INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, KOTA

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B. Tech. CSE Syllabus

(Based on the curriculum scheme 2016-17)

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1 B. Tech. CSE 1st Year

Semester - I						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	MAT101	Mathematics - I	3	0	0	3
2	ECT101	Digital Electronics	3	0	0	3
3	ECT103	Fundamentals of Electrical Engineering	3	0	0	3
4	CST101	Introduction to Computer Systems and Programming	3	0	0	3
5	HST101	Communication Skills in English	2	0	0	2
		Labs				
6	ECP101	Digital Electronics Lab	0	0	2	1
7	CSP101	Computer Programming Lab	0	0	2	1
8	CSP111	IT Workshop - 1	0	0	3	2
9	HSP101	English Communication Lab	0	0	2	1
10	OTP101	Creative Arts / Liberal Arts	0	0	1	1
Total			14	0	10	**20**
Semester – II						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	MAT102	Mathematics – II	3	0	0	3
2	ECT102	Electronic Devices and Circuits	3	0	0	3
3	CST102	Data Structures and Algorithms	3	0	0	3
4	CST104	Internet and Web Technologies	3	0	0	3
5	HST102	Health, Safety and Environment	1	0	0	1
6	HST104	Human Values and Effective Communication	2	0	0	2
		Labs				
7	ECP102	Electronic Devices and Circuits Lab	0	0	2	1
8	CSP102	Data Structures and Algorithms Lab	0	0	2	1
9	CSP112	IT Workshop – 2	0	0	3	2
10	HSP104	Soft Skill Development Lab	0	0	2	1
11	OTD102	Independent Project	0	0	1	1
Total			15	0	10	**21**

1.1 I Semester

1.1.1 MAT101

Course code : **MAT101**
Course title : **Mathematics - I**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Partial Differentiation – Partial differentiation, Euler's theorem on homogenous functions, total differentiation, approximate calculation.

Unit 2: 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.

Unit 3: 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.

Unit 4: 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.

Unit 5: 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.

Unit 6: 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

1.1.2 ECT101

Course code : **ECT101**
Course title : **Digital Electronics**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Binary systems (number base conversions, complements, signed and unsigned binary numbers, binary codes), Boolean algebra and logic gates (basic theorems and properties of Boolean algebra, canonical and standard forms, digital logic gates and their truth table)
Unit 2: Simplification of Boolean functions (Karnaugh map, don't care conditions, Quine-McCluskey method)
Unit 3: Combinational logic circuits (half and full adder and subtractor, look-ahead carry and decimal adders, multiplier, magnitude comparator, decoder, encoder, multiplexer, demultiplexer), programmable logic devices (ROM, PLA, PAL)
Unit 4: Synchronous sequential logic circuits (RS, JK, D and T flip-flops, state and excitation tables, state diagram reduction and assignment, shift registers, synchronous and ripple counters)

Text book(s)

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Prentice Hall, 4th Edition
2. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 3rd Edition

Reference book(s)

1. Albert Paul Malvino, Donald P. Leach, "Digital Principles and Applications", Tata McGraw Hill, 6th Edition
2. John F. Wakerly, "Digital Design: Principles and Practices", Pearson Education, 4th Edition
3. Frederick J. Hill, Gerald R. Peterson, "Introduction to Switching Theory and Logic Design", John Wiley, 1st Edition
4. Frederick J. Hill, Gerald R. Peterson, "Computer Aided Logical Design with Emphasis on VLSI", John Wiley, 4th Edition

1.1.3 ECT103

Course code : **ECT103**
Course title : **Fundamentals of Electrical Engineering**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: 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

Unit 2: Linear circuit analysis techniques (nodal analysis, mesh analysis), Network theorems (Thevenin's, Norton's, Superposition, Maximum Power Transfer), Source transformations

Unit 3: Duality, Time-domain transient analysis (natural and forced) of first-order and second-order circuit

Unit 4: Phasor-domain or frequency-domain steady-state analysis, AC power, Polyphaser circuits, Three-phase loads, Frequency response, Basic filters, Resonance, Quality factor and bandwidth

Unit 5: 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

Reference book(s)

1. Edward Hughes, "Electrical & Electronic Technology", Pearson Education, 10th Edition
2. Vincent Del Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd Edition
3. Allan R. Hambley, "Electrical Engineering Principles and Applications", Prentice Hall, 5th Edition
4. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 3rd Edition

1.1.4 CST101

Course code : **CST101**
Course title : **Introduction to Computer Systems and Programming**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I

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. Memory: Primary and secondary memory. Semiconductor, magnetic, optical memory. Disc structure. Operating System, kernel. Number systems, base conversions.

Unit- II

C Programming - what is required to learn 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, basic program/process view - Stack, Heap, Data and Code segment, what are different ways to write main(), keywords -> switch, case, default, break. Issues with printf() and scanf(). More input, output functions.

Unit- III

Compiler - Compilation process. Compiler and interpreter. Using **GCC**.
C Programming - Arrays, Strings, 2-dimensional and multi-dimensional arrays, address computations

Unit- IV

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.

Unit- V

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

Unit- VI

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

Text /Reference Book(s)

1. Programming in ANSI C by E. Balagurusamy
2. The C Programming Language by Brian Kernighan, Dennis Ritchie
3. Let us C by Yashavant Kanetkar

1.1.5 HST101

Course code : **HST101**
Course title : **Communication Skills in English**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **2**
Course prerequisites : **None**

Syllabus

Unit 1: 'Night of the Scorpion'. Prepositions, Tenses.
Unit 2: 'Our Urgent Need for Self Esteem'. Subject-verb Agreement, Creative Writing, Informal Letters
Unit 3: 'The Diary of a Young Girl'. Vocabulary Building, Common Errors.
Unit 4: 'Building an Internet Culture'. Reported Speech, Precis Writing, Conditional sentences.
Unit 5: 'The Sporting Spirit'. Active and Passive Voice, Formal Letters and Applications, Phonetics
Unit 6: '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

1.1.6 ECP101

Course code : **ECP101**
Course title : **Digital Electronics Lab**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

Exp 1: Introduction to various logic gates using TTL ICs (7400, 7402, 7404, 7408, 7432, and 7486) and verification of truth table for various logic gates.

Exp 2: Implementation of basic gates (NOT, AND, OR) using universal NAND and NOR gates.

Exp 3: Implementation of combinational circuits using MSI Logic.

a. Design of four bit Binary to Gray and Gray to Binary code Converter.
b. Design of Half and Full Adder circuits.

Exp 4: Implementation of combinational circuits using MSI Logic.

a. Design of Half and Full Subtractor circuits.
b. Design of Two bit multiplier.

Exp 5: Implementation of combinational circuits using MSI Logic.

a. Design of One and Two bit Comparators.
b. Design of Even and Odd parity generator and checker.

Exp6: Implementation of combinational circuits using MSI Logic.

a. Design of 2:1 and 4:1 MUX using basic gates.
b. Design of 4:1 MUX using 2:1 MUX.

Exp7: Design a binary to decimal and octal to decimal decoder.

Exp 8: To design and verify truth table of flip-flops.

a. SR latch with NOR and NAND Gates.
b. SR flip-flop with control input using NOR and NAND Gates.
c. D, JK and T flip-flops.

Exp 9: To design and implement binary ripple and synchronous up/down counters using flip-flops.

Exp 10: To 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. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 3rd Edition

1.1.7 CSP101

Course code : **CSP101**
Course title : **Computer Programming Lab**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

Unit 1: Introduction – Computers, Internet, Web Applications, Using LDAP ID and IIITK email. Keyboard layout. Software, System Software, Application Software. Memory - Primary and secondary memory. Semiconductor, magnetic, optical memory. Disc structure. Operating System, kernel. Using gedit and VI editors. Using GCC.

Unit 2: C Programming – what is required to learn 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).

Unit 3: C Programming – branching (if, if-else, else_if ladder), repetitions (for, while, do while loops), keywords -> if, else, for, while, do. What are different ways to write main(), keywords -> switch, case, default, break. Issues with printf() and scanf(). More input, output functions.

Unit 4: C Programming – Arrays, Strings, 2-dimensional and multi-dimensional arrays, Strings functions.

Unit 5: C Programming – Structure and Unions, Enumeration. Functions, parameter passing, call-by-value, call-by-reference.

Unit 6: 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.

Unit 7: C Programming – File handling, reading from and writing to files. File processing functions.

Unit 8: Pre-processor directives (inclusion, definition, conditional compilation, pragma). Makefiles. Static and shared libraries. Introduction to LLVM and Clang.

Text /Reference Book(s)

1. Programming in ANSI C by E. Balagurusamy
2. The C Programming Language by Brian Kernighan, Dennis Ritchie
3. Let us C by Yashavant Kanetkar

1.1.8 CSP111

Course code **: CSP111**
Course title **: IT Workshop - 1**
Year/Semester **: I/I**
Branch **: CSE, ECE**
Course credits **: 2**
Course prerequisites **: 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 past:

- ✓ Shell scripting (Linux)
- ✓ Robotics project (Arduino boards)

1.1.9 HSP101

Course code : **HSP101**
Course title : **English Communication Lab**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

Unit 1: Pronunciation Practice – Practice in Phonetic Symbols (IPA) and Transcription on Language Laboratory software

Unit 2: 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

Unit 3: Speaking Skills Practice – Self-presentation, Extempore, Just a Minute, Weave a Story Elocution, Expansion of themes and Presentations

Reference Book(s)

1. Daniel Jones, "Cambridge English Pronouncing Dictionary", Cambridge, ELBS Cambridge
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

1.1.10 OTP101

Course code : **OTP101**
Course title : **Creative Arts / Liberal Arts**
Year/Semester : **I/I**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

This unique course is aimed to allow students to explore creative and artistic dimensions.

Following activities have been taken up by students:

- ✓ Vocal Music
- ✓ Rangoli Creation
- ✓ Cookery Workshop
- ✓ Invited lectures (Building Self Confidence and a Positive Attitude, Mind-Body Interface)
- ✓ Movie Making
- ✓ Cleanness Drive

1.2 II Semester

1.2.1 MAT102

Course code : **MAT102**
Course title : **Mathematics –II**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Integral Calculus – Improper integrals, Area and length of curves, Surface area and volume of solid of revolution. Multiple integrals, Change of order of integration.

Unit 2: 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.

Unit 3: 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.

Unit 4: 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.

Unit 5: 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

1.2.2 ECT102

Course code : **ECT102**
Course title : **Electronic Devices and Circuits**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: 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)

Unit 2: 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

Unit 3: Field Effect Transistor (FET types, operation, configurations, characteristics), Metal-Oxide Semiconductor FET (MOSFET types, their logic gate applications), Complimentary MOSFET (CMOS)

Unit 4: 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)

Unit 5: 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, "Fundamentals of Electrical Engineering", Oxford University Press, 2nd Edition
2. Jacob Millman, Christos C. Halkias, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw Hill
3. J. Millman, H. Taub, "Pulse, Digital and Switching Waveforms", 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

1.2.3 CST102

Course code : **CST102**
Course title : **Data Structures and Algorithms**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I

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).

Unit- II

Array and Linked list: 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.

Unit- III

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

Unit- IV

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.

Unit- V

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, Sartaj Sahni, “Fundamentals of Data Structures”, Computer Science Press
2. R.L. Kruse, “Data Structure and Program Design”, Prentice-Hall India

Reference Books:

1. Aho A.V., J.E. Hop croft, J.D. Ullman, Data Structures and algorithms, Addison Wesley.
2. Aaron M. Tenenbaum, Y. Langsam, Moshe J. Augenstein, Data Structures Using C.
3. Mark Allen Weiss, Data Structures and Algorithm Analysis.

1.2.4 CST104

Course code : **CST104**
Course title : **Internet and Web Technology**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Introduction – Open Source Environments/Platforms, Protocols, client, server, secure connections, application and development tools, the web browser, Web data representation

Unit 2: Client side scripting: Javascript, website development with Javascript, Advance script, web browser environments, forms and validations, HTML, CSS, XML, event handling

Unit 3: Server side scripting – Introduction to Apache web server, MySQL database, LAMP (Linux Apache MySQL PHP). PHP & Python - starting to script on server side, Servlets, JSP, Java Beans, EJB, JDBC, Arrays, function and forms.

Unit 4: Building web applications – Cookies, Sessions, Browser compatibilities issues, security issues, use of frameworks in web development.

Unit 5: Case Study – Contemporary web frameworks

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

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

1.2.5 HST102

Course code : **HST102**
Course title : **Health Safety and Environment**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

Unit 1: Report Writing
Unit 2: Business correspondence (letters of enquiry, order, complaints and reply). Notices, Agenda, Minutes of meeting
Unit 3: Vocabulary practice
Unit 4: 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. Pushp Lata, "Communicate to Conquer: A Handbook of Group Discussion and Job Interviews", PHI Learning
3. Nira Konar, "Communication Skills for Professionals", PHI Learning, 2011
4. Kavita Tyagi, Padma Mishra, "Advanced Technical Communication", PHI Learning
5. Sanjay Kumar, Pushp Lata, "Communication Skills", Oxford, 2011

1.2.6 HST104

Course code : **HST104**
Course title : **Human Values and Effective Communication**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **2**
Course prerequisites : **None**

Syllabus

Unit 1: 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.

Unit 2: Safety performance – As per Indian and International standards; Hazard analysis: Cost effectiveness in hazard elimination, logical analysis, HAZOP; Probabilistic reliability considerations, Safety management techniques.

Unit 3: 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

1.2.7 ECP102

Course code : **ECP102**
Course title : **Electronic Devices and Circuits Lab**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

Exp 1: To (i) study basic measurements using various lab equipment such as DMM, DSO, function generator and power supply, and (ii) identify basic circuit elements such as resistor, capacitor, diode and transistor
Exp 2: To study (i) i-v characteristics of pn junction and zener diodes, and (ii)half-wave and full-wave rectifiers using pn junction diode
Exp 3: To study positive and negative level clipper and clamper circuits using pn junction diode
Exp 4: To study voltage regulator using (i) pn junction diode with resistive plus capacitive loads, (ii) Zener diode with resistive only load
Exp 5: To study BJT input and output characteristics in CB, CE and CC configurations
Exp 6: To study FET output and transfer characteristics in CG, CS and CD configurations
Exp 7: To study BJT amplifier in CB configuration and obtain its frequency response
Exp 8: To study BJT amplifier in CE configuration and obtain its frequency response
Exp 9: To study FET amplifier in CS configuration and obtain its frequency response
Exp 10: To study RC phase-shift oscillator and Wien bridge oscillator using BJT

Text book(s)

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

1.2.8 CSP102

Course code : **CSP102**
Course title : **Data Structure and Algorithms Lab**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

Concepts revision of C Programming Language, Data Types Revisited, Variable and Constant, Static and Dynamic Memory Allocation, Array, Pointer, Structure, Strings, Sorting (Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort), Searching (Linear search and binary search), Linked list (Creation, Insertion, Deletion and Search operations in Singly Linked List, Circular Linked List, Doubly Linked List and Circular Doubly Linked List), Recursion, Stack, Queue, Circular Queue, Priority Queue, Double Ended Queue, Infix, Prefix and Postfix expression conversion, Tree (Creation of Binary and Multiway tree, Insertion, Deletion and Search in Binary Tree, Creation, Insertion, Deletion in Binary Search Tree, Inorder, Preorder and Postorder Traversal, Creation of Heap Tree, Heap sort), Graph (Creation of Directed and Undirected Graph, Depth First Traversal and Breath First Traversal)

Text book(s)

1. Ellis Horowitz, Sartaj Sahni, “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

1.2.9 CSP112

Course code **: CSP112**
Course title **: IT Workshop -2**
Year/Semester **: I/II**
Branch **: CSE, ECE**
Course credits **: 2**
Course prerequisites **: 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 past:

- ✓ Python
- ✓ Matlab

1.2.10 HSP104

Course code : **HSP104**
Course title : **Soft Skills Development Lab**
Year/Semester : **I/II**
Branch : **CSE, ECE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

1.2.11 OTD102

Course code **: OTD102**
Course title **: Independent Project**
Year/Semester **: I/II**
Branch **: CSE, ECE**
Course credits **: 1**
Course prerequisites **: None**

Syllabus

This unique course is aimed to allow students to explore their creative dimension by one Independent Project in the first year.

2 B. Tech. CSE 2nd Year

Semester - III						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	MAT201	Discrete Mathematical Structures	3	0	0	3
2	ECT201	Microprocessors and Microcontrollers	3	0	0	3
3	ECT209	Communication Systems	3	0	0	3
4	CST201	Database Management System	3	0	0	3
5	CST203	Object Oriented System Design	3	0	0	3
6	BMT201	Engineering Economics	3	0	0	3
		Labs				
7	ECP201	Microprocessors and Microcontrollers Lab	0	0	2	1
8	CSP201	Database Management System Lab	0	0	2	1
9	CSP203	Object Oriented System Design Lab	0	0	2	1
10	CSP211	IT Workshop - 3	0	0	3	2
Total			18	0	9	**23**

Semester - IV						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST202	Software Engineering	3	0	0	3
2	CST204	Computer Architecture and Organization	3	0	0	3
3	CST206	Design and Analysis of Algorithms	3	0	0	3
4	CST208	Operating Systems	3	0	0	3
5	CST210	Introduction to Logic and Formal Methods	3	0	0	3
6	HST202	Technical Writing and Professional Communication	3	0	0	3
		Labs				
7	CSP204	Computer Architecture and Organization Lab	0	0	2	1
8	CSP206	Design and Analysis of Algorithms Lab	0	0	2	1
9	CSP208	Operating Systems Lab	0	0	2	1
10	HSP202	Professional Communication Lab	0	0	2	1
Total			18	0	8	**22**

2.1 III Semester

2.1.1 MAT201

Course code : **MAT201**
Course title : **Discrete Mathematical Structures**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1 – Set theory: Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability, proofs of some general identitites on sets. Relation and Functions: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, equivalence relation partial ordering relation. Function: Definition and types of function, composition of functions), pigeonhole principle.

Unit 2 – Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, converse, inverse, contrapositive, negation, and contradiction.

Unit 3 – Combinatorics: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, and Inhomogeneous recurrence relation), and generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit 4 – Algebraic Structure: Binary composition and its properties definition of algebraic structure; Semi group, Monoid Groups, Abelian Group, properties of groups, Homomorphism, isomorphism, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

Unit 5 – Number Theory: Number-theoretic algorithms: Greatest Common Divisor, Chinese Remainder Theorem, Primality testing, polynomial representation of binary number, Galois fields, primitive roots.

Unit 6 – Graph Theory: Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree (rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).

Textbook(s)

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.
3. Grimaldi, R.P. “Discrete and Combinatorial Mathematics”, Pearson Education, 2002

Reference book(s)

1. Koshy, Discrete Mathematics with Applications, Elsevier
2. Kolman B., Busby R: Discrete Mathematics Structures for Computer Science, PHI
3. C.L.Liu, Elements of Discrete Mathematics, McGraw-Hill Book
4. Foulds: Graphs Theory Applications, Narosa

2.1.2 ECT201

Course code : **ECT201**
Course title : **Microprocessors and Microcontrollers**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: 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.
Unit 2: 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
Unit 3: 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.
Unit 4: Comparative study of 8086 – Architecture, Instructions & Instruction Format, Addressing (no programming & no detailed study of Instruction Set).
Unit 5: 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 (no programming).

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

2.1.3 ECT209

Course code : **ECT209**
Course title : **Communication Systems**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Introduction to communication systems; concepts of signal-to-noise ratio, channel bandwidth, rate of communication, randomness, redundancy, coding; Classification of signals and useful signal operations, Frequency domain representation of signals using Fourier transform, Important properties of Fourier transform, Signal transmission through a linear system, Ideal and practical filters, Energy and power of a signal, Energy and power spectral density

Unit 2: Principle of modulation, Amplitude modulation and demodulation systems (DSB-FC, DSB-SC, SSB-SC, VSB-SC modulations; Carrier acquisition, Super heterodyne AM receiver), Concept of angle modulation (frequency modulation and phase modulation), Generation and demodulation of FM waves, Interference in angle modulated systems

Unit 3: 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; Emerging digital communication technologies

Text book(s)

1. B.P. Lathi, “Modern Digital & Analog Communications Systems”, Oxford University Press

Reference book(s)

1. S. Haykin,"Communications Systems", John Wiley and Sons, 2001
2. J. G. Proakis, M. Salehi, "Communication Systems Engineering", Pearson Education, 2002
3. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001

2.1.4 CST201

Course code : **CST201**
Course title : **Database Management System**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I

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

Unit- II

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

Unit- III

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.

Unit- IV

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.

Unit- V

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

Text Books:

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

Reference Books:

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

2.1.5 CST203

Course code : **CST203**
Course title : **Object Oriented System Design**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

2.1.6 BMT201

Course code : **BMT201**
Course title : **Engineering Economics**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Basic Economic Concepts and foundations of economics for decision – making; circular flows.
Unit 2: Demand analysis and consumer behavior; elasticity of demand and its measurement; supply analysis and price – mechanism.
Unit 3: Production Analysis – short run and long run production functions; law of variable proportions and returns to scale.
Unit 4: Cost Concepts and Analysis (short run and long run), Revenue curves under perfect and imperfect competition.
Unit 5: Break Even Analysis (revenue - cost - output relationship).
Unit 6: Market Structures; pricing in perfect competition, monopoly, monopolistic competition and oligopoly.
Unit 7: Economic Appraisal Techniques (pay - back period, NPV, IRR, cost - benefit ratio).
Unit 8: 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

2.1.7 ECP201

Course code **: ECP201**
Course title **: Microprocessors and Microcontrollers**
Year/Semester **: II/I**
Branch **: CSE**
Course credits **: 1**
Course prerequisites **: None**

Syllabus

Exp 1: Introduction
Exp 2: Data Transfer Operations (Immediate, Direct and Register addressing; Register Indirect Addressing; Direct Addressing)
Exp 3: Flag operations
Exp 4: Arithmetic and Logical Operations (8-bit Addition and Subtraction, One's Complement, Mask Off Most Significant Four Bits, Set Bits, Logical Operations, Packed to Unpacked)
Exp5: Branch Instructions (8-bit Multiplication, 8-bit By 8-bit Division, 24-bit Multiprecision Addition, Sum of N elements)
Exp 6: Code Conversion (ASCII to Decimal Conversion, BCD to Hex Conversion, Hex to Decimal Conversion, Hex to Binary Form)
Exp 7: Array Operation (Biggest Number in an Array; Arrange in Descending Order; Number of Zero, Positive and Negative Numbers; Square of a Number)

2.1.8 CSP201

Course code : **CST201**
Course title : **Database Management System Lab**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

2.1.9 CSP203

Course code : **CSP203**
Course title : **Object Oriented System Design Lab**
Year/Semester : **II/I**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

2.1.10 CSP211

Course code : CSP211
Course title : IT Workshop -3
Year/Semester : II/I
Branch : CSE
Course credits : 2
Course prerequisites : 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 past:

- ✓ Web Development

2.2 IV Semester

2.2.1 CST202

Course code : **CST202**
Course title : **Software Engineering**
Year/Semester : **II/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

UNIT I: Introductory Concepts: Historical perspective, System Definition, Software development Life Cycle and Models, Software Engineering paradigms.

UNIT II: Software Project Management: Project management process, metrics for software productivity and quality, observations on estimating, project planning objectives, software scope, project estimation, decomposition techniques, empirical estimation models, automated estimation tools, project planning, risk analysis, project scheduling, software acquisition, software re-engineering, organizational planning, software project plan.
Software Requirement Analysis: System analysis, requirement analysis, methods; data structure-oriented methods, automated techniques for requirement analysis.

UNIT III: Software Design: Design process, design fundamentals, effective modular design, data design, architectural design, procedural design, data flow-oriented design, Coding style & efficiency User interface design – human factors, styles of human-computer interaction, human-computer interface design, interface design guidelines.

UNIT IV: Software Quality Assurance: Quality assurance, software reviews, formal technical reviews, software quality metrics, formal approaches, software reliability.
Software Testing: white box, black box, basis path and control structure. Software Testing Strategies: Strategic approach to software testing, unit testing, integration testing, validation testing, system testing, art of debugging.

UNIT V: Software Maintenance: Characteristics, maintainability, tasks, side effects. Software configuration management (SCM)- SCM process, identification of objects in the SCM process, version control, change control, configuration audit, status reporting, SCM standards.

Text Books:

1. Pressman R.S: Software Engineering: A Practitioner Approach, McGraw Hill.
2. Sommerville I: Software Engineering, Addison Wesley

Reference Books:

1. Ghezzi C. Jazayeri M and Mandrioli: Fundamentals of Software Engineering, PHI.
2. Gamma, Helm, Johnson, Vlissides: Design Patterns - Elements of Reusable Object - Oriented Software

2.2.2 CST204

Course code : **CST204**
Course title : **Computer Architecture and Organization**
Year/Semester : **II/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: 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.

Unit 2: 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

Unit 3: 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)

Unit 4: 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

Unit 5: 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

2.2.3 CST206

Course code : CST206
Course title : Design and Analysis of Algorithms
Year/Semester : II/II
Branch : CSE
Course credits : 3
Course prerequisites : None

Syllabus

Unit I: 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.

Unit II: Divide and Conquer:
Heap Sort, Merge Sort, Quick sort, Order Statistics – finding the median, exponentiation, matrix multiplication.(5 Hours)Sorting in Linear Time: Count Sort, Radix Sort, Bucket Sort.

Unit III: 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.

Unit IV: 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.

Unit V: String matching algorithms:
Naive, Rabin Karp, KMP, Boyer Moore.
Introduction to problem classes: P, NP, NPC, NP-Hard problems.

Text Books:
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 Books:
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

2.2.4 CST208

Course code : **CST208**
Course title : **Operating Systems**
Year/Semester : **II/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I
Introduction and Process Management
Introduction and need of operating system, layered architecture, logical structure 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, hierarchy, context switching, process implementation, process control block, basic system calls, Linux and Windows. Threads - processes versus threads, threading, kernel and user level threads, thread usage, benefits, and multi-threading.

Unit- II
Inter-Process Communication and Process Scheduling
Introduction to message passing, race condition, critical section problem, mutual exclusion with busy waiting, disabling interrupts, lock variables, strict alteration, Peterson's solution, TSL instructions, sleep and wakeup calls, Semaphore, monitors. Classical IPC problems.
Process scheduling - basic concepts, classification, CPU and I/O bound, CPU scheduler - short, medium, long-term, dispatcher. Scheduling - preemptive and non-preemptive, static and dynamic, Priority, Co-operative & Non-cooperative, Scheduling algorithms - FCFS, SJFS, Shortest Remaining Time, round robin, priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, fair share scheduling.

Unit- III
Deadlock and Memory Management
System model, resource types, deadlock problem, methods for deadlock handling, detection. Deadlock prevention, avoidance, recovery from deadlock.
Memory management - concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading. Memory allocation schemes - first fit, next fit, best fit, worst fit and quick fit. Free space management - bitmap, link list/free list, buddy's system, memory protection and sharing, relocation and address translation.

Unit- IV Virtual Memory
Virtual Memory - concept, virtual address space, pure paging scheme. Segmentation, segmentation with paging scheme, hardware support and implementation details, memory fragmentation, demand paging, pre-paging, page fault frequency, thrashing. Page replacement algorithms - optimal, MRU, FIFO, LRU, LRU- approximation clock, WS clock, Belady's anomaly, design issues for paging system. Page size, separate instruction and data spaces, shared pages, cleaning policy, TLB. Inverted page table, I/O interlock, program structure, page fault handling. Basic idea of MM in Linux.

Unit- V File System and Storage
File System - concepts, naming, attributes, operations, types, structure. File organization and access (Sequential, Direct, Index and Sequential) methods. Memory mapped files, directory structures - one level, two level, hierarchical/tree, acyclic graph, general graph, file system mounting, file sharing, path name, directory operations. Overview of file system in Linux and windows.

Input/output subsystems - concepts, functions/goals, input/output devices- block and character. Spooling, disk structure and operation, disk attachment, disk storage capacity. Disk scheduling algorithm - FCFS, SSTF, Scan scheduling, C-scan schedule, Look and C-Look schedule.

Text Books:

1. Silberschatz and Galvin: Operating System Principals, Wiley India Pvt. Ltd.
2. Tanenbaum: Modern Operating System, Prentice Hall.

Reference Books:

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

2.2.5 CST210

Course code : **CST210**
Course title : **Introduction to Logic and Formal Methods**
Year/Semester : **II/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I
Logic and formal methods
Logic: Introduction to Logic, Propositional Logic and Predicate Logic. Reasoning: Inductive reasoning and deductive reasoning, proof examples. Formal methods – need, techniques, challenges.

Unit- II
Propositional logic:
Elements, Truth table, Declarative sentences, Construction of Proposition, Converse and Contrapositive, Reasoning with Propositions, Natural deduction – rules, Provable equivalence, Semantics, logical connectives, Soundness and completeness of propositional logic, Normal forms, Identities of Propositions and Dual, Use of Identities, Implications, Reasoning with Propositions, Proof of Identities, Proof of
Implications, Semantic equivalence, satisfiability and validity, Conjunctive normal forms (CNF).

Unit- III
Predicate logic:
Terms, Formulas - Well Formed Formula (WFF) of Predicate Logic, Constructing Formulas; Free and bound variables, Reasoning with Predicate Logic, deduction rules, Resolution theorem proving, Quantifiers, Semantics, Undecidability of predicate logic, Expressiveness, second-order logic.

Unit- IV
Verification:
Validation v/s verification, need and challenges.
Linear-time temporal (LTL) logic, Syntax and Semantics, Model checking: systems, tools, properties, Branching-time temporal logic – Syntax and Semantics of CTL, Model-checking algorithms

Unit- V
Program verification: Hoare triple, Partial and total correctness, Introduction to Modal logic – syntax and semantics, Binary decision diagrams (BDD).

Text Books:
1. Michael Huth, Mark Ryan: Logic in Computer Science: Modelling and Reasoning about Systems, Cambridge University Press.

References:
http://web.mit.edu/16.35/www/lecturenotes/FormalMethods.pdf
http://formalmethods.wikia.com/wiki/VL
https://users.ece.cmu.edu/~koopman/des_s99/formal_methods/

2.2.6 HST202

Course code : **HST202**
Course title : **Technical Writing and Professional Communication**
Year/Semester : **II/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit 1: Introduction – Technical Communication skills, Reading, Listening, Writing, and Speaking. Improving these with comprehension
Unit 2: Paragraph Writing, Expansion, Abstract and Specific words, avoiding Jargon and Cliches
Unit 3: Technical Note taking, Mechanics & Note-taking Techniques
Unit 4: Technical description of Engineering Objects/Products/ Processes, Manual writing, Slogan Writing Speech Advertising
Unit 5: Vocabulary Building: Prefixes, Suffixes, One word Substitutions, root words, commonly used foreign words and phrases
Unit 6: Punctuation, Use of Modals

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"

2.2.7 CSP204

Course code : CSP204
Course title : Computer Architecture and Organization Lab
Year/Semester : II/II
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

2.2.8 CSP206

Course code : **CSP206**
Course title : **Design and Analysis of Algorithms Lab**
Year/Semester : **II/II**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

2.2.9 CSP208

Course code : CSP208
Course title : Operating Systems Lab
Year/Semester : II/II
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

2.2.10 HSP202

Course code : HSP202
Course title : Professional Communication Lab
Year/Semester : II/II
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

3 B. Tech. CSE 3rd Year

Semester - V						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST301	Theory of Computation	3	0	0	3
2	CST303	Computer Networks	3	0	0	3
3	CST305	Information Systems and Security	3	0	0	3
4	CST307	Computer Graphics	3	0	0	3
5	CST309	Elective - 5.1	3	0	0	3
6	BMT301	Business Environment	3	0	0	3
		Labs				
7	CSP303	Computer Networks Lab	0	0	2	1
8	CSP305	Information Systems and Security Lab	0	0	2	1
9	CSP307	Computer Graphics Lab	0	0	2	1
10	CSD309	Technical Presentation / Seminar - I	0	0	2	1
Total			18	0	8	**22**
Semester - VI						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	MAT302	Information Theory and Coding	3	0	0	3
2	CST302	Compiler Design	3	0	0	3
3	CST304	Elective - 6.1	3	0	0	3
4	HST302	Communication Techniques, Interview and GD	3	0	0	3
		Labs				
5	CSD300	Project – I	0	0	9	6
6	CSP302	Compiler Design Lab	0	1	2	2
7	CSP304	Elective - 6.1 Lab	0	0	2	1
8	HSP302	Communication Techniques Lab	0	0	2	1
Total			12	1	15	**22**

3.1 V Semester

3.1.1 CST301

Course code : CST301
Course title : Theory of Computation
Year/Semester : III/I
Branch : CSE
Course credits : 3
Course prerequisites : None

Syllabus

Unit I

Proving techniques- Mathematical induction - Diagonalization principle - Pigeonhole principle - Functions - Primitive recursive and partial recursive functions - Computable and non-computable functions, Formal representation of languages - Chomsky classification

Unit II

Introduction to Automata Theory, Definition of Automation, Finite automata, Language acceptability by finite automata, Deterministic and non-deterministic finite automation, Regular expressions, Finite automation with ϵ transitions, Conversion of NFA to DFA, Minimization of DFA, DFA to Regular expressions conversion, Pumping lemma for regular languages, Applications of finite automata, NFA with o/p (moore / mealy).

Unit III

Context Free Grammar, Simplification of CFG, Normal forms: Chomsky Normal form and Greibach Normal form, pumping lemma for Context free languages, Applications of PDA,
Pushdown Automata, Formal definition, Language acceptability by PDA through empty stack and final state, Deterministic and nondeterministic PDA, designing of PDA.

Unit IV

Turing Machines: Formal definition, Language acceptability by TM, TM as acceptors, Transducers, designing of TM, Two way infinite TM, Multi tape TM, Universal Turing Machines, Church's Thesis-Godelization, Time complexity of TM, Halting Problem, Rice theorem, Post correspondence problem, Linear Bounded Automata.

Unit V

Complexity classes, tractable problems, Class P, P Complete-Reduction problem, Context grammar nonempty, intractable problems- Class NP – NP Complete- Cooks theorem, Reduction problems-SAT-Clique-Hamiltonian-TSP-Vertex Cover-NP Hard problems.

Text books

1. Hopcroft, J, E; Motwani, J; Ullman, J, D (2002). Introduction to Automata Theory, Languages and Computation. Pearson Education.
2. Mishra, K, L, P; Chandrasekaran, N (2009). Theory of Computer Science. PHI.
3. Michael Sipser – Theory of Computation

3.1.2 CST303

Course code : **CST303**
Course title : **Computer Networks**
Year/Semester : **III/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I

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.

Unit- II

Application layer, DNS, HTTP, FTP, SMTP, etc.

Unit- III

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.

Unit- IV

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.

Unit- V

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.

Unit- VI

Introduction to Mobile Networks, Wi-Fi, MANET.

Network Security.

SAN, FC, ISCSI.

Text Books:

1. Computer Networks A Systems Approach by Peterson and Davie

Reference Books:

1. Computer Networking A Top-Down Approach by Kurose and Ross.
2. An Engineering Approach to Computer Networking by S. Keshav.

3.1.3 CST305

Course code : CST305
Course title : Information Systems and Security
Year/Semester : III/I
Branch : CSE
Course credits : 3
Course prerequisites : None

Syllabus

3.1.4 CST307

Course code : **CST307**
Course title : **Computer Graphics**
Year/Semester : **III/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

Unit- I
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)

Unit- II
2D & 3D Co-ordinate System
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.

Unit- III
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.

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

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

Text Books:
1. Hearn and Baker – Computer Graphics

Reference Books:

3.1.5 CST309

Course code : **CST309**
Course title : **Elective – 5.1**
Year/Semester : **III/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

3.1.6 BMT301

Course code : **BMT301**
Course title : **Business Environment**
Year/Semester : **III/I**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

3.1.7 CSP303

Course code : CSP303
Course title : Computer Networks Lab
Year/Semester : III/I
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

3.1.8 CSP305

Course code : **CSP305**
Course title : **Information Systems and Security Lab**
Year/Semester : **III/I**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

3.1.9 CSP307

Course code : CSP307
Course title : Computer Graphics Lab
Year/Semester : III/I
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

3.1.10 CSD309

Course code : CSD309
Course title : Technical Presentation/Seminar – II
Year/Semester : III/I
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

3.2 VI Semester

3.2.1 MAT302

Course code : **MAT302**
Course title : **Information Theory and Coding**
Year/Semester : **III/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

3.2.2 CST302

Course code : CST302
Course title : Compiler Design
Year/Semester : III/II
Branch : CSE
Course credits : 3
Course prerequisites : None

Syllabus

Unit- I
Introduction to compilers, translators, and interpreters, compilation process. Tale of two Compliers – GCC and LLVM

Unit- II
Lexical Analysis: Finite automata, Regular expressions, Design & implementation of lexical analyzers.
Syntax Analysis: Context Free Grammars, Derivation and Parse trees, Bottom-up and Top-down Parsing. Ambiguity, Shift Reduce Parser, Operator Precedence Parser, Predictive Parsers, canonical collection of items, LR parsers.

Unit- III
Syntax directed translation: Syntax directed translation, Attributes, Intermediate codes, three address codes. Symbol table organization: Hashing, linked list, tree structures.

Unit- IV
Memory allocation: Static and dynamic structure allocation.
Code optimization: Basic blocks, Flow graphs, DAG, Global data flow analysis and chaining, available expressions, Loop optimization.

Unit- V
Code generation: Compilation of expression and control structures. Error detection and recovery.

Unit- VI
Case study: (i) GCC or (ii) LLVM and Clang

Text Books

Reference Books

3.2.3 CST304

Course code : **CST304**
Course title : **Elective – 6.1**
Year/Semester : **III/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

3.2.4 HST302

Course code : HST302
Course title : Communication Techniques, Interview and GD
Year/Semester : III/II
Branch : CSE
Course credits : 3
Course prerequisites : None

Syllabus

3.2.5 CSD300

Course code : CSD300
Course title : Project –I
Year/Semester : III/II
Branch : CSE
Course credits : 6
Course prerequisites :

Syllabus

3.2.6 CSP302

Course code : CSP302
Course title : Compiler Design Lab
Year/Semester : III/II
Branch : CSE
Course credits : 2
Course prerequisites : None

Syllabus

3.2.7 CSP304

Course code : **CSP304**
Course title : **Elective – 6.1**
Year/Semester : **III/II**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

3.2.8 HSP302

Course code : HSP302
Course title : Communication Techniques Lab
Year/Semester : III/II
Branch : CSE
Course credits : 1
Course prerequisites : None

Syllabus

4 B. Tech. CSE 4th Year

Semester - VII						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST401	Elective - 7.1	3	0	0	3
2	CST403	Elective - 7.2	3	0	0	3
3	OTT401	Open Elective	3	0	0	3
		Labs				
4	CSD405	Project - II	0	0	9	6
5	CSD407	Technical Presentation / Seminar - II	0	0	2	1
Total			9	0	11	**16**

Semester - VIII						
Sr. No.	**Subject Code**	**Subject**	**Scheme**			
			L	**T**	**P**	**Credits**
1	CST402	Elective - 8.1	3	0	0	3
2	CST404	Elective - 8.2	3	0	0	3
3	OTT402	Open Elective	3	0	0	3
4	BMT402	IPRs and IT Laws	3	0	0	3
		Labs				
5	CSP402	Elective - 8.1 Lab	0	0	2	1
6	CSP408	Survey / Thought Based Project	0	0	2	1
Total			12	0	4	**14**

4.1 VII Semester

4.1.1 CST401

Course code : CST401
Course title : Elective – 7.1
Year/Semester : IV/I
Branch : CSE
Course credits : 3
Course prerequisites :

Syllabus

4.1.2 CST403

Course code : CST403
Course title : Elective – 7.2
Year/Semester : IV/I
Branch : CSE
Course credits : 3
Course prerequisites :

Syllabus

4.1.3 OTT401

Course code : OTT401
Course title : Open Elective
Year/Semester : IV/I
Branch : CSE
Course credits : 3
Course prerequisites :

Syllabus

4.1.4 CSD405

Course code : CSD405
Course title : Project-II
Year/Semester : IV/I
Branch : CSE
Course credits : 6
Course prerequisites :

Syllabus

4.1.5 CSD407

Course code : CSD407

Course title : **Technical Presentation/Seminar-II**
Year/Semester : **IV/I**
Branch : **CSE**
Course credits : **1**
Course prerequisites :

Syllabus

4.2 VIII Semester

4.2.1 CST402

Course code : **CST402**
Course title : **Elective – 8.1**
Year/Semester : **IV/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites :

Syllabus

4.2.2 CST404

Course code : **CST404**
Course title : **Elective – 8.2**
Year/Semester : **IV/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites :

Syllabus

4.2.3 OTT402

Course code : **OTT402**
Course title : **Open Elective**
Year/Semester : **IV/II**
Branch : **CSE**
Course credits : **3**
Course prerequisites :

Syllabus

4.2.4 BMT402

Course code : **BMT402**
Course title : **IPRs and IT Laws**
Year/Semester : **IV/II**

Branch : **CSE**
Course credits : **3**
Course prerequisites : **None**

Syllabus

4.2.5 CSP406

Course code : **CSP406**
Course title : **Elective – 8.1 Lab**
Year/Semester : **IV/II**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

4.2.6 CSP408

Course code : **CSP408**
Course title : **Survey/Thought Based Project**
Year/Semester : **IV/II**
Branch : **CSE**
Course credits : **1**
Course prerequisites : **None**

Syllabus

5 Appendix A. Course Codes

Following Naming Convention has been used for course codes:

First two characters denote stream or department code.

- CS - Computer Science and Engineering
- EC - Electronics and Communication Engineering
- MA - Mathematics
- HS - Humanities and Social Sciences
- BM - Management Studies
- OT - Others / Open Elective

Next one character denotes mode of the course being offered.

- T - Theory Lecture
- P - Practice Lab
- D - Dissertation for project/seminar

Next a 3-digit number completes course code.

- 1st digit indicates year, e.g. 1/2/3/4
- 2nd and 3rd digits together make an incrementing number such that an odd number is used for odd semester and an even number is used for even semester.

6 Appendix B. Course Credits

All theory courses in B. Tech. CSE are of 3 credits each unless specified explicitly.

All lab courses are of 1 credits each unless specified explicitly.

IT workshops are of 2 credits each.

What is the definition of 1 credit?
We define 1 credit as 1 hour classroom learning per week for theory courses. For complementary lab courses 2 hours of engagement per week is 1 credit and 3 hours of engagement per week is 2 credits. Students are encouraged and expected to dedicate at least the same number of hours per week outside classrooms.

Note: - Regarding minimum and maximum credits in each semester or all other such restrictions, rules of concerned scheme will be applicable. These topics are not in the scope of this syllabus document.

7 Appendix C. Elective Courses

Note: - Newly proposed elective courses may be added here as and when courses are offered.

AI and Neural Networks
Course code :
Course title : AI and Neural Networks
Course credits : 3
Course prerequisites :

Syllabus

Unit I Problem Solving

Introduction: Intelligent Agents; Problem Formulation; Problem Solving by Searching – Uninformed Search (BFS, Uniform cost, DFS, Depth limited, Iterative deepening, Bidirectional), Constraint Satisfaction Search, Heuristic Functions, Informed Search (Greedy search, A*, IDA*, SMA*), Hill Climbing, Simulated Annealing

Unit II Logical Reasoning

Knowledge-based Agents: Reasoning and Logic; Propositional Logic – Syntax, Semantics, Validity, Inference; First-order Logic; Inference in First-order Logic – Inference Rules, Forward and Backward Chaining, Completeness, Resolution,

Unit III Planning

Planning Agent: Problem Solving to Planning; Planning with State Space Search; Partial-Order Planning; Planning and Acting in Real World – Conditional Planning, Replanning, Planning and Execution

Unit IV Uncertain Knowledge and Reasoning

Uncertainty; Rational Decisions: Probability Review and Reasoning; Bayes' Rule – Simple case and Normalization; Bayesian Networks; Hidden Markov Models (HMM)

Unit V Learning Using Neural Network

Learning from Observations: Hypothesis and Hypothesis Space; Learning in Neural Networks – Neural Networks Basics, Perceptron, Some Simple Networks - Feed Forward and Back Propagation Learning in Single and Multilayer Networks;
Different Network Architectures and their Applications; Comparison of Neural Networks and Rule-Based Methods; Benefits of Neural Computing; Limitations of Neural Computing

Text Books:

1. S. Russell and P. Norvig, "Artificial Intelligence – A Modern Approach", Prentice-Hall, 2009.
2. Rajendra Akerkar, "Introduction to Artificial Intelligence", PHI, 2005

Reference Books

1. G. F. Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Fifth Edition, Addition Wesley, 2005.
2. N. J. Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann Publishers, 1998.
3. Kevin L. Priddy and Paul E. Keller, "Artificial Neural Networks – An Introduction", SPIE Press, 2005.

Intelligent System Design
Course code :
Course title : Intelligent System Design
Course credits : 3
Course prerequisites :

Syllabus

Introduction: Evolution of AI as a discipline, Definitions and approaches, Subject matter of AI, Foundations of AI, Philosophical issues, the Turing test. Applications of AI.

Unit- II

Intelligent agents: Fundamental concepts of intelligent agents, concepts, methods, techniques, and tools for the use of intelligent agents in computer-based systems, components and functions of intelligent agents, properties of intelligent agents, PEAS (Performance measure, Environment, Actuators, Sensors), structure of agents, agent programs, types of agents.

Unit- III

Fuzzy systems: The uncertain and inexact nature of the real world: ideas and examples; fuzzy membership functions; fuzzy numbers and fuzzy arithmetic, Basic concept and properties of fuzzy logic versus classical two-valued logic, Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, properties of fuzzy sets, fuzzy relations. Propositional logic and Predicate logic, fuzzy If – Then rules, fuzzy mapping rules and fuzzy implication functions, Applications.

Unit- IV

Game Theory: Game as a Search Problem, Abstract definition of Two player games as search problem, game tree, Minimax algorithm, Alpha beta pruning.
Definitions: Cooperative v/s Non-cooperative games, Fair v/s Unfair games, finite/infinite games, simultaneous/parallel games, zero sum games.
Introduction to Nash Equilibrium and its application is solving problem.

Unit- V

Logic: Motivation for logic, reasoning, formal methods, verification.
Propositional logic, connectives, truth tables, well-formed formula (WFF). Tautology, contradiction, priority of operators. Predicate Logic, quantifiers, well-formed formula (WFF), priority or operators.
Introduction to temporal logic, Modal logic, Hoare Triple, Program Logic.
Inference rules for natural deduction, examples. Logical equivalence.
Resolution Theorem Proving (proof by contradiction), Unification, substitution, Most General Unifier.

Text Books:

1. Artificial Intelligence by Rich and Knight
2. Artificial Intelligence A Modern Approach by Russell and Norvig

Reference Books:

1. Logic in Computer Science by Huth and Ryan

Machine Learning
Course code :
Course title : Machine Learning
Course credits : 3
Course prerequisites :

Syllabus

Unit I Introduction

Learning Problems; Perspectives and Issues in Machine Learning; Concept Learning; General-to-Specific Ordering; Hypothesis and Hypothesis Space; Version Space; Find_S Algorithm; Candidate_Elimination Algorithm; Biased and Unbiased Learning; Decision Tree Learning; Inductive Bias; Issues in Decision Tree Learning

Unit II Bayesian Learning and Statistical Testing

Sampling Theory; Evaluating Hypothesis; Binomial Distribution; Confidence Interval; Parametric and Non-Parametric Statistical Tests; t-Tests – Student t-test, Paired and Unpaired t-tests; Z-test; ANOVA; Bayes Theorem and Concept Learning; Maximum Likelihood; Bayes Optimal Classifier; Naïve Bayes Classifier; Gibbs Algorithm; Bayesian Belief Networks; Probability Learning; EM Algorithm

Unit III Linear Models

Regression Problem; Univariate Linear Regression; Multivariate Linear Regression; Regularized Regression; Logistic Regression; Gradient Descent; Variable Types and Coding; Least Square Estimation; Maximum Likelihood Estimation; Variable Interactions; Model Selection; Under fitting, Fitting and Overfitting; Shrinkage and Ridge Regression; Case Weights

Unit IV Instant Based Learning and Unsupervised Learning

K- Nearest Neighbor Learning; Locally Weighted Regression; Radial Basis Functions; Case Based Learning; K-means Clustering; Hierarchical Clustering; Principal Component Analysis (PCA); Independent Component Analysis (ICA)

Unit V Neural Networks and Support Vector Machines

Neural Network Representation; Problems; Perceptron; Single Layer Networks; Multilayer Networks; Feed Forward and Back Propagation Algorithms; Learning Neural Networks Structures; Support Vector Machines (SVM); Soft Margin SVM; Going Beyond Linearity

Text/Reference Books:

1. Tom M. Mitchell, “Machine Learning”, McGraw Hill.
2. S. Haykin, “Neural Networks and Learning Machines”, Pearson.
3. S. Marsland, “Machine Learning: An Algorithmic Perspective”, CRC Press.

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Malware Analysis and Detection

Course code :
Course title : Malware Analysis and Detection
Course credits : 3
Course prerequisites :

Syllabus

Unit I: Introduction

Introduction to malware, OS security concepts, malware threats, evolution of malware, malware types- viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs, malware analysis, static malware analysis, dynamic malware analysis.

Unit II: Advanced Static Analysis

X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, C Main Method and Offsets. Analyzing Windows programs, Portable executable file format, disassembling malicious executable programs. Anti-static analysis techniques- obfuscation, packing, metamorphism, polymorphism.

Unit III: Advanced Dynamic Analysis

Debugging malware- ollydbg, windbg, setting virtual environments- sandboxes, emulators, hypervisors, virtual machines, live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, api-calls, registries, network activities. Anti-dynamic analysis techniques- anti-vm, runtime-evasion techniques.

Unit IV: Malware Functionality

Downloaders, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Unit V: Malware Detection Techniques

Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature

Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant-inferences.

Text books:

1) Sikorski, Michael, and Andrew Honig. "Practical Malware Analysis." *Netw. Secur* 2012.12 (2012)
2) Filiol, Eric. *Computer viruses: from theory to applications*. Springer Science & Business Media, 2006

Digital Image Processing
Course code :
Course title : Digital Image Processing
Course credits : 3
Course prerequisites : Fundamentals of signal processing

Syllabus

Unit- I 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.

Unit- II 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.

Unit- III 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

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

Unit- V 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)

Unit- VI 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 Books:
1. R.C.Gonzalas and R.E.Woods, Digital Image Processing, Prentice Hall, 3rd Ed.

Reference Books:
1. A.K.Jain, Fundamentals of Digital Image Processing, Prentice Hall.
2. S.Sridhar, Digital Image Processing, Oxford University Press.

Simulation and Modelling Lab
Course code :
Course title : Simulation and Modelling Lab
Course credits : 2
Course prerequisites :

Syllabus

Unit I: Introduction to Programming
Components of a computer, Working with numbers, Machine code, Software hierarchy, Matrix theory

Unit II: P rogramming Environment
MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

Unit III: Graph Plots
Basic plotting, Built in functions, Generating waveforms,

Unit IV: Procedures and Functions
Arguments and return values, M-files, Formatted console input-output, String handling

Unit V: Control Statements Conditional statements: If, Else, Elseif, Repetition statements: While, For

Unit VI: 1D and 2D signals
Audio and Image peocessing, load save etc.