”, McGraw-Hill
2. A.K. Sawhney, “Electrical & Electronics Measurement and Instrumentation”, Dhanpat Rai & Co

Reference Book(s)

1. D.V.S. Murthy, “Transducers and Instrumentation”, PHI, 1st Edition
2. B.E. Jones, “Instrumentation, Measurement and Feedback”, Tata McGraw Hill, 1978
3. R.S. Figliola, D.E. Beasley, “Theory and Design for Mechanical Measurements”, John Wiley & Sons

Department of Electronics & Communication Engineering

Course code : ECT206
Course title : Electromagnetic Theory
Year/Semester : II/IV
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Electrostatics – Vector Calculus, Coulomb's Law, Electric Field and Force, Electric Potential, Superposition Principle, Conservative Field, Electric-Dipole and its field, Gauss Law and Divergence Theorem, Electrostatic Potential, Laplace and Poisson's Equation, Energy in the Field, Field near charged conductor, Capacitance, capacitance of common two-plate capacitors, including two-wire capacitor, Dielectrics, dielectric boundary conditions. Solution of Laplace's Equation and Poisson's Equation in 1-D, uniqueness theorem. Capacitance calculations with multiple dielectrics. Isotropic dielectrics, Boundary conditions at dielectric surfaces. E and P relationship.

Magnetostatics – Lorentz Force, charged particle motion in E and B field. Force due to a Magnetic field, Force due to combined Electric and Magnetic fields, Biot-Savart Law, Magnetic Vector Potential, calculation of Magnetic Field for simple coil configurations. Ampere's Law, Magnetic flux, Stokes theorem, Magnetic materials, magnetic boundary conditions, Inductance calculations for common geometries, Force on a dipole.

Time-Varying Fields – EMF, EM induction, Faradays law for circuit, self-inductance. Equation of continuity, The Displacement current. Maxwell's Equation, The wave equation in 1-Dimension, Solution of the wave equation. Plane waves, Wave propagation in vacuum and lossy dielectrics, Skin depth and frequency dependence of lumped elements, Energy transport by waves. The Poynting vector, Characteristic Impedance, Reflection at boundaries. Normal incidence formula. Guided Waves.

Text book(s)

1. William H. Hayt Jr., "Engineering Electromagnetics", Tata McGraw Hill, 5th Edition
2. R. Plonsey, R.E. Collin, "Principles and Applications of Electromagnetic Fields", McGraw Hill, 1961

Reference Book(s)

1. Julius Adams Stratton, "Electromagnetic Theory", IEEE Press, 2007
2. Tai L. Chow, "Introduction to Electromagnetic Theory: A Modern Perspective", Jones and Bartlett Publishers, 2006

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : HST202
Course title : Technical Writing and Professional Communication
Year/Semester : II/IV
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction – Technical Communication skills, Reading, Listening, Writing, and Speaking. Improving these with comprehension, Punctuation, Use of Modals

Paragraph Writing, Expansion, Abstract and Specific words, avoiding Jargon and Cliches

Technical Note taking, Mechanics & Note-taking Techniques

Technical description of Engineering Objects/Products/Processes, Manual writing, Slogan Writing Speech Advertising

Vocabulary Building: Prefixes, Suffixes, One word Substitutions, root words, commonly used foreign words and phrases

Text book(s)

1. Sharon J. Gerson, Steven M. Gerson, "Technical Writing Process and Product", Pearson Education, 8th Edition
2. Raymond Murphy, "Essential English Grammar", Cambridge University Press

Reference book(s)

1. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill, 2012
2. Norman Lewis, "Word Power Made Easy" Goyal Saab, Latest Version
3. Lynne Truss, "Eats Shoots and Leaves"

Department of Electronics & Communication Engineering

Course code : MAT202
Course title : Information Theory and Coding
Year/Semester : II/IV
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Information and Entropy – Mathematical foundation of information theory in communication systems. Measures of Information – self information, Shannon's theory, joint and conditional entropies, mutual information and their properties

Discrete Memoryless Channels and Source coding – Classification of channels, Calculation of channel capacity, Unique decipherable codes, Condition of instantaneous codes, Average code word length, Kraft inequality. Shannon's noiseless coding theorem. Construction of codes – Shannon Fano, Shannon Binary and Huffman codes. Higher extension codes. Decoding scheme – the ideal observer decision scheme.

Channel Coding and Error Correcting Codes – Minimum distance principles. Relation between distance and error correcting properties of codes, The Hamming bound. Construction of Linear block codes, Parity check coding and syndrome decoding.

Text book(s)

1. Robert G. Gallager, "Information Theory and Reliable Communication", Springer-Verlag Wien GMBH.

Reference book(s)

1. Robert B. Ash, "Information Theory", Dover Publications Inc.
2. Fazlollah M. Reza, "An Introduction to Information Theory", Dover Publications Inc.
3. W. Wesley Peterson, E.J. Weldon Jr., "Error Correcting Codes", 2nd edition, The Massachusetts Institute of Technology.
4. Robert J. McEliece, "The Theory of Information and Coding", Cambridge University Press

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP204
Course title : Computer Architecture and Organization Lab
Year/Semester : II/IV
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Write a Verilog/VHDL code for Arithmetic circuits (Half Adder, Full Adder). Write a Verilog/VHDL code for Arithmetic circuits (Half Subtractor, Full Subtractor, ADD-SUB). Write a Verilog/VHDL code for Carry Look-Ahead Adder, Ripple-Carry Adder and realize that which one is better in terms of area, power and timing. Write a Verilog/VHDL code for 4:1 mux (Behavioral, Structural (using 2:1), dataflow), decoder, demux, encoder. Write a Verilog/VHDL code and compare 4x4 Array Multiplier and Booth Multiplier. Implement Vedic multiplier and compare its statistics area, power and timing with Booth Multiplier. Design a simple 4-bit ALU (ALU contain comparator, addition, subtraction and multiplication). Simulate and synthesis Barrel Shifter, investigate the applications of barrel shifter. Design a simple bus. Realize and explore a simple cache simulator and define the design policies. Realize a simple pipelining in any circuit. Explore a Computer Architecture simulator (eg. Gem5).

Text book(s)

1. D.A. Patterson, J.L. Hennessy, "Computer Organization and Design", Elsevier, 5th Edition
2. John P. Hayes, "Computer Architecture and Organization", McGraw Hill, 5th Edition

Reference book(s)

1. William Stalling, "Computer Organization and Architecture", Prentice Hall India
2. C. Hamacher, Z. Vranesic, S. Zaky, "Computer Organization", McGraw Hill, 5th Edition
3. A.S. Tanenbaum, "Structured Computer Organization", Prentice Hall India, 4th Edition
4. P. Pal Chaudhuri, "Computer Organization and Design', Prentice Hall India, 3rd Edition

Department of Electronics & Communication Engineering

Course code : ECP202
Course title : Analog Communication Lab
Year/Semester : II/IV
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Amplitude modulation and demodulation. Diode detector characteristics. DSB-SC modulation and demodulation. SSB modulation. Frequency modulation and demodulation. Pre-emphasis and de-emphasis. Mixer circuit. Automatic Gain control circuit. Sampling theorem verification. Pulse amplitude modulation and de-modulation. Pulse-width modulation and demodulation. Pulse position modulation.

Text book(s)

1. S. Haykin,"Communication Systems", John Wiley and Sons, 2001
2. B.P. Lathi, “Modern Digital & Analog Communications Systems”, Oxford University Press

Reference book(s)

1. J. G. Proakis, M. Salehi, "Communication Systems Engineering", Pearson Education, 2002
2. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001
3. Behrouz A. Forouzan "Data communication and Networking", Tata McGraw Hill, 2007

Department of Electronics & Communication Engineering

Course code : ECP204
Course title : Measurement and Instrumentation Technology Lab
Year/Semester : II/IV
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Getting familiar with LabVIEW (Loops, Case Structures, and Timing, Arrays, Clusters, Type Definitions, File I/O, etc). Data Acquisition with ELVIS, myDAQ and myRIO. Characterization of devices and sensors (Discrete LED, Pushbutton Switch, DIP Switches, Relay, Potentiometer, Thermistor, Photocell, Electret Microphone, Buzzer/Speaker, Motor, Rotary Encoder, Photointerrupter, Hall-Effect Sensor, Piezoelectric-Effect Sensor, Servo, H-Bridge and Geared Motor, IR Range Finder, Sonic Range Finder, Accelerometer, Gyroscope, Compass, Ambient Light Sensor, RTD, Thermocouple, etc) using ELVIS, myDAQ and myRIO. Design a weight measurement system using load cell, ELVIS, myDAQ and myRIO. Design a temperature measurement system using thermocouple, resistance temperature detector, ELVIS, myDAQ and myRIO. QNET Mechatronic Sensors (Strain Gage, Pressure Sensor, Piezo Sensor, Potentiometer, Infrared, Sonar, Optical Position, Magnetic Field, Encoder, Temperature Sensor, Switches and LEDs, Switch Debounce Analysis) trainer with ELVIS. Design and performance evaluation of closed-loop control system using LabVIEW

Text Book(s)

1. E.O. Doeblin, D. Manik, "Measurement Systems: Application and Design", McGraw-Hill
2. A.K. Sawhney, "Electrical & Electronics Measurement and Instrumentation", Dhanpat Rai & Co

Reference Book(s)

1. D.V.S. Murthy, "Transducers and Instrumentation", PHI, 1st Edition
2. B.E. Jones, "Instrumentation, Measurement and Feedback", Tata McGraw Hill, 1978
3. R.S. Figliola, D.E. Beasley, "Theory and Design for Mechanical Measurements", John Wiley & Sons

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : HSP202
Course title : Professional Communication Lab
Year/Semester : II/IV
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Introduction to phonetics – IPA symbols of "received pronunciation", received and accepted pronunciation. Phonetic transcription using IPA symbols. IPA transcription of words often mispronounced. Reading and listening skills. Extempore – Public speaking. Information transfer – Professional presentation and effecting delivery using power-point. Debate skills. Group discussions. Vocabulary building – Words list. General manners and etiquettes.

Text book(s)

Reference book(s)

1. Norman Lewis, "Words Power Made Easy", Anchor Books
2. Nitin Bhatnagar, Mamta Bhatnagar, "Professional Communication for Engineers", Pearson Education
3. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill

Department of Electronics & Communication Engineering

Course code : ECT301
Course title : Digital Signal Processing
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction – DSP Applications, Concepts of Frequency and Filtering, Commonly used signals in DSP, characterization of LTI systems. Review of Z-transform – Z-transform, Concepts of zeros and poles of a system, region of convergence (ROC) of Z-transform; Inverse Z-transform and Properties of Z- transform

Frequency Domain Representation of Signals – Concept of spectrum, Sampling theorem - decimation and interpolation of discrete signals, Frequency representation of discrete time signals - Discrete time Fourier transform (DTFT), Discrete Fourier transform (DFT), Fast Fourier transform (Decimation in Time and Decimation in Frequency), Concepts of circular shift and convolution, Filtering of long data sequence

Linear Time Invariant (LTI) Systems in Transform Domain – Concept of filtering revisited (lowpass, bandpass and highpass filters), Transfer function and the frequency response of a system, Types of transfer functions - FIR filters, ideal filters, linear phase filters, zero locations of linear phase FIR filters; IIR filters, pole and zero locations of IIR filters, all pass filters, comb filters, stability issues for IIR filters. Filter Structures – IIR system (direct, cascade and parallel form, Transposed form), FIR system (direct and cascade form, and structure for linear phase FIR systems)

Filter Design Techniques – Digital filter specifications, selection of filter type, and filter order; FIR filter design using windowing Techniques; FIR filter design using frequency sampling method; IIR filter design using Impulse Invariance; IIR filter design using bilinear transformation; Spectral transformations for designing a filter with new characteristics based on a previously designed filter; Finite precision (Quantization and round-off error, Finite word length effects in digital filter). Adaptive Filters – Applications of Adaptive Filters, Adaptive Direct Form FIR Filters (LMS algorithm), Adaptive Direct Form Filters (RLS algorithm)

Random Signal Analysis & Spectral Estimation – Auto-correlation and cross-correlation with examples, power spectral density and Spectral estimation. Introduction to Digital Signal Processors

Text Book(s)

1. John G. Proakis, Dmitris G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Pearson, 4th Edition
2. Sanjit K. Mitra, “Digital Signal Processing: A Computer-Based Approach”, McGraw Hill, 4th Edition

Reference Book(s)

1. Shlomo Engelberg, “Digital Signal Processing: An Experimental Approach”, Springer, 2008
2. Dag Stanneby, Willian Walker, “Digital Signal Processing and Applications”, Elsevier, 2nd Edition

Department of Electronics & Communication Engineering

Course code : ECT303
Course title : Digital Communication
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Digital Signals and Systems – Overview of Digital Communication Systems (DCS) - Merits and Demerits of the same; Digital PAM Signals - Signaling rate and Data Rate; Line codes (Unipolar, Polar, Bipolar, Manchester, CHDB-n, 4B3T, Top-hat); Power Spectra of Digital PAM, Transmission Limitations (Inter Symbol Interference, Eye Pattern Regenerators); Noise and Errors – M-ary Error Probabilities (Binary Error Probabilities); Matched Filtering - Optimum Terminal filters, Equalization; Comparison of Analogue and Digital Communications

Analog to digital Conversion –Conversion Quantization (Uniform and Non-uniform); Quantization Noise; Pulse Code Modulation - PCM generation and reconstruction, Mu and A law, Bandwidth considerations; Differential PCM; Delta Modulation; Adaptive Delta Modulation; Digital Multiplexing - Multiplexing and Hierarchies (North American and CCITT); Synchronization Techniques - Bit and Frame synchronization; Comparison between Waveform and Parameter Coding Digitization for GSM mobiles

Digital Modulation Techniques Bandpass Transmission – Binary Modulation (ASK, PSK, FSK, MSK, and their Spectral Analysis); Coherent Demodulation (Optimum Binary Detection; Coherent OOK, PSK, FSK; M-ary Systems, QAM; M-ary PSK, ASK Systems); Comparison of digital modulation systems; Introduction to information theory

Error Control and Coding – Error Detection and Correction (Parity check code, Repetition Code vectors, Hamming distance, FEC systems, ARQ systems, Block codes - Hamming Codes and Cyclic Codes Convolutional Codes)

Bandpass Digital Transmission – Coherent Binary, Noncoherent Binary, Quadrature Carrier and M-ary Systems. Spread Spectrum Techniques – DSS, FHSS, Coding, Synchronization

Text book(s)

1. S. Haykin,"Communication Systems", John Wiley and Sons, 2001
2. S. Haykin,"An Introduction to Analog and Digital Communications", John Wiley and Sons, 2009

Reference book(s)

1. B.P. Lathi, “Modern Digital & Analog Communications Systems”, Oxford University Press
2. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001

Department of Electronics & Communication Engineering

Course code : ECT305
Course title : VLSI Design
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Fabrication of MOSFETs: Fabrication Process Flow: Basic Steps, The CMOS n-Well Process, Layout Design Rules, Full-Custom Mask Layout Design

MOS transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias Structure and Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances

MOS inverters: Static characteristics, Resistive-Load Inverter, Inverters with n-Type MOSFET Load, CMOS Inverter

MOS inverters: Switching characteristics and interconnect effects: Delay-Time Definitions, Calculation of Delay Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters

Combinational MOS logic circuit: Introduction, MOS Logic Circuits with Depletion n-MOS Loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Transmission Gates (Pass Gates).

Sequential MOS logic circuits: Introduction, Behavior of Bistable Elements, The SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop. Semiconductor memory: Static and Dynamic memory realization.

Text Book(s)

1. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", McGraw-Hill, 2nd Edition, 1999.
2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits - A Design Perspective", Pearson education, 2nd Edition.

Reference Book(s)

1. Neil H.E. Weste, Kamran Eshraghian, "Principles of CMOS VLSI Design: A Systems Perspective", Pearson Education, 2nd Edition.
2. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 1st Edition.
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2001
4. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design", Prentice-Hall, 3rd Edition

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT307
Course title : Transmission Lines and Antennas
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to EM waves and various techniques of communication, The decibel and neper, Current and voltage calculation for symmetrical networks and their characteristic impedance and properties of symmetrical network. Propagation Constant. Filter Fundamentals Pass Band, Stop Bands of Low Pass of different filters. Characteristic impedance of symmetrical networks. Characteristic Impedance of Transmission Line and Reflection Coefficient, Impedance Transformation. Loss less and Low loss transmission Line VSWR, Power transfer on Transmission Line, Smith Chart, Admittance Smith Chart.

Experimental set up of Transmission Line Measurements, Application of Transmission Lines, Impedance matching, Lossy transmission Line, Problems of Transmission Line, Types of Transmission Line, Maxwell's equation and Boundary conditions at media interface. Uniform plane wave and its Propagation. Wave polarization, Pioncere's Sphere, Wave propagation in conducting medium, Wave propagation and phase velocity, Power flow and Poynting vector, Surface current and Power loss in a conductor. Plane wave in arbitrary direction, Plane wave at dielectric interface

Antenna Introduction. Solution for Potential Function, Radiation from Hertz dipole, Power radiated by Hertz dipole.The linear Antenna, Radiation parameters of antennas, Receiving Antenna, Monopole and Dipole Antenna.Fourier Transform relation between current and radiation pattern, Antenna Array, Uniform linear array, Synthesis of Array, Binomial Array and general Array Synthesis, Radiation characteristics.

Text book(s)

1. John D. Ryder, "Networks, Lines and Fields", Prentice Hall India
2. John D Krauss, "Antennas", McGraw Hill
3. Constantine A. Balanis, "Antenna Theory Analysis and Design", Wiley
4. Robert E. Collin, "Field Theory of Guided Waves", IEEE Press

Reference Book(s)

1. Yi Huang, Kevine Boyle, "Antennas: From Theory to Practice", John Wiley, 2008
2. Frank Olyslager, "Electromagnetic Waveguides and Transmission Lines", Oxford Science Publications, 1999

Department of Electronics & Communication Engineering

Course code : ECP301
Course title : Digital Signal Processing Lab
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Represent basic signals Unit Impulse, Ramp, Unit Step, Exponential, Discrete sine and cosine signals with given sampling frequency. Represent complex exponential as a function of real and imaginary part, and impulse and step response of two vectors using MATLAB. Convolution between two vectors using MATLAB without using conv function, and cross correlation between two vectors using MATLAB. Compute DFT and IDFT of a given sequence using MATLAB. Linear convolution of two sequence using DFT using MATLAB. Compute z-transform from the given transfer function and its ROC using MATLAB. Compute rational z-transform from the given poles and zeros using MATLAB. Compute partial fraction expansion of rational z-transform using MATLAB. Design a Type - 1 Chebyshev IIR highpass filter using MATLAB. Design an IIR Elliptic low pass filter using MATLAB, and an IIR Butterworth bandpass filter using MATLAB. Generate rectangular, Hamming, Hanning, Blackman and Kaiser window using MATLAB. Design low pass filter using the Kaiser window using MATLAB. Determine coefficient quantization effects on the frequency response of a cascade form IIR filter using MATLAB.

Text Book(s)

1. John G. Proakis, Dmitris G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson, 4th Edition
2. Sanjit K. Mitra, "Digital Signal Processing: A Computer-Based Approach", McGraw Hill, 4th Edition

Reference Book(s)

1. Shlomo Engelberg, "Digital Signal Processing: An Experimental Approach", Springer, 2008
2. Dag Stanneby, Willian Walker, "Digital Signal Processing and Applications", Elsevier, 2nd Edition

Department of Electronics & Communication Engineering

Course code : ECP303
Course title : Digital Communication Lab
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Sampling Theorem verification. Pulse code modulation. Delta Modulation. Amplitude shift keying, Frequency Shift Keying. Phase Shift Keying, Differential Phase shift keying. Quadrature Phase shift keying,8-phase shift keying. 8-Quadrature Amplitude modulation. 16-QAM. 32-QAM. 64-QAM. Mini project.

Text book(s)

1. S. Haykin,"Communication Systems", John Wiley and Sons, 2001
2. S. Haykin,"An Introduction to Analog and Digital Communications", John Wiley and Sons, 2009

Reference book(s)

1. B.P. Lathi, “Modern Digital & Analog Communications Systems”, Oxford University Press
2. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001

Department of Electronics & Communication Engineering

Course code : ECP305
Course title : VLSI Design Lab
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Write VHDL code for Arithmetic circuits (Half Adder, Full Adder, Half Subtractor, Full Subtractor, ADD-SUB) and analyze the result. Write VHDL code for Carry Look-Ahead Adder, Ripple-Carry Adder, compare which one is better in terms of area, power and timing, and analyze the result. Write a VHDL code for 4:1 mux (Behavioral, Structural (using 2:1), dataflow), decoder, demux, encoder, and analyze the result. Write VHDL code and compare 4x4 Array Multiplier and Booth Multiplier, and analyze the result. Implement Vedic multiplier and compare its statistics area, power and timing with Booth Multiplier, and analyze the result. Design a simple 4-bit ALU (ALU contain comparator, addition, subtraction and multiplication) and analyze the result. Basic MOS models, SPICE models and frequency dependent parameters. Basic NMOS/CMOS gain stage, cascade and cascode circuits, frequency response, stabilty and noise issues in amplifiers. CMOS analog blocks (Current Sources and Voltage references). Differential amplifier and OPAMP design. Frequency Synthesizers and Phased lock-loop. Non-linear analog blocks (Comparators, Charge-pump circuits and Multipliers). Data converters. Analog interconnects. Analog testing and layout issues. Low-voltage and low-power circuits. Introduction to RF electronics. Basic concepts in RF design.

Text Book(s)

1. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", McGraw-Hill, 2nd Edition, 1999.
2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits - A Design Perspective", Pearson education, 2nd Edition.

Reference Book(s)

1. Neil H.E. Weste, Kamran Eshraghian, "Principles of CMOS VLSI Design: A Systems Perspective", Pearson Education, 2nd Edition.
2. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 1st Edition.
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2001
4. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design", Prentice-Hall, 3rd Edition

Department of Electronics & Communication Engineering

Course code : ECP307
Course title : Transmission Lines and Antennas Lab
Year/Semester : III/V
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Microwave bench, amp, waveguide components. Measurement of Klystron source frequency using frequency meter and validate this frequency with slotted line section. Determine the standing wave ratio and reflection coefficient. Impedance measurement of unknown load using Microwave Bench. Measurement of Gain and Polar pattern of Horn antenna. I-V characteristic of Gunn Diode. Directional Coupler. Isolator and Circulators. E Plane, H Plane, Magic Tee.

Text book(s)

1. John D. Ryder, "Networks, Lines and Fields", Prentice Hall India
2. John D Krauss, "Antennas", McGraw Hill
3. Constantine A. Balanis, "Antenna Theory Analysis and Design", Wiley
4. Robert E. Collin, "Field Theory of Guided Waves", IEEE Press

Reference Book(s)

1. Yi Huang, Kevine Boyle, "Antennas: From Theory to Practice", John Wiley, 2008
2. Frank Olyslager, "Electromagnetic Waveguides and Transmission Lines", Oxford Science Publications, 1999

Department of Electronics & Communication Engineering

Course code : ECT302
Course title : Embedded Systems
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Embedded computing - Microprocessors, embedded design process, system description formalisms. Instruction sets - CISC and RISC.

CPU fundamentals - Programming I/Os, co-processors, supervisor mode, exceptions, memory management units and address translation, pipelining, super scalar execution, caching, CPU power consumption.

Embedded computing platform - CPU bus, memory devices, I/O devices, interfacing, designing with microprocessors, debugging techniques.

Program design and analysis - Models of program, assembly and linking, compilation techniques, analysis and optimization of execution time, energy, power and size.

Processes and operating systems - Multiple tasks and multiple processes, context switching, scheduling policies, inter-process communication mechanisms.

Hardware accelerators - CPUs and accelerators, accelerator system design.

Networks - Distributed embedded architectures, networks for embedded systems, network-based design, Internet-enabled systems.

System design techniques - Design methodologies, requirements analysis, system analysis and architecture design, quality assurance.

Text book(s)

1. Wayne Wolf, "Computers As Components - Principles of Embedded Computing System Design". Morgan Kaufman Publishers, 2nd Edition
2. Frank Vahid, Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley, 3rd Edition.

Reference book(s)

1. Steve Heath, "Embedded System Design", Newnes, 3rd Edition.
2. Steve Furber, "ARM System-on-Chip Architecture", Pearson, 2014

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT304
Course title : Wireless Communication
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Evolution of mobile radio communication; Different generations of wireless communication and their technical specifications.

Cellular concept: frequency reuse, channel assignment, handoff, interference, improving system capacity and cell coverage.

Mobile radio propagation: free space propagation, reflection, diffraction, scattering, link budget design.

Fading: multipath propagation, Doppler shift, impulse response model, multipath parameters, statistical models for multipath propagation.

Mitigation of fading effects: equalization, diversity, channel coding

Multiple access: FDMA, TDMA, CDMA, SDMA (Space division Multiple access) and Basics of OFDM

Text book(s)

1. Theodore S. Rappaport, "Wireless Communications: Principles and Practice", Pearson Education, 2nd Edition.
2. Simon Haykin, Michael Moher, "Modern Wireless Communications", Pearson Education, 2005.

Reference book(s)

1. Theodore Rappaport, William H. Tranter, "Principles of Communication Systems Simulation with Wireless Applications", Pearson Education, 2004.
2. A. Mitra, "Lecture Notes on Mobile Communication", https://pdfs.semanticscholar.org/29a9/203fad7685e040b2a72517559e4d98788a3a.pdf

Department of Electronics & Communication Engineering

Course code : ECT306
Course title : Optical Communication
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

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

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.

Optical sources - LEDs and Lasers, Photo-detectors - pin-detectors, detector responsivity, noise. Optical receivers, Optical link design - BER calculation, quantum limit, power penalties, Optical switches - coupled mode analysis of directional couplers, electro-optic switches.

Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solition based communication. Optical amplifiers - EDFA, Raman amplifier, and WDM systems.

Text book(s)

1. Gerd Keiser, "Fibre Optic Communications", McGraw-Hill, 2nd Edition
2. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 1992

Reference book(s)

1. Govind P. Agrawal, "Nonlinear Fibre Optics", Academic Press, 2nd Edition.
2. John Gowar, "Optical Communication Systems", Pearson

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECD302
Course title : Project - I
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 6 (0-0-6)
Course prerequisite : None

Syllabus

The aim of this course is to give an opportunity to the student, under supervision of faculty supervisor, to find a problem which can be researched, apply their subject knowledge to the chosen problem, train the student in the research methodology, cultivate a logical and creative thinking, and to enable them to express their findings in the form of a scientific report.

Text book(s)

Reference book(s)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECD304
Course title : Technical Presentation - I
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 1 (0-0-1)
Course prerequisite : None

Syllabus

In this course, a group of students (maximum two students per group) are required to select a technical article published recently in a reputed journal, conference or magazine based on a topic from list of topics identified by expert area of faculty members, present it and submit an abstract report on it. Course is intended to impart following skills in students - slide making, topic understanding, presentation, question & answers, team spirit and technical report writing.

Text book(s)

Reference book(s)

Department of Electronics & Communication Engineering

Course code : ECP302
Course title : Embedded Systems Lab
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

To study following: Embedded computing. CISC and RISC instruction sets. CPU fundamentals. Embedded computing platform. Program design and analysis. Processes and operating systems. Hardware accelerators. Networks. System design techniques.

Text book(s)

1. Wayne Wolf, "Computers As Components - Principles of Embedded Computing System Design". Morgan Kaufman Publishers, 2nd Edition
2. Frank Vahid, Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley, 3rd Edition.

Reference book(s)

1. Steve Heath, "Embedded System Design", Newnes, 3rd Edition.
2. Steve Furber, "ARM System-on-Chip Architecture", Pearson, 2014

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : HSP304
Course title : Business Communication Skills Lab
Year/Semester : III/VI
Branch : ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Text book(s)

Reference book(s)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECD401
Course title : Project - II
Year/Semester : IV/VII
Branch : ECE
Course credit (L-T-P) : 6 (0-0-6)
Course prerequisite : None

Syllabus

The aim of this course is to give an opportunity to the student, under supervision of faculty supervisor, to find a problem which can be researched, apply their subject knowledge to the chosen problem, train the student in the research methodology, cultivate a logical and creative thinking, and to enable them to express their findings in the form of a scientific report.

Text book(s)

Reference book(s)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECD402
Course title : Technical Presentation - II
Year/Semester : IV/VII
Branch : ECE
Course credit (L-T-P) : 1 (0-0-1)
Course prerequisite : None

Syllabus

In this course, a group of students (maximum two students per group) are required to select a technical article published recently in a reputed journal, conference or magazine based on a topic from list of topics identified by expert area of faculty members, present it and submit an abstract report on it. Course is intended to impart following skills in students - slide making, topic understanding, presentation, question & answers, team spirit and technical report writing.

Text book(s)

Reference book(s)

Department of Electronics & Communication Engineering

List of ECE Electives (Pool 1) :

Code	Subject
ECT501	Advanced CMOS and Beyond CMOS
ECT502	Advanced Digital Signal Processing
ECT503	Advanced Microprocessors and Microcontrollers
ECT504	Advanced Microwave Engineering
ECT505	Advanced Mobile Communication
ECT506	Advanced Process Control
ECT507	Advanced Communication Systems
ECT508	Analog CMOS IC Design
ECT509	Antennas
ECT510	Biomedical Measurement and Instrumentation
ECT511	Cognitive Radio Networks
ECT512	Computational Electromagnetic
ECT513	Digital CMOS IC Design
ECT514	Digital Image Processing
ECT515	Digital System Synthesis
ECT516	Discrete Spectral Estimation
ECT517	Error Correcting Codes
ECT518	Evolutionary Computation
ECT519	Fuzzy Logic
ECT520	Internet of Things
ECT521	MEMS and NEMS
ECT522	Microwave Engineering
ECT523	Mobile Communication
ECT524	Nanoelectronic Devices Modeling and Simulation
ECT525	Neural Networks
ECT526	Pattern Recognition
ECT527	Phased Array Antenna Design
ECT528	Plasmonics and Photonics
ECT529	Power Electronics
ECT530	Process Control
ECT531	RF Communication
ECT532	RF Microelectronics
ECT533	Radar Engineering
ECT534	Real Time Systems
ECT535	Satellite Communication
ECT536	Semiconductor Optoelectronic Devices
ECT537	Simulation of Circuits and Devices
ECT538	Soft Computing

ECT539	Spread Spectrum Technology
ECT540	System Identification
ECT541	Telecom Switching Circuits and Networks
ECT542	VLSI Devices and Process Simulation
ECP508	Analog CMOS IC Design Lab
ECP513	Digital CMOS IC Design Lab
ECP514	Digital Image Processing Lab
ECP515	Digital System Synthesis Lab
ECP520	Internet of Things Lab
ECP522	Microwave Engineering Lab
ECP529	Power Electronics Lab
ECP530	Process Control Lab
ECP538	Soft Computing Lab

List of CSE electives (Pool 2)

Code	Subject
CST201	Database Management Systems
CST206	Design and Analysis of Algorithms
CST208	Operating Systems
CST302	Compiler Design
CST303	Computer Networks
CST305	Information Systems and Security
CST307	Computer Graphics
CSP201	Database Management Systems Lab
CSP206	Design and Analysis of Algorithms Lab
CSP208	Operating Systems Lab
CSP302	Compiler Design Lab
CSP303	Computer Networks Lab
CSP305	Information Systems and Security Lab
CSP307	Computer Graphics Lab

List of Fractal Electives (Pool 3) :

Code	Subject
ECT601	Topics on Advanced CMOS and Beyond CMOS
ECT602	Topics on Advanced Digital Signal Processing
ECT603	Topics on Advanced Microprocessors and Microcontrollers
ECT604	Topics on Advanced Microwave Engineering
ECT605	Topics on Advanced Mobile Communication
ECT606	Topics on Advanced Process Control
ECT607	Topics on Advanced Communication Systems
ECT608	Topics on Analog CMOS IC Design
ECT609	Topics on Antennas
ECT610	Topics on Biomedical Measurement and Instrumentation
ECT611	Topics on Cognitive Radio Networks
ECT612	Topics on Computational Electromagnetic
ECT613	Topics on Digital CMOS IC Design
ECT614	Topics on Digital Image Processing
ECT615	Topics on Digital System Synthesis
ECT616	Topics on Discrete Spectral Estimation
ECT617	Topics on Error Correcting Codes
ECT618	Topics on Evolutionary Computation
ECT619	Topics on Fuzzy Logic
ECT620	Topics on Internet of Things
ECT621	Topics on MEMS and NEMS
ECT622	Topics on Microwave Engineering
ECT623	Topics on Mobile Communication
ECT624	Topics on Nanoelectronic Devices Modeling and Simulation
ECT625	Topics on Neural Networks
ECT626	Topics on Pattern Recognition
ECT627	Topics on Phased Array Antenna Design
ECT628	Topics on Plasmonics and Photonics
ECT629	Topics on Power Electronics
ECT630	Topics on Process Control
ECT631	Topics on RF Communication
ECT632	Topics on RF Microelectronics
ECT633	Topics on Radar Engineering
ECT634	Topics on Real Time Systems
ECT635	Topics on Satellite Communication
ECT636	Topics on Semiconductor Optoelectronic Devices
ECT637	Topics on Simulation of Circuits and Devices
ECT638	Topics on Soft Computing

ECT639	Topics on Spread Spectrum Technology
ECT640	Topics on System Identification
ECT641	Topics on Telecom Switching Circuits and Networks
ECT642	Topics on VLSI Devices and Process Simulation

List of Humanities electives (Pool 4) :

Code	Subject
BMT501	Business Economics
BMT502	Industrial Management
BMT503	Intellectual Property Rights and IT Laws
BMT504	Introduction to Globalization
BMT505	Financial Management
BMT506	Marketing Research
BMT507	Operations Management
BMT508	Supply Chain Management
BMT509	Total Quality Management
DET501	Product Design - Planning and Management
HST501	Contemporary India
HST502	Gandhian Thoughts
HST503	Human Resource Development
HST504	Professional Ethics

Department of Electronics & Communication Engineering

Course code : ECT502
Course title : ECE Elective (Advanced Digital Signal Processing)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Review of sampling theory. Sampling rate conversion by integer and rational factors. Efficient realization and applications of sampling rate conversion.

Wiener filtering. Optimum linear prediction. Levinson-Durbin algorithm. Prediction error filters. Adaptive filters. FIR adaptive LMS algorithm. Convergence of adaptive algorithms. Fast algorithms. Applications: Noise canceller, echo canceller and equalizer.

Recursive least squares algorithms. Matrix inversion lemma. Convergence analysis of the RLS algorithm. Adaptive beam forming. Kalman filtering.

Spectrum estimation. Estimation of autocorrelation. Periodogram method. Nonparametric methods. Parametric methods.

Text book(s)

1. J.G. Proakis, M. Salehi, "Advanced Digital Signal Processing", McGraw–Hill, 1992.
2. S. Haykin, "Adaptive Filter Theory", Prentice-Hall, 1996.

Reference book(s)

1. D.G. Manolakis, V. K. Ingle, S. M. Kogon ,"Statistical and Adaptive Signal Processing", McGraw-Hill, 2005
2. S.L. Marple, "Digital Spectral Analysis", 1987.
3. M.H. Hays," Statistical Digital Signal Processing and Modeling", John-Wiley, 2001.

Department of Electronics & Communication Engineering

Course code : ECT510
Course title : ECE Elective (Biomedical Measurement and Instrumentation)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to bio-medical Instrumentation: Definition, concepts, significance& scope of topic, fields of biomedical engineering, classification of biomedical instruments, roots, prefixes, suffixes in media terminology, Biometrics, Man-instrument system, Physiological systems of body, Challenges in measuring a living system. Transducers for bio-medical applications, Signal conditioning techniques, Bioelectode potential, biopotential amplifiers, bio-electrodes

Cardiovascular system: Functioning of heart, measurement of blood pressure, blood flow, pulse rate, heart sound, ECG. Respiratory Systems: Physiology, tests and instruments. Nervous Systems: Anatomy, instrumentation, EEG, EMG, EOG, EEG, ERG. Sensory and behavioural measurements: psycho physiological measurements, GSR.

X-RAY and Radioisotope instrumentation. Imaging systems [Ultrasonic, MRI, CT, PET etc.]. Therapeutic and prosthetic devices. Clinical laboratory instruments. Electrical safety of biomedical equipment. Lasers and fiberoptic in medical instrumentation. Patient monitoring systems. ITC in bio-medical instrumentation.

Text book(s)

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", PHI, New Delhi, 2nd Edition.
2. J.J. Carr, J.M. Brown, "Introduction to Biomedical Equipments & Technology", Pearson Education, 4th Edition.

Reference book(s)

1. Mandeep Singh, "Introduction to biomedical instrumentation", EEE edition
2. John G Webster, "Medical Instrumentation Application and Design", John Wiley & Sons
3. R.S. Khandpur, "Handbook of biomedical instrumentation", Tata McGraw-Hill

Department of Electronics & Communication Engineering

Course code : ECT511
Course title : ECE Elective (Cognitive Radio Networks)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Software Defined Radio: Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

SDR Architecture: Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

Introduction to Cognitive Radios: Marking radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

Cognitive Radio Architecture: Cognitive Radio - functions, components and design rules, Cognition cycle - orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architechture.

Next Generation Wireless Networks: The XG N etwork architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

Text book(s)

1. Joseph Mitola III,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.
2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE, 2009.
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.
4. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006.

Reference book(s)

1. Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005.
2. Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications , Jan 2008.
3. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
4. Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.
5. Alexander M. Wyglinski, Maziarnekovee, Y. Thomas Hu, "Cognitive Radio Communication and Networks", Elsevier, 2010.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT514
Course title : ECE Elective (Digital Image Processing)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Digital image fundamentals: Fundamental steps in DIP, Components of digital image processing system, elements of visual perception, Structure of the human eye, Image formation in the eye, Brightness adaptation and discrimination, light, Image sensing and acquisition, Image formation model, definition and some properties of two dimensional system, Discrete 2D convolution, 2D discrete Fourier transform and its properties, optical and modulation transfer function, Spectral density function. Sampling and quantization of images, Two dimensional sampling theory, representation of digital image, Spatial and gray level resolution, Zooming and shrinking, some basic relationships between pixels.

Image enhancement in spatial domain: Gray level transformations, Piecewise linear transformation, Histogram processing, enhancement using Arithmetic logic operations, Basics of spatial filtering, Smoothing and sharpening spatial filters, Use of first order and second order derivative in enhancement.

Image enhancement in frequency domain: Two dimensional Fourier transform, properties of frequency domain, correspondence between filtering in spatial and frequency domain, Smoothing and Sharpening frequency domain filters Homomorphic filtering

Image restoration: Model of image degradation/ Restoration process, Noise models, Noise reduction in spatial domain and frequency domain, Inverse filtering, Wiener filtering.

Image compression: Fundamentals of Image compression, Types of redundancy. Image compression model, concepts of information theory, Fundamental coding theorems, Estimation of entropy, Variable length coding, Huffman coding, Near optimal variable length coding, Arithmetic coding, LWZ coding, Bit plane coding , constant area coding, run length coding, Lossless predictive coding, image compression standards (JPEG, JPEG2000)

Image Segmentation: Detection of discontinuities (point, line edge), Edge linking and boundary detection, Thresholding, Basic global thresholding, Adaptive thresholding, Region based segmentation, region growing splitting and merging.

Text book(s)

1. Rafael C. Gonzalez, Richard Eugene Woods, “Digital Image Processing”, Prentice Hall, 3rd Edition.
2. S. Sridhar, “Digital Image Processing”, Oxford University Press, 2011

Reference book(s)

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall, 1989
2. Kenneth R. Castle man, “Digital Image Processing”, Pearson, 1996

Department of Electronics & Communication Engineering

Course code : ECT516
Course title : ECE Elective (Discrete Spectral Estimation)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Periodogram and correlogram. Blackman – Tukey, Bartlett, Welch and Daniel methods. Window design considerations.

Parametric methods for rational spectra. Covariance structure of ARMA processes. AR, MA and ARMA signals. Multivariate ARMA signals.

Parametric methods for line spectra. Models of sinusoidal signals in noise. Nonlinear least squares, high order Yule-Walker, min-norm, Pisarenko, MUSIC and ESPRIT methods.

Filter bank methods. Filter-bank interpretation of the periodogram. Refined filter-bank and Capon methods. Spatial methods. Array model. Nonparametric methods; beam forming and Capon method. Parametric methods; nonlinear least squares, Yule-Walker, min-norm, Pisarenko, MUSIC and ESPRIT methods.

Text book(s)

1. P.Stoica & R.Moses, "Spectral Analysis of signals", Pearson, 2005.
2. Marple, "Introduction to Spectral Analysis", Prentice Hall.

Reference book(s)

1. S.M. Key, "Fundamentals of Statistical Signal Processing", Prentice Hall PTR, 1998.

Department of Electronics & Communication Engineering

Course code : ECT520
Course title : ECE Elective (Internet of Things)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

The IoT Networking Core: Technologies involved in IoT Development. Internet/Web and Networking Basics: OSI Model, Data transfer referred with OSI Model, IP Addressing, Point to Point Data transfer, Point to Multi Point Data transfer & Network Topologies, Sub-netting, Network Topologies referred with Web, Introduction to Web Servers, Introduction to Cloud Computing IoT Platform overview. Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards. Network Fundamentals: Overview and working principle of Wired Networking equipment's – Router, Switches, Overview and working principle of Wireless Networking equipment's – Access Points, Hubs etc. Linux Network configuration Concepts: Networking configurations in Linux Accessing Hardware & Device Files interactions.

IoT Architecture: History of IoT, M2M – Machine to Machine, Web of Things, IoT protocols. Applications: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis. The Architecture: The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN Security aspects in IoT

Application Protocols: MQTT, REST/HTTP,CoAP, MySQL. Back-end Application Designing: Apache for handling HTTP Requests, PHP & MySQL for data processing, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development, Application Development for mobile Platforms: Overview of Android / IOS App Development tools.

Case Study & advanced IoT Applications: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

Text book(s)

1. Zach Shelby, "6LoWPAN: The Wireless Embedded Internet", Carsten Bormann, Wiley
2. Ovidiu Vermesan, Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers
3. Jean-Philippe Vasseur, Adam Dunkels, "Interconnecting Smart Objects with IP: The Next Internet", Morgan Kuffmann

Reference book(s)

1. Lu Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning, "The Internet of Things: From RFID to the Next-Generation Pervasive Networked"
2. Vijay Madisetti, Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)"
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things"
4. Asoke K Talukder, Roopa R Yavagal, "Mobile Computing," Tata McGraw Hill, 2010.
5. Andrew S. Tanenbaum, "Computer Networks", Pearson Education, 4th Edition
6. William Stallings, "Data and Computer Communications", Pearson, 6th Edition
7. F. Adelstein, S.K.S. Gupta, "Fundamentals of Mobile and Pervasive Computing," McGraw Hill, 2009.
8. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
9. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley-India, 2010

Department of Electronics & Communication Engineering

Course code : ECT524
Course title : ECE Elective (Nanoelectronic Devices Modeling and Simulation)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Quantum Mechanics: Principle of Quantum Mechanics, Schrodinger's wave equation, Application of Schrodinger's wave equation, extension of wave theory to atoms. Introduction to the Quantum Theory of Solids: Electrical conductions in solids, Drift current, Density of states function, Statistical mechanics. The Semiconductor in Equilibrium: Charge carriers in semiconductor, Dopant atoms and energy levels, Extrinsic semiconductor, Statistics of donors and acceptors, charge neutrality, position of Fermi level. Carrier Transport Phenomena: Carrier drift, carrier diffusion, Hall effect, graded impurity distribution. Non equilibrium excess carriers: Carrier generation and recombination, Characteristics of excess carriers, Ambipolar transport, Quasi-Fermi energy level. The PN Junction: Basic structures of the PN junction, Zero bias condition, forward bias, reverse bias condition. The PN Junction Diode: PN junction current, small signal model of PN junction, generation- recombination current, junction breakdown, charge storage and diode transient. Fundamentals of the Metal-Oxide-Semiconductor Field-Effect Transistor: Two terminal MOS structure, basic MOSFET operation, non-ideal effects, MOSFET scaling, threshold voltage modification, radiation and hot electron effects.

Text book(s)

1. Donald Neamen, "Semiconductor Physics and Devices", McGraw-Hill, 4th Edition
2. Simon M. Sze, Kwok K. Ng, "Physics of Semiconductor Devices", Wiley, 3rd Edition

Reference book(s)

1. B.G. Streetman, S. Banerjee Solid State, "Solid State Electronic Devices", Prentice Hall India

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT529
Course title : ECE Elective (Power Electronics)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Solid State Power Devices & Operation – Power Diode, Power Transistor, MOSFET, IGBT, SCR, GTO, Classification of SCR triggering methods, Design and operation of triggering circuits, Commutation methods, Pulse transfer and isolation scheme, Protection of power devices, Series and parallel operation of SCRs.

Phase Controlled Converters – Single-phase uncontrolled, half-controlled and fully controlled converters. Three-phase half-controlled and full controlled bridge converters.

Choppers – Different schemes and circuit configurations. Buck, Boost, Buck-boost and Flyback converter.

Inverters – Single-phase and three-phase bridge converter operating as line-commutated voltage source inverters, force commutated inverters, Pulse width modulated inverters with IGBTs/MOSFETs, Gate driving Circuit, Dead-time, Design of Snubber Circuit, Current source inverter.

Cycloconverters – Three-phase to single-phase and three-phase to three-phase configurations.

Text book(s)

1. P.S. Bimbhra, "Power Electronics", Khanna Publishers, 2012
2. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson, 3rd Edition

Reference book(s)

1. Robert W. Erickson, "Fundamentals of Power Electronics", Springer, 1997
2. Denis Fewson, "Introduction to Power Electronics", Arnold Publishers, 1998

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT530
Course title : ECE Elective (Process Control)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Objectives of Process Control: basic control loop, variables, requirements, aims, parameters, dynamics of the process. Terms, concepts used in process dynamics. Model of lumped and distributed parameter systems.

Feedback Control Components: On-off, on-off with neutral zone. Proportional, Integral, derivative, PI, PD, PID. Effect on dynamic behavior of process with different controller modes in closed loop. Controller tuning (Ziegler, Cohen-Coon, Integral performance). Controller modes in Electronic controllers. Digital Control Systems (Sampling and reconstruction, DDC structure, position & velocity algorithm). Functions of control valves, Types of control valves, actuators. Draw P&I diagrams.

Complex Control Schemes: Cascade control, Ratio control, Feedforward, Adaptive control, Inferential, Model reference adaptive control, Self tuning regulator, Override, Auctioneering, Split Range, Design of cross controllers and selection of loops using RGA, Intelligent Controllers

Programmable Logic Controllers: PLC vs relay Logic, PLC vs PCs, hardware components. Ladder diagram, selection of PLCs

Distributed Digital Control Systems: History, functional requirements, system architecture, configuration

Text book(s)

1. Surekha Bhanot, "Process Control: Principles and Applications", Oxford University press, Fourth Impression 2010
2. C.D. Johnson, "Process Control Instrumentation Technology", Prentice Hall of India, 1993

Reference book(s)

1. Liptak B.G., "Process Control: Instrument Engineer's handbook", Butterworth Heinemann
2. Stephanopoulos George, "Chemical Process Control", Prentice Hall of India

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT535
Course title : ECE Elective (Satellite Communication)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance. Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example. Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods. Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs.

Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

Text book(s)

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite Communications", Wiley, 2nd Edition.
2. Wilbur L. Pritchard, Robert A Nelson, Henri G. Suyderhoud, "Satellite Communications Engineering", Pearson Publications, 2nd Edition.

Reference book(s)

1. M. Richharia, "Satellite Communications: Design Principles", BS Publications, 2nd Edition.
2. Dennis Roddy, "Satellite Communications", McGraw Hill, 2nd Edition.
3. Behrouz A. Forouzan, "Data communication and Networking", 4th Edition , McGraw-Hill.

Department of Electronics & Communication Engineering

Course code : ECT536
Course title : ECE Elective (Semiconductor Optoelectronic Devices)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Review of Semiconductor Device Physics: Energy bands in solids, the E-k diagram, Density of states, Occupation probability, Fermi level and quasi Fermi levels, p-n junctions, Schottky junction and Ohmic contacts. Semiconductor optoelectronic materials, Bandgap modification, Heterostructures and Quantum Wells.

Interaction of photons with electrons and holes in a semiconductor: Rates of emission and absorption, Condition for amplification by stimulated emission, the laser amplifier. Semiconductor Photon Sources: Electroluminescence. The LED: Device structure, materials and characteristics. The Semiconductor Laser: Basic structure, theory and device characteristics; direct current modulation. Quantum-well lasers; DFB-, DBR- and vertical-cavity surface-emitting lasers (VCSEL); Laser diode arrays. Device packages and handling.

Semiconductor Optical Amplifiers & Modulators: Semiconductor optical amplifiers (SOA), SOA characteristics and some applications, Quantum-confined Stark Effect and Electro-Absorption Modulators.

Semiconductor Photodetectors: Types of photodetectors, Photoconductors, Single junction under illumination: photon and carrier-loss mechanisms, Noise in photodetection; Photodiodes, PIN diodes and APDs: structure, materials, characteristics, and device performance. Photo-transistors, solar cells, and CCDs. Optoelectronic integrated circuits - OEICs.

Text book(s)

1. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prentice Hall, 1997
2. J. M. Senior, "Optical Fiber Communication: Principles and Practice", Prentice Hall, 2nd Edition

Reference book(s)

1. G. Keiser, "Optical Fiber Communications", McGraw-Hill Inc, 3rd Edition, 2000
2. B. E. A. Saleh, M. C. Teich, "Fundamentals of Photonics", John Wiley & Sons, 2nd Edition, 2007

Department of Electronics & Communication Engineering

Course code : ECT537
Course title : ECE Elective (Simulation of Circuits and Devices)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to SPICE Simulation, Analysis of complex electronic circuits, simulation and analysis using SPICE, AC/DC operation, DC sweep transfer function, frequency response, feedback control analysis, transient response, device models, simulation and analysis of electronic circuits and systems. Review of semiconductor physics, The pn junction, The built-in voltage, Depletion width and junction capacitance, Diode current/voltage characteristic, Minority carrier charge storage. MOS transistors, Threshold voltage and the body effect, Current/voltage characteristics, Subthreshold current, Short channel effect and narrow width effect, Drain induced barrier lowering Channel length modulation, Hot carrier effects, Effective mobility and velocity saturation SPICE models, MOS inverter circuits Bipolar transistors, Current gain, Gummel plots and output characteristics, Recombination in the emitter/base depletion region, Charge storage and forward transit time, Cut-off frequency, TTL gates. Basic SPICE Models, Ebers-Moll and basic Gummel-Poon model, Small-signal model, Parameter extraction.

Text book(s)

1. B.G. Streetman, S. Banerjee Solid State, “Solid State Electronic Devices”, Prentice Hall India
2. D.A.Hodges, H.G. Jackson, “Analysis and Design of Digital Integrated circuits”, McGrraw-Hill

Reference book(s)

1. J.P. Uyemura, “Introduction to VLSI circuit and systems”, John Wiley and Sons.
2. Y. Taur, T.H. Ning, “Fundamentals of Modern VLSI devices”, Cambridge University Press
3. K. Eshraghian, “Principles of CMOS VLSI design , A systems perspective”, Addison Wesley.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : ECT538
Course title : ECE Elective (Soft Computing)
Year/Semester :
Branch : ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Soft Computing: Machine learning, Intelligent Systems, Expert Systems

Fundamentals of Artificial Neural Network and Applications: Model of artificial neuron, Architecture, Learning methods: Supervised, Unsupervised, Reinforcement, Perceptron, Back propagation, Hebbian, Hopfield, dynamic, competitive, RBF networks, ANN applications in function approximation, modeling, pattern recognition, prediction, modeling & control, Matlab implementation

Fundamentals of Fuzzy Logic and Applications: Fuzzy Set theory, fuzzy set operations, fuzzy relations, Fuzzy applications in control, classification, pattern recognition, Matlab implementation

Hybrid systems and Evolutionary Computing Techniques: Neuro-Fuzzy, Genetic algorithm, Differential evolution, particle swam, firefly and applications, Matlab implementation

Text book(s)

1. Martin D Hagen et al, "Neural Network Design"
2. Hung T. Nguyen, N R Prasad, C L Walker, E A Walker, "A first course in Fuzzy and Neural Control", Chapman & Hall/CRC Press
3. Xin-She Yang, "Nature-inspired Metaheuristc Algorithms", Luniver Press

Reference book(s)

1. Samir Roy, Udit Chakraborty, "Introduction to Soft Computing", Pearson
2. Timothy J Ross, "Fuzzy Logic with Engineering Application", Wiley
3. Laurene Fausett, "Fundamentals of Neural Networks, Architecture, Algorithms and Applications", Pearson Education

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST201
Course title : CSE Elective (Database Management System)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Need, purpose and goal of DBMS, Three tier architecture, Entity Relationship Diagram (ERD), data models- Relational, Network, Hierarchical and Object Oriented.

SQL: DDL and DML, Relational Algebra. Application Development using SQL, Host Language interface, embedded SQL programming, Stored procedures and triggers and views, Constraints assertions.

Data Base Design: Conceptual data base design, Theory of Normalization, Primitive and Composite data types, concept of physical and logical databases, data abstraction and data independence, data aggregation, Relational Calculus.

Internal of RDBMS: Physical data organization in sequential, indexed random and hashed files. Inverted and multi-list structures, B trees, B+ trees, Query Optimization, Join Algorithm, Statistics and Cost Base optimization.

Transactions: Transaction Processing, concurrency control, and recovery management. Transaction model properties and state serializability. Lock base protocols, two phase locking.

Text book(s)

1. Korth and Silberschatz: Database Systems Concepts, McGraw Hill
2. Almasri and Navathe: Fundamentals of Database Systems

Reference book(s)

1. C.J. Date: Data Base Design, Addison Wesley

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST206
Course title : CSE Elective (Design and Analysis of Algorithms)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Algorithm Analysis: Asymptotic notation, model of computation, time and space complexities, average and worst case analysis, Master's Theorem, solving recurrence equations.

Data Structures: Hash tables, Binary tree, Binary Search Tree, AVL Trees, and B-trees, red-black tree, tries, binomial heaps, Fibonacci heaps.

Divide and Conquer: Heap Sort, Merge Sort, Quick sort, Order Statistics – finding the median, exponentiation, matrix multiplication. Sorting in Linear Time: Count Sort, Radix Sort, and Bucket Sort.

Greedy algorithm: Fractional Knapsack problem, Huffman codes, Travelling Salesman Problem, Activity Selection Problem.

Dynamic Programming: Matrix Chain multiplication, longest common subsequence, 0/1 knapsack problem, Strassen's Matrix Multiplication.

Graph Algorithms: Graph Traversal Algorithms (BFS, DFS), Shortest path algorithms (Bellman-ford, Dijkstra's, Transitive-Closure, Floyd-Warshall), minimum spanning tree algorithms, (Kruskal, Prim), Network-flow (ford-fulkerson), applications of DFS: - bi-connectivity, topological sort, strongly-connected components, Articulation point.

String matching algorithms: Naive, Rabin Karp, KMP, Boyer Moore.

Introduction to problem classes: P, NP, NPC, NP-Hard problems.

Text book(s)

1. Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India
2. Horowitz and Sahani: Fundamental of Computer algorithms.
3. Klienberg and Tardos – Algorithm Design

Reference book(s)

1. Aho A.V, J.D Ullman: Design and analysis of Algorithms, Addison Wesley
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, Introduction to the Design and Analysis of Algorithms, Mc Graw Hill

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST208
Course title : CSE Elective (Operating Systems)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction and Process Management: Introduction and need of operating system, types of OS, operating system as resource manager, OS services, kernel, system calls, firmware, BIOS, bootloader. Process model, creation, termination, states and transitions, context switching, process control block, basic system calls in Linux and Windows. Threads - processes versus threads, kernel and user level threads and multi-threading.

Inter-Process Communication and Process Scheduling: Message passing, race condition, critical section problem, mutual exclusion with busy waiting, Peterson's solution, Semaphore, Classical IPC problems. Process scheduling - concepts, CPU and I/O bound, CPU scheduler - short, medium, long-term, dispatcher. Scheduling - preemptive and non-preemptive, Priority, Scheduling algorithms - FCFS, SJFS, Shortest Remaining Time, round robin, priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, fair share scheduling.

Deadlock and Memory Management: Deadlock problem, detection, prevention, avoidance, recovery from deadlock. Memory management - concepts, logical and physical address space, address binding, degree of multiprogramming, swapping. Memory allocation schemes, Free space management, memory protection and sharing, relocation and address translation.

Virtual Memory: Virtual Memory - concept, paging, segmentation, segmentation with paging, demand paging, thrashing. Page replacement algorithms - optimal, MRU, FIFO, LRU, Belady's anomaly, design issues for paging system. Page size, TLB. Inverted page table. Basic idea of MM in Linux.

File System and Storage: File System - concepts, operations, types. File organization and access (Sequential, Direct, Index and Sequential) methods. Memory mapped files, directory structures, file system mounting, file sharing. Overview of file system in Linux. Input/output subsystems - concepts, input/output devices, disk structure, disk storage capacity. Disk scheduling algorithm - FCFS, SSTF, Scan scheduling, C-scan schedule, Look and C-Look schedule.

Text book(s)

1. Silberschatz and Galvin: Operating System Principals, Wiley India Pvt. Ltd.
2. Tanenbaum: Modern Operating System, Prentice Hall.
3. OS – Three Easy Step by Remzi (available free online)

Reference book(s)

1. DM Dhamdhere: Operating Systems – A Concepts Based Approach, Tata McGraw Hill
2. Charles Crowly: Operating System A Design Oriented Approach, Tata McGraw Hill.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST302
Course title : CSE Elective (Compiler Design)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Overview of Compilation: Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping, data structures in compilation – LEX lexical analyzer generator.

Top down Parsing: Context free grammars, Top down parsing – Backtracking, LL (1), recursive descent parsing, Predictive parsing, Preprocessing steps required for predictive parsing.

Bottom up parsing: Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing , handling ambiguous grammar, YACC – automatic parser generator.

Semantic analysis: Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Conversion of popular Programming languages language Constructs into Intermediate code forms, Type checker.

Symbol Tables: Symbol table format, organization for block structures languages, hashing, tree structures representation of scope information. Block structures and non-block structure storage allocation: static, Runtime stack and heap storage allocation, storage allocation for arrays, strings and records.

Code optimization: Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, folding, DAG representation.

Data flow analysis: Flow graph, data flow equation, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation.

Object code generation: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

Text book(s)

1. Principles of compiler design -A.V. Aho . J.D.Ullman; Pearson Education.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

Reference book(s)

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
3. Engineering a Compiler-Cooper & Linda, Elsevier.
4. Compiler Construction, Louden, Thomson.

Department of Electronics & Communication Engineering

Course code : CST303
Course title : CSE Elective (Computer Networks)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction to Protocol Layering, OSI Reference Model and TCP/IP Protocol Stack. Networking core – packet switching, circuit switching, nodal delay (processing delay, queuing delay, transmission delay, propagation delay). Introduction to interconnecting networking devices: hubs, repeaters, switches, bridges, routers, gateways.

Application layer, DNS, HTTP, SMTP, etc.

Transport layer, UDP, TCP, Sliding Window, sender and receiver window size, silly window syndrome, Nagle's Algorithm, packet loss detection, retransmission, RTT, RTO, Karn/Patridge Algorithm, sequence number wrap around, bandwidth delay product.

Resource allocation classification, best effort service v/s QoS model, Fairness, Raj Jain's fairness index, Queuing disciplines (FIFO, FQ, WFQ). Congestion Control: AIMD, Slow Start, Fast Retransmit and Recovery, Congestion Avoidance, TCP variants (Tahoe, Reno, Vegas).

Network layer, IP addressing scheme, private addresses, static and dynamic assignment (DHCP), sub-netting, CIDR. Routing, Scale, avoiding loops/failures, Distance Vector routing – RIP (15 hops), IGRP (255 hops). Link State Routing (OSPF). Brief introduction to multi-cast routing, MPLS, QoS, IPv6, etc.

Link layer (OSI – physical layer, MAC, LLC), Physical later – bit stream, cables, hubs, repeaters, switches. Error detection – parity, CRC, checksum. MAC, Ethernet, CSMA/CD, ARP, ICMP, ARQ, bridging concepts.

Introduction to Mobile Networks, Wi-Fi and Mobile IP.

Text book(s)

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", The Morgan Kaufmann Series in Networking, 2011
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson, 6th Edition.

Reference book(s)

1. Srinivasan Keshav, "An Engineering Approach to Computer Networking : ATM Networks, the Internet and the Telephone Network", Pearson, 1997.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CST305
Course title : CSE Elective (Information Systems and Security)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Basic Security Concepts, Confidentiality, integrity, availability, Security policies, security mechanisms, assurance, Basic Cryptography, Historical background, Transposition Substitution, Caesar Cipher, Introduction to Symmetric crypto primitives, Asymmetric crypto primitives and Hash functions.

Secret Key Cryptography, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Encrypting large messages (ECB, CBC, OFB, CFB, CTR), Multiple Encryption, DES.

Ecommerce and security: Network Security, web security, Credit card authentications, Credit card transactions, SET, SSL.

Public Key Cryptography, Number theory: Euclidean algorithm, Euler Theorem, Fermat Theorem, Totient functions, multiplicative and additive inverse, RSA, Selection of public and private key.

DOS, Flooding Attacks, DDOS, Application Based Bandwidth Attacks, Reflector and Amplifier Attacks, Session management, user authentication, Cybercrime, Firewalls, VPNs, Intellectual Property, Malwares, Types of Malicious Software (Malware), Operating Systems Hardening, Software Security Issues, Stack Overflows, Defending Against Buffer Overflows, Access control.

Text book(s)

1. William Stallings, “Computer Security”
2. Davin Kim, “Fundamentals of Information Systems Security”

Reference book(s)

1. Mark Stamp, Information Security: Principles and Practice

Department of Electronics & Communication Engineering

Course code : CST307
Course title : CSE Elective (Computer Graphics)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Introduction: Raster scan displays, Storage tube displays, Refreshing, flicking, interlacing. Color monitors, display processors, resolution. Introduction to Interactive Computer Graphics: Picture analysis. Overview of programmer's model of interactive graphics. Fundamental problems in geometry. Scan Conversion: point, line, circle, ellipse polygon, Aliasing, and introduction to anti-aliasing (No anti-aliasing algorithm)

2D & 3D Co-ordinate System: Homogeneous Co-ordinates, Translation, Rotation, Scaling, Reflection, Inverse transformation, Composite transformation, Polygon Representation, Flood Filling, Boundary filling. Point Clipping, Cohen-Sutherland Line Clipping Algorithm, Polygon Clipping algorithms.

Hidden Lines, Surfaces, Curves, Splines: Image and Object space, Depth Buffer Methods, Hidden Facets Removal, Scan line algorithm, Area based algorithms, Parametric and Non parametric Representations, Bezier curve, Bspline Curves.

Rendering: Basic illumination model, Rendering: Diffuse reflection, Specular reflection, Phong shading, Gourand shading, Ray tracing, Color models like RGB, YIQ, CMY, HSV.

Multimedia & Animation: Multimedia components, Multimedia Input/Output Technologies: Storage and retrieval technologies, Architectural considerations, File formats. Animation: Introduction, Rules, Problems, Animation techniques.

Text book(s)

1. Computer Graphics C version, Donald Hearn and M. Pauline Baker, Pearson education.
2. Computer Graphics Principles & practice, second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

Reference book(s)

1. Computer Graphics Second edition, Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc Graw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH.
4. Principles of Computer Graphics, Shalini, Govil-Pai, Springer.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP201
Course title : CSE Elective Lab (Database Management System Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Data Definition Language (DDL) commands in RDBMS. Data Manipulation Language (DML) and Data Control Langauge (DCL). High Level Language extensions with cursors. High Level Language extensions with Triggers, Procedures and Functions. Database design using E-R model and Normalization. Design and Implementation of Library Information System. Automatic Backup of files and recovery of files. For case study and implementation, use MySQL and PostgreSQL.

Text book(s)

1. Korth and Silberschatz: Database Systems Concepts, McGraw Hill
2. Almasri and Navathe: Fundamentals of Database Systems

Reference book(s)

1. C.J. Date: Data Base Design, Addison Wesley

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP206
Course title : CSE Elective Lab (Design and Analysis of Algorithms Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Sorting- Insertion sort, Merge Sort, quick sort, Heap sort, bubble sort, selection sort, Count sort, Radix sort, bucket sort. Tree Creation, traversal, deletion. BST, AVL tree, B-tree. Longest common subsequence, Matrix chain Multiplication, Activity selection problem. Knapsack problem, travelling salesman problem. Graph traversal- DFS, BFS, Dijkstra, Bellman-ford, ford-fulkerson, floyd-warshall. MST – Kruskal and Prim's algorithm. String matching- KMP, Rabin Karp, Boyer Moore, Naive.

Text book(s)

1. Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India
2. Horowitz and Sahani: Fundamental of Computer algorithms.
3. Klienberg and Tardos – Algorithm Design

Reference book(s)

1. Aho A.V, J.D Ullman: Design and analysis of Algorithms, Addison Wesley
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, Introduction to the Design and Analysis of Algorithms, Mc Graw Hill

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP208
Course title : CSE Elective Lab (Operating Systems Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Prepare a dual boot system. Understand BIOS, bootloader, UEFI, partitions, OS installation. Read source code of any one utility (Linux /open source project) that you have used. Get familiarity with open sourced utilities and how utility is packaged, libraries. Makefiles. Understand process memory Layout in Linux using process maps and /proc interface. Implement a system call to print HelloWorld in Linux and compile the latest stable kernel. Case study and project: PintOS (scheduling, system calls, memory management, etc.). Study and Understand virtualization (VMWare workstation, Virtual Box). Implement concepts learned in the class: CPU scheduling, Process creation (fork, exec, clone, etc.), Multi-threaded programs to understand concurrency, Peterson's solution, Mutual Exclusion with bounded wait, Memory Management, Disk Scheduling, etc.
Note: - Students are encouraged to use C, C++ and Shell Scripting for the lab, preferably on Ubuntu and compilers LLVM Clang or GCC. Use a tab of 2-spaces for code indentation.

Text book(s)

Reference book(s)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP302
Course title : CSE Elective Lab (Compiler Design Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Introduction to compilers, translators, and interpreters, compilation process. Compare two complier front ends - GCC and Clang. Lexical Analysis, Syntax Analysis – create parsers using Lex and Yacc (Bison). Check grammar and production rules in parsers. Use GCC to understand code optimization: Basic blocks, Control Flow Graphs, Global data flow analysis. Loop optimization. Understanding of code generation: Compilation of expression and control structures. Case study: (i) GCC or (ii) Clang

Text book(s)

1. Compilers: Principles, Techniques and Tools, by Alfred V. Aho , Monika, Ravi Sethi , D. Jeffrey Ullman

Reference book(s)

1. Compilers Principles and Practice, D M Dhamdhere

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP303
Course title : CSE Elective Lab (Computer Networks Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

NS2 – topology creation, attaching UDP and TCP traffic flows, visualizing simulation using nam, sample run, DropTail AQM observations. Useful networking commands: ifconfig, route, host, ping, tcpdump, wireshark, etc. Network configuration files - /etc/hosts, /etc/network/interfaces, /etc/resolve.conf, /etc/protocols, /etc/services, etc. Using tcpdump and wireshark, analyze packet details at transport layer, capture TCP header. NS2 – understand and analyze trace files, run multiple simulations, plot graphs using gnuplot for simulation scenarios. Using wireshark analyze packet details at network layer, capture IP header. Socket programming: create a simple client-server implementation using raw sockets in c/c++ with multiple decent clients. Recap – IP address, subnet mask, default gateway, MTU details. Analyze TCP and IP headers. Understand fragmentation and reassembly in IP header. Socket program – convert client message to upper case. Introduction to NS3. Differences between NS2 and NS3. Sample run in NS3. Learn how to analyze simulations in NS3. NS3 documentation and using help.

Text book(s)

Reference book(s)

1. NS2 manual
2. Wireshark documentation
3. Linux man pages

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP305
Course title : CSE Elective Lab (Information Systems and Security Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

Different substitution cipher techniques (Both encryption and decryption process) – Caesar Cipher, Modified Caesar Cipher, Mono Alphabetic Cipher, Homophonic Cipher, Polygram Cipher, polyalphabetic Cipher, Playfair cipher and Hill cipher. Different transposition cipher techniques – Rail Fence, Simple Columnar and Advanced Columnar Transposition Cipher, vernam cipher etc. Diffie-Hellman Key Exchange Algorithm. Stream ciphers and Block ciphers algorithms (Both encryption and decryption process): Electronic code book mode (ECB Mode), Cipher feedback mode (CFB Mode), Cipher block chaining mode (CBC mode), Output feedback mode (OFB mode), Counter mode. Simple RSA Algorithm with small numbers, DES, Double DES and Triple DES (encryption and decryption), AES encryption and decryption both. IDEA encryption and decryption both. Given PT is "Welcome to cryptography and Network Security", generate Digital signature. Demonstrate DOS and DDOS attacks on a system by CLI and by any tool. Demonstrate IP spoofing and DNS Spoofing. using CLI (nmap, tcpdump, etc) and GUI based tool named ettercap. Demonstrate SQL injection.

Text book(s)

1. William Stallings ,"Computer Security"
2. Davin Kim, "Fundamentals of Information Systems Security"

Reference book(s)

1. Mark Stamp, Information Security: Principles and Practice

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : CSP307
Course title : CSE Elective Lab (Computer Graphics Lab)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 1 (0-0-2)
Course prerequisite : None

Syllabus

DDA line drawing algorithm, Bresenham's Algorithm – Line, Circle, Ellipse. Line, Circle and ellipse Attributes. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear, Composite 2D Transformations, Cohen Sutherland 2D line clipping and Windowing. Liang – Barsky line clipping algorithm, Sutherland – Hodgeman Polygon clipping Algorithm, polygon filling algorithm – Scan line fill and boundary fill. Three dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear, Projection, Composite 3D transformations. Hidden surface removal method - painters, Z- buffer, A- buffer algorithms, area based surface removal methods: Quad tree, octree. Curves - Bazier curve, B-spline curve, Implement shading methods- flat, Gouraud shading and phong shading.

Text book(s)

1. Computer Graphics C version, Donald Hearn and M. Pauline Baker, Pearson education.
2. Computer Graphics Principles & practice, second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

Reference book(s)

1. Computer Graphics Second edition, Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc Graw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

Department of Electronics & Communication Engineering

Course code : BMT501
Course title : Humanities Elective (Business Economics)
Year/Semester :
Branch : CSE, ECE
Course credit (L-T-P) : 3 (3-0-0)
Course prerequisite : None

Syllabus

Basic Economic Concepts and foundations of economics for decision – making; circular flows.

Demand analysis and consumer behavior; elasticity of demand and its measurement; supply analysis and price – mechanism.

Production Analysis – short run and long run production functions; law of variable proportions and returns to scale.

Cost Concepts and Analysis (short run and long run), Revenue curves under perfect and imperfect competition.

Break Even Analysis (revenue - cost - output relationship).

Market Structures; pricing in perfect competition, monopoly, monopolistic competition and oligopoly.

Economic Appraisal Techniques (pay - back period, NPV, IRR, cost - benefit ratio).

Macro-Economic Concepts such as national income, inflation, deflation, stagflation, monetary and fiscal policies, business cycles, foreign exchange rates and balance of payments.

Text book(s)

1. H.C. Peterson, W. Cris Lewis, S.K. Jain, "Managerial Economics", Prentice Hall
2. Suma Damodran, "Managerial Economics", Oxford University Press

Reference book(s)

1. G.S. Gupta, "Managerial Economics", Tata McGraw Hill
2. R.R. Barthwal, "Industrial Economics, An Introductory Text Book", New Age International (P) Limited
3. Paul Samuelson, William Nordhaus, "Economics", Tata McGraw Hill
4. C.S. Barla, "Managerial Economics", National Publishing House, New Delhi
5. N.D. Mathur, "Managerial Economics", Shivam Book House (Pvt. Ltd.), Jaipur