

# Syllabus for B.Tech(Computer Science & Engineering) Second Year

## & 3<sup>rd</sup> Year (Proposed)

Revised Syllabus of B.Tech CSE (for the students who were admitted in Academic Session 2010-2011)



### CSE

A. THEORY							
Sl.No.	Field	Theory	Contact Hours/Week				Cr. Points
			L	T	P	Total	
1	HU301	Values & Ethics in Profession	3	0	0	3	3
2	PH301	Physics-2	3	1	0	4	4
3	CH301	Basic Environmental Engineering & Elementary Biology;	3	0	0	3	3
4	CS301	Analog & Digital Electronics	3	0	0	3	3
5	CS302	Data Structure & Algorithm	3	1	0	4	4
6	CS303	Computer Organisation	3	1	0	4	4
<b>Total of Theory</b>						<b>21</b>	<b>21</b>
B. PRACTICAL							
7	PH391	Physics-2	0	0	3	3	2
8	CS391	Analog & Digital Electronics	0	0	3	3	2
9	CS392	Data Structure & Algorithm	0	0	3	3	2
10	CS393	Computer Organisation	0	0	3	3	2
<b>Total of Practical</b>						<b>12</b>	<b>8</b>
<b>Total of Semester</b>						<b>33</b>	<b>29</b>

### Second Year - Fourth Semester

A. THEORY							
Sl.No.	Field	Theory	Contact Hours/Week				Cr. Points
			L	T	P	Total	
1	M(CS)401	Numerical Methods	2	1	0	3	2
2	M401	Mathematics-3	3	1	0	4	4
3	CS401	Communication Engg & Coding Theory	2	0	0	3	3
4	CS402	Formal Language & Automata Theory	3	1	0	4	4
5	CS403	Computer Architecture	3	1	0	4	4
<b>Total of Theory</b>						<b>18</b>	<b>17</b>
B. PRACTICAL							
6	HU481	Technical Report Writing & Language	0	0	3	3	2
7	M(CS)491	Lab Practice	0	0	2	2	1
8	CS491.	Communication Engg & Coding Theory	0	0	3	3	2
9	CS492	Software Tools	0	0	3	3	2
10	CS493	Computer Architectur	0	0	3	3	2
<b>Total of Practical</b>						<b>14</b>	<b>9</b>
<b>Total of Semester</b>						<b>32</b>	<b>26</b>

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### SEMESTER - III

#### Theory

#### VALUES & ETHICS IN PROFESSION

**HU-301**

**Contracts:3L**

**Credits- 3**

Science, Technology and Engineering as knowledge and as Social and Professional Activities

#### ***Effects of Technological Growth:***

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Appropriate Technology Movement of Schumacher; later developments

Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.

Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

#### ***Ethics of Profession:***

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

#### ***Profession and Human Values:***

Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

#### **Books:**

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2<sup>nd</sup> Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

**Code: PH-301**

**Contacts: 4L**

**Credit: 3+1**

#### **Module 1:**

Vector Calculus:

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1.1 Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates. 2L

Module 2 :

Electricity

2.1 Coulombs law in vector form. Electrostatic field and its curl. Gauss's law in integral form and conversion to differential form . Electrostatic potential and field, Poisson's Eqn. Laplace's eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady current. 5L

2.2 Dielectrics-concept of polarization, the relation  $D=\epsilon_0E+P$ , Polarizability. Electronic polarization and polarization in monoatomic and polyatomic gases. 3L

Module 3:

Magnetostatics & Time Varying Field:

3. Lorentz force, force on a small current element placed in a magnetic field. Biot-Savart law and its applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form. Faraday's law of electro-magnetic induction in integral form and conversion to differential form. 3L

### **Module 4:**

Electromagnetic Theory:

4.1 Concept of displacement current Maxwell's field equations, Maxwell's wave equation and its solution for free space. E.M. wave in a charge free conducting media, Skin depth, physical significance of Skin Depth, E.M. energy flow, & Poynting Vector.

6L

Module 5:

Quantum Mechanics:

5.1 Generalised coordinates, Lagrange's Equation of motion and Lagrangian, generalised force potential, momenta and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion.

4L

*Course should be discussed along with physical problems of 1-D motion*

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5.2 Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function  $\psi$  (normalization and probability interpretation), Expectation values, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels.

9L

### **Module 6:**

#### **Statistical Mechanics:**

3.1 Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of blackbody radiation..

7L

#### **Basic Environmental Engineering & Elementary Biology**

**Code: CH301**

**Contacts: 3L = 3**

**Credits: 3**

#### **General**

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.

2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function.

1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

2L

#### **Ecology**

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function.

1L

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Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

### **Air pollution and control**

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).

2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.

Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. 2L

Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. 1L

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

1L

### **Water Pollution and Control**

Hydrosphere, Hydrological cycle and Natural water.

Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. 2L

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River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH.

2L

Lake: Eutrophication [Definition, source and effect]. 1L

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) 1L

Standard and control: Waste water standard [BOD, COD, Oil, Grease],

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.

2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

1L

### Land Pollution

Lithosphere; Internal structure of earth, rock and soil 1L

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.

Solid waste management and control (hazardous and biomedical waste). 2L

### Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] 1L

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,

$L_{10}$  (18 hr Index),  $Ld_n$ .

Noise pollution control. 1L

### Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L

### References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

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### Analog & Digital Electronics

Code: CS301

Contact: 3L

Cr: 3

**Pre-requisite of Analog Electronics:** Basic Electronics Parts I & II learned in the First year, semesters 1 & 2. Basic concept of the working of P-N diodes, Schottky diodes, Basic BJTs, Basic FETs and OPAMP as a basic circuit component. Concept of Feedback.

#### Module -1: [9L]

1. Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency [2L]; Recapitulation of basic concepts of Feedback and Oscillation [1L], Phase Shift, Wein Bridge oscillators [2L]. (5L)
2. Astable & Monostable Multivibrators [1L]; Schmitt Trigger circuits [1L], 555 Timer [2L]. (4L)

**[Learning Outcome:** The learner will be trained to compare the merits and demerits of the different amplifiers and must be able to bias the transistors accordingly; the student must be able to design multivibrator circuits using 555 timers]

**Pre-requisite of Digital Electronics:** Binary numbers & Basic Boolean algebra – already covered in First year; Logic gates, Truth Tables and function realization – already covered in First year upto minimisation of Logic expressions by algebraic method, K-map,

#### Module – 2: [11 L]

- a) Binary Number System & Boolean Algebra (recapitulation ) [1L]; BCD, ASCII, EBCDIC, Gray codes and their conversions [1L]; Signed binary number representation with 1's and 2's complement methods [1L], Binary arithmetic, Venn diagram, Boolean algebra (recapitulation) [1L]; Representation in SOP and POS forms [1L]; Minimization of logic expressions by algebraic method. [2L] (7L)
- b) Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor) [2L]; Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator [2L]. (4L)

#### Module - 3: [10L]

1. Sequential Circuits - Basic Flip-flop & Latch [1L], Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops [3L], (4L)
2. Registers (SISO,SIPO,PIPO,PISO) [2L], Ring counter, Johnson counter [1L], Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), [2L], Design of Mod N Counter [2L] (6L)

#### Module – 4: [6L]

1. A/D and D/A conversion techniques – Basic concepts (D/A :R-2-R only [2L]  
A/D: successive approximation [2L]) (4L)
2. Logic families- TTL, ECL, MOS and CMOS - basic concepts. (2L)

**[Learning Outcome:** The student must be able to convert from one number system to another, work out problems related to Boolean algebra, minimisation problems etc. The student must also learn to differentiate between the combinational and sequential circuits and design simple circuits)

**Total: 36 hours**

#### Textbooks:

Microelectronics Engineering - Sedra & Smith-Oxford.

Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand

Digital Electronics – Kharate – Oxford

Digital Electronics – Logic & Systems by J.Bigmeil & R.Donovan; Cambridge Learning.

Digital Logic and State Machine Design (3rd Edition) – D.J.Comer, OUP

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Electronic Devices & Circuit Theory – Boyelstad & Nashelsky - PHI  
Bell-Linear IC & OP AMP—Oxford  
P.Raja- Digital Electronics- Scitech Publications  
Morries Mano- Digital Logic Design- PHI  
R.P.Jain—Modern Digital Electronics, 2/e , Mc Graw Hill  
H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill.  
D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers  
Tocci, Widmer, Moss- Digital Systems,9/e- Pearson  
J.Bignell & R.Donovan-Digital Electronics-5/e- Cenage Learning.  
Leach & Malvino—Digital Principles & Application, 5/e, Mc Graw Hill  
Floyed & Jain- Digital Fundamentals-Pearson.

### Data Structure & Algorithm

**Code:** CS302

**Contacts:** 3L +1T

**Credits:** 4

**Pre-requisites:** CS 201 (Basic Computation and Principles of C), M101 & M201 (Mathematics), basics of set theory

#### Module -I. [8L] Linear Data Structure

##### Introduction (2L):

Why we need data structure?

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.

Algorithms and programs, basic idea of pseudo-code.

Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.

##### Array (2L):

Different representations – row major, column major.

Sparse matrix - its implementation and usage. Array representation of polynomials.

##### Linked List (4L):

Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

#### Module -II: [7L] Linear Data Structure

##### [Stack and Queue (5L):

Stack and its implementations (using array, using linked list), applications.

Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications.

##### Recursion (2L):

Principles of recursion – use of stack, differences between recursion and iteration, tail recursion.

Applications - The Tower of Hanoi, Eight Queens Puzzle.

#### Module -III. [15L] Nonlinear Data structures

##### Trees (9L):

Basic terminologies, forest, tree representation (using array, using linked list).

Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree.

Binary search tree- operations (creation, insertion, deletion, searching).

Height balanced binary tree – AVL tree (insertion, deletion with examples only).

B- Trees – operations (insertion, deletion with examples only).

##### Graphs (6L):

Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism).

Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list.



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Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications.  
Minimal spanning tree – Prim’s algorithm (basic idea of greedy methods).

### Module - IV. Searching, Sorting (10L):

**Sorting Algorithms (5L):** Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort.

**Searching (2L):** Sequential search, binary search, interpolation search.

**Hashing (3L):** Hashing functions, collision resolution techniques.

### Recommended books:

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

### Learning outcome:

Ideally this course should act as a primer/pre-requisite for CS 503 (Design and Analysis of Algorithms). On completion of this course, students are expected to be capable of understanding the data structures, their advantages and drawbacks, **how to implement them in C**, how their drawbacks can be overcome and **what the applications are and where they can be used**. Students should be able to learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation. Detailed time analysis of the graph algorithms and sorting methods are expected to be covered in CS 503 but it is expected that the students will be able to understand at least the efficiency aspects of the graph and sorting algorithms covered in this course. The students should be able to convert an inefficient program into an efficient one using the knowledge gathered from this course.

### Computer organization

**Code: CS303**

**Contacts: 3L +1T**

**Credits: 4**

Pre-requisite: Concept of basic components of a digital computer, Basic concept of Fundamentals & Programme structures. Basic number systems, Binary numbers, representation of signed and unsigned numbers, Binary Arithmetic as covered in Basic Computation & Principles of Computer Programming Second semester, first year. Boolean Algebra, Karnaugh Maps, Logic Gates – covered in Basic Electronics in First year

### Module – 1: [8L]

Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes. [7L]

Commonly used number systems. Fixed and floating point representation of numbers. [1L]

### Module – 2: [8L]

Overflow and underflow. Design of adders - ripple carry and carry look ahead principles. [3L]

Design of ALU. [1L]

Fixed point multiplication -Booth's algorithm. [1L]

Fixed point division - Restoring and non-restoring algorithms. [2L]

Floating point - IEEE 754 standard. [1L]

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### Module – 3: [10L]

Memory unit design with special emphasis on implementation of CPU-memory interfacing. [2L]

Memory organization, static and dynamic memory, memory hierarchy, associative memory. [3L]

Cache memory, Virtual memory. Data path design for read/write access. [5L]

### Module – 4: [10L]

Design of control unit - hardwired and microprogrammed control. [3L]

Introduction to instruction pipelining. [2L]

Introduction to RISC architectures. RISC vs CISC architectures. [2L]

I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA. [3L]

### Learning Outcome:

#### Additional Tutorial Hours will be planned to meet the following learning outcome.

Through this course, the students will be exposed to extensive development and use of computer organization based concepts for the future knowledge outcome of Advanced Computer Architecture offered in subsequent semester. The students will be able to understand different instruction formats, instruction sets, I/O mechanism. Hardware details, memory technology, interfacing between the CPU and peripherals will be transparent to the students. Students will be able to design hypothetical arithmetic logic unit.

### Text Book:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Behrooz Parhami “Computer Architecture”, Oxford University Press

### Reference Book:

1. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill,
2. Hamacher, “Computer Organisation”, McGraw Hill,
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers” OUP
4. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,
5. P N Basu- “Computer Organization & Architecture”, Vikas Pub

### Practical

#### Physica Lab-2

Code: PH-391

Contacts: (3P)

Credit: (2)

Group 1: Experiments on Electricity and Magnetism

1. Determination of dielectric constant of a given dielectric material.
3. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
4. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
5. Determination of specific charge (e/m) of electron by J.J. Thomson’s method.

Group 2: Quantum Physics

6. Determination of Planck’s constant using photocell.
7. Determination of Lande’s g factor using Electron spin resonance spectrometer.
8. Determination of Stefan’s radiation constant
9. Verification of Bohr’s atomic orbital theory through Frank-Hertz experiment.
10. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

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### Group 3: Modern Physics

11. Determination of Hall co-efficient of semiconductors.
12. Determination of band gap of semiconductors.

13. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

b) In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c] into electrical voltage and collect the data in a computer using phoenix or similar interface.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

#### Note:

Failure to perform each experiment mentioned in b] and c] should be compensated by two experiments mentioned in the above list.

At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]

Experiment in b] and c] can be coupled and parts of a single experiment.

#### Recommended Text Books and Reference Books:

##### For Both Physics I and II

1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
- 4.. Arthur Baiser (Perspective & Concept of Modern Physics)

##### Physics I (PH101/201)

##### Vibration and Waves

Kingsler and Frey

D.P. Roychaudhury

N.K. Bajaj (Waves and Oscillations)

K. Bhattacharya

R.P. Singh ( Physics of Oscillations and Waves)

A.B. Gupta (College Physics Vol.II)

Chattopadhyaya and Rakshit (Vibration, Waves and Acoustics)

##### Optics

Möler (Physical Optics)

A.K. Ghatak

E. Hecht (Optics)

E. Hecht (Schaum Series)

F.A. Jenkins and H.E. White

6. Chita Ranjan Dasgupta ( Degree Physics Vol 3)

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### Quantum Physics

Eisberg and Resnick

A.K. Ghatak and S. Lokenathan

S.N. Ghoshal (Introductory Quantum Mechanics)

E.E. Anderson (Modern Physics)

Haliday, Resnick and Crane (Physics vol.III)

Binayak Dutta Roy [Elements of Quantum Mechanics]

### Crystallography

1. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)

2. A.J. Dekker

3. Ashcroft and Mermin

4. Ali Omar

5. R.L. Singhal

6. Jak Tareen and Trn Kutty (Basic course in Crystallography)

### Laser and Holography

A.K. Ghatak and Thyagarajan (Laser)

Tarasov (Laser)

P.K. Chakraborty (Optics)

B. Ghosh and K.G. Majumder (Optics)

B.B. Laud (Laser and Non-linear Optics)

Bhattacharyya [Engineering Physics] Oxford

### Physics II(PH 301)

#### Classical Mechanics (For Module 5.1 in PH 301)

H. Goldstein

A.K. Roychaudhuri

R.G. Takwal and P.S. Puranik

Rana and Joag

M. Spiegel (Schaum Series)

J.C. Upadhya (Mechanics)

#### Electricity and Magnetism

Reitz, Milford and Christy

David J. Griffith

D. Chattopadhyay and P.C. Rakshit

Shadowitz (The Electromagnetic Field)

#### Quantum Mechanics

Eisberg and Resnick

A.K. Ghatak and S. Lokenathan

S.N. Ghoshal (Introductory Quantum Mechanics)

E.E. Anderson (Modern Physics)

Haliday, Resnick and Crane (Physics vol.III)

Binayak Dutta Roy [Elements of Quantum Mechanics]

#### Statistical Mechanics

Sears and Sallinger (Kinetic Theory, Thermodynamics and Statistical Thermodynamics)

Mondal (Statistical Physics)

S.N. Ghoshal ( Atomic and Nuclear Physics)

Singh and Singh

B.B. Laud (Statistical Mechanics)

F. Reif (Statistical Mechanics)

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Dilectrics  
Bhattacharyya [Engineering Physics] Oxford

### **Analog & Digital Electronics**

**Code: CS391**

**Contact: 3**

**Cr: 2**

#### **ANALOG: At least any two of the following**

1. Design a Class A amplifier
2. Design a Phase-Shift Oscillator
3. Design of a Schmitt Trigger using 555 timer.

#### **DIGITAL : At least any five of the following**

1. Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.
2. Construction of simple Decoder & Multiplexer circuits using logic gates.
3. Realization of RS / JK / D flip flops using logic gates.
4. Design of Shift Register using J-K / D Flip Flop.
5. Realization of Synchronous Up/Down counter.
6. Design of MOD- N Counter
7. Study of DAC .

Any one experiment specially designed by the college.

(Detailed instructions for Laboratory Manual to follow for further guidance. The details will be uploaded in the website from time to time)

### **Data Structure & Algorithm**

**Code: CS392**

**Contacts: 3**

**Credits: 2**

Experiments should include but not limited to :

Implementation of array operations:

Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem :

Evaluation of expressions operations on Multiple stacks & queues :

Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:

Polynomial addition, Polynomial multiplication

Sparse Matrices : Multiplication, addition.

Recursive and Nonrecursive traversal of Trees

Threaded binary tree traversal. AVL tree implementation

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Application of Trees. Application of sorting and searching algorithms

Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

(Detailed instructions for Laboratory Manual to follow for further guidance. The details will be uploaded in the website from time to time)

### Computer organization

**Code: CS393**

**Contacts: 3**

**Credits: 2**

1. Familiarity with IC-chips, e.g.  
a) Multiplexer , b) Decoder, c) Encoder b) Comparator  
Truth Table verification and clarification from Data-book.
2. Design an Adder/Subtractor composite unit .
3. Design a BCD adder.
4. Design of a 'Carry-Look-Ahead' Adder circuit.
5. Use a multiplexer unit to design a composite ALU .
6. Use ALU chip for multibit arithmetic operation.
7. Implement read write operation using RAM IC.
8. (a) & (b) Cascade two RAM ICs for vertical and horizontal expansion.

(Detailed instructions for Laboratory Manual to follow for further guidance. The details will be uploaded in the website from time to time)

## SEMESTER - IV

### Theory

#### NUMERICAL METHODS

**Code: M (CS) 401**

**Contacts: 2L+1T**

**Credits: 2**

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (4)

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. (5)

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3)

Numerical solution of a system of linear equations:  
Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method. (6)

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Numerical solution of Algebraic equation:  
Bisection method, Regula-Falsi method, Newton-Raphson method. (4)

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (6)

Text Books:

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar, & Jain: Numerical Methods (Problems and Solution).

References:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.

**Subject Name: MATHEMATICS**

**Code: M 401**

**Contacts: 3L +1T = 4**

**Credits: 4**

Note 1: The whole syllabus has been divided into five modules.

Note 2: Structure of the question paper

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the five modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have two or three parts covering not more than two modules. Sufficient questions should to be set covering the whole syllabus for alternatives.

### Module I

**Theory of Probability:** Axiomatic definition of probability. Conditional probability. Independent events and related problems. Bayes theorem (Statement only) & its application. One dimensional random variable. Probability distributions-discrete and continuous. Expectation. Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems.  $t$ ,  $\chi^2$  and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application. **(14L)**

### Module II

**Sampling theory:** Random sampling. Parameter, Statistic and its Sampling distribution. Standard error of statistic. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems.

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**Estimation of parameters:** Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal). Confidence intervals and related problems. (7L)

### Module III

**Testing of Hypothesis:** Simple and Composite hypothesis. Critical region. Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions.  $\chi^2$  - test for goodness of fit. (5L)

### Module IV

**Advanced Graph Theory:** Planar and Dual Graphs. Kuratowski's graphs. Homeomorphic graphs. Eulers formula ( $n - e + r = 2$ ) for connected planar graph and its generalisation for graphs with connected components. Detection of planarity. Graph colouring. Chromatic numbers of  $C_n$ ,  $K_n$ ,  $K_{m,n}$  and other simple graphs. Simple applications of chromatic numbers. Upper bounds of chromatic numbers (Statements only). Chromatic polynomial. Statement of four and five colour theorems. (10L)

### Module V

**Algebraic Structures:** Group, Subgroup, Cyclic group, Permutation group, Symmetric group ( $S_3$ ), Coset, Normal subgroup, Quotient group, Homomorphism & Isomorphism (Elementary properties only).

Definition of Ring, Field, Integral Domain and simple related problems. (12L)

#### Text Books:

1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur & Sons.
2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
3. Mapa S.K. :Higher Algebra (Abstract & Linear), Sarat Book Distributors.
4. Sen M.K., Ghosh S. and Mukhopadhyay P.: Topics in Abstract Algebra, University Press.
5. West D.B.: Introduction to Graph Theory, Prentice Hall.

#### References:

1. Babu Ram: Discrete Mathematics, Pearson Education.
2. Balakrishnan: Graph Theory (Schaum's Outline Series), TMH.
3. Chakraborty S.K and Sarkar B.K.: Discrete Mathematics, OUP.
4. Das N.G.: Statistical Methods, TMH.
5. Deo N: Graph Theory with Applications to Engineering and Computer Science, Prentice Hall.
6. Khanna V.K and Bhambri S.K. : A Course in Abstract Algebra, Vikas Publishing House.
7. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.
8. Wilson: Introduction to graph theory, Pearson Education.

#### Communication Engineering & Coding Theory

Code: CS401

Contacts: 3L

Credits: 3



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Module - 1: **Elements of Communication system, Analog Modulation & Demodulation, Noise, SNR Analog-to-Digital Conversion.** (Basic ideas in brief) [8]

[Details: Introduction to Base Band transmission & Modulation (basic concept) (*IL*); Elements of Communication systems (mention of transmitter, receiver and channel); origin of noise and its effect, Importance of SNR in system design (*IL*); Basic principles of Linear Modulation (Amplitude Modulation) (*IL*); Basic principles of Non-linear modulation (Angle Modulation - FM, PM) (*IL*); Sampling theorem, Sampling rate, Impulse sampling, Reconstruction from samples, Aliasing (*IL*); Analog Pulse Modulation - PAM (Natural & flat topped sampling), PWM, PPM (*IL*); Basic concept of Pulse Code Modulation, Block diagram of PCM (*IL*); Multiplexing - TDM, FDM (*IL*);

Module - 2: **Digital Transmission:** [8]

[Details: Concept of Quantisation & Quantisation error, Uniform Quantiser (*IL*); Non-uniform Quantiser, A-law &  $\mu$ -law companding (mention only) (*IL*); Encoding, Coding efficiency (*IL*); Line coding & properties, NRZ & RZ, AMI, Manchester coding PCM, DPCM (*IL*); Baseband Pulse Transmission, Matched filter (mention of its importance and basic concept only), Error rate due to noise (*2L*); ISI, Raised cosine function, Nyquist criterion for distortion-less base-band binary transmission, Eye pattern, Signal power in binary digital signals (*2L*);

Module - 3: **Digital Carrier Modulation & Demodulation Techniques:** [8]

[Details: Bit rate, Baud rate (*IL*); Information capacity, Shanon's limit (*IL*); M-ary encoding, Introduction to the different digital modulation techniques - ASK, FSK, PSK, BPSK, QPSK, mention of 8 BPSK, 16 BPSK (*2L*); Introduction to QAM, mention of 8QAM, 16 QAM without elaboration (*IL*); Delta modulation, Adaptive delta modulation (basic concept and importance only, no details (*IL*); introduction to the concept of DPCM, Delta Modulation, Adaptive Delta modulation and their relevance (*IL*); Spread Spectrum Modulation - concept only. (*IL*).

Module - 4: **Information Theory & Coding:** [8]

[Details: Introduction, News value & Information content (*IL*); Entropy (*IL*); Mutual information (*IL*); Information rate (*IL*); Shanon-Fano algorithm for encoding (*IL*); Shannon's Theorem - Source Coding Theorem (*IL*); Channel Coding Theorem, Information Capacity Theorem (basic understanding only) (*IL*); Error Control & Coding - basic principle only. (*IL*);

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

References:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
3. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
4. Understanding Signals and Systems by Jack Golten, Published by McGraw Hill.

**Learning Outcome:** [These are the minimum competence to be developed; the students will be encouraged to learn more and acquire better understanding.]

Module -1: The student will be able to differentiate between base-band transmission and modulation and **compute antenna size** from knowledge of carrier frequency; (Tutorial: To identify different communication processes based on these two methods and appreciate their relative merit and demerit); The learner will be able to **determine the carrier and message frequencies** from the expression for AM signals and Angle modulated signals. Given an expression for a modulated signal, the student must be able to **recognize the type of modulation**. The ability to explain each and every block of the PCM system must be acquired.

Module -2: The student must be able to appreciate the importance of digital modulation over analog modulation in respect of noise immunity (concept); The student will be able to compute the coding efficiency of binary and decimal coding systems; The relative merits and demerits of the different digital modulation techniques to be understood clearly; (Tutorial: Students should be encouraged to find out where these different modulation techniques are used in everyday life); Capability to calculate signal power in digital systems to be mastered.

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Module -3: Ability to compute bit rate and baud rate for different signals to be developed; the student must be able to compare between the channel capacity in case of channels of varying band-width and SNR value and predict the maximum data rate possible; The learner must be able to compare the merits and short comings of the basic digital modulation techniques. (Tutorial: Find out the area of application for each with reason for such application)

Module -4: Student will be able to calculate the information content, entropy and information rate for given situations; He/she will be able to appreciate the importance of the different line coding and error coding techniques. (Tutorial: Find out the range of applicability).

### Formal Language & Automata Theory

Code: CS402

Contacts: 3L+1T

Credits: 4

#### Prerequisites of Formal Language & Automata Theory:

Elementary discrete mathematics including the notion of set, function, relation, product, partial order, equivalence relation, graph & tree. They should have a thorough understanding of the principle of mathematical induction.

#### **Module-1:** [13 L]

Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model [2L]

Finite state machine: Definitions, capability & state equivalent, kth- equivalent concept [1L]

Merger graph, Merger table, Compatibility graph [1L]

Finite memory definiteness, testing table & testing graph. [1L]

Deterministic finite automaton and non deterministic finite automaton. [1L] Transition diagrams and Language recognizers. [1L]

Finite Automata: NFA with  $\hat{I}$  transitions - Significance, acceptance of languages. [1L]

Conversions and Equivalence: Equivalence between NFA with and without  $\hat{I}$  transitions. NFA to DFA conversion. [2L]

Minimization of FSM, Equivalence between two FSM's, Limitations of FSM [1L]

Application of finite automata, Finite Automata with output- Moore & Melay machine. [2L]

#### Learning outcome of Finite Automata:

The student will be able to define a system and recognize the behavior of a system. They will be able to minimize a system and compare different systems.

#### **Module-2:** [8 L]

Regular Languages : Regular sets. [1L]

Regular expressions, identity rules. Arden's theorem state and prove [1L]

Constructing finite Automata for a given regular expressions, Regular string accepted by NFA/DFA [1L]

Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). [1L]

Grammar Formalism: Regular grammars-right linear and left linear grammars. [1L]

Equivalence between regular linear grammar and FA. [1L]

Inter conversion, Context free grammar. [1L]

Derivation trees, sentential forms. Right most and leftmost derivation of strings. (Concept only) [1L]

#### Learning outcome of Regular Languages and Grammar:

Student will convert Finite Automata to regular expression. Students will be able to check equivalence between regular linear grammar and FA.

#### **Module-3:** [9L]

Context Free Grammars, Ambiguity in context free grammars. [1L]

Minimization of Context Free Grammars. [1L]

Chomsky normal form and Greibach normal form. [1L]

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Pumping Lemma for Context Free Languages. [1L]  
Enumeration of properties of CFL (proofs omitted). Closure property of CFL, Ogden's lemma & its applications [1L]  
Push Down Automata: Push down automata, definition. [1L]  
Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. [1L]  
Equivalence of CFL and PDA, interconversion. (Proofs not required). [1L]  
Introduction to DCFL and DPDA. [1L]

### Learning outcome of PDA and context free grammar:

Students will be able to minimize context free grammar. Student will be able to check equivalence of CFL and PDA. They will be able to design Turing Machine.

### **Module-4: [6L]**

Turing Machine : Turing Machine, definition, model [1L]  
Design of TM, Computable functions [1L]  
Church's hypothesis, counter machine [1L]  
Types of Turing machines (proofs not required) [1 L]  
Universal Turing Machine, Halting problem [2L]

### Learning outcome of Turing Machine :

Students will be able to design Turing machine.

### **TEXT BOOKS:**

- "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D., Pearson Education.
- "Theory of Computer Science ", Automata Languages and computation", Mishra and Chandrashekar, 2<sup>nd</sup> edition, PHI.
- "Formal Languages and Automata Theory", C.K.Nagpal, Oxford

### **REFERENCES:**

- 2.1 "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill
- 2.2 "Introduction to Computer Theory", Daniel I.A. Cohen, John Wiley
- 2.3 "Introduction to languages and the Theory of Computation", John C Martin, TMH
- 2.4 "Elements of Theory of Computation", Lewis H.P. & Papadimitrou C.H. Pearson, PHI.

### **Computer Architecture**

**Code: CS403**

**Contacts: 3L+1T**

**Credits: 4**

**Pre-requisite:** Basic Electronics in First year, Introduction to Computing in second semester, Analog & Digital Electronics and Computer Organisation in Third semester.

Module – 1: [12 L]

Introduction: Review of basic computer architecture (Revisited), Quantitative techniques in computer design, measuring and reporting performance. (3L)

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques; Compiler techniques for improving performance. (9L)

Module – 2: [8L]

Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies. (8L)

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Module – 3: [6L]

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, superpipelined and VLIW processor architectures. Array and vector processors. (6L)

Module – 4: [12 L]

Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers. (8L)

Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures. (4L)

Learning Outcome:

This course is a formidable prerequisite for the course Operating System to be offered in the subsequent semester.

Text books:

[To be detailed]

### Practical

#### Technical Report Writing & Language Lab Practice

Code: HU481

Cr-2

#### Guidelines for Course Execution:

**Objectives of this Course: This course has been designed:**

1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.

Detailed Course Outlines:

A. *Technical Report Writing* : 2L+6P

1. Report Types (Organizational / Commercial / Business / Project )
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

#### B. *Language Laboratory Practice*

*I. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory*

*Practice Sessions* 2L

*2. Conversation Practice Sessions: (To be done as real life interactions)*  
2L+4P

*a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed*

*b) Introducing Role Play & honing over all Communicative Competence*

*3. Group Discussion Sessions:* 2L+6P

*a) Teaching Strategies of Group Discussion*

*b) Introducing Different Models & Topics of Group Discussion*

*c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure*  
*Interview Sessions;* 2L+6P

*a) Training students to face Job Interviews confidently and successfully*

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- b) *Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication*

4. *Presentation:* 2L+6P

- a) *Teaching Presentation as a skill*
- b) *Strategies and Standard Practices of Individual /Group Presentation*
- c) *Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids*

5. *Competitive Examination:* 2L+2P

- a) *Making the students aware of Provincial /National/International Competitive Examinations*
- b) *Strategies/Tactics for success in Competitive Examinations*
- c) *SWOT Analysis and its Application in fixing Target*

*Books – Recommended:*

*Nira Konar: English Language Laboratory: A Comprehensive Manual*

*PHI Learning, 2011*

*D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing*

*Pearson Education (W.B. edition), 2011*

*References:*

*Adrian Duff et. al. (ed.): Cambridge Skills for Fluency*

*A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)*

*B) Listening (Levels 1-4 Audio Cassettes/Handbooks)*

*Cambridge University Press 1998*

*Mark Hancock: English Pronunciation in Use*

*4 Audio Cassettes/CD'S OUP 2004*

### **NUMERICAL METHODS Lab**

**Code : M(CS) 491**

**Contacts : 2L**

**Credits :1**

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runge-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

### **Communication Engineering & Coding Theory**

**Code : CS 491**

**Contacts : 3L**

**Credits :2**

Practical Designs & Experiments:

Module - 1: Generation of Amplitude Modulation (Design using transistor or Balanced Modulator Chip (to view the wave shapes)

Module - 2: Generation of FM using VCO chip (to view the wave shapes)

Module - 3: Generation of PAM

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Module - 4: Generation of PWM & PPM (using IC 555 Timer)

### Software Tools

Code : CS 492

Contacts : 3L

Credits :2

[Suggested; Feedback invited]

1. Introduction to Visual Basic/VC++ & difference with BASIC. Concept about form Project, Application, Tools, Toolbox, Controls & Properties. Idea about  
  - i. Labels, Buttons, Text Boxes.
  - ii. Data basics, Different type variables & their use in VB,
  - iii. Sub-functions & Procedure details, Input box () & MsgBox ().
  - iv. Making decisions, looping
  - v. List boxes & Data lists, List Box control, Combo Boxes, data Arrays.
  - vi. Frames, buttons, check boxes, timer control,
  - vii. Programming with data, ODBC data base connectivity.
  - viii. Data form Wizard, query, and menus in VB Applications,
  - ix. Graphics.
2. Case studies using any of the following items including relevant form design with the help of visual programming aids.
  - a) Payroll accounting system.
  - b) Library circulation management system.
  - c) Inventory control system.
  - d) University examination & grading system.
  - e) Patient information system.
  - f) Tourist information system.
  - g) Judiciary information system.
  - h) Flight reservation system.
  - i) Bookshop automation software.
  - j) Time management software.

### Computer Architecture

Code : CS 492

Contacts : 3L

Credits :2

All laboratory assignments are based on Hardware Description Language (VHDL or Verilog) Simulation.

[Pre-requisite: The hardware based design has been done in the Analog & Digital Electronics laboratory and Computer Organisation laboratory]

1. HDL introduction
2. Basic digital logic base programming with HDL
3. 8-bit Addition, Multiplication, Division
4. 8-bit Register design
5. Memory unit design and perform memory operations.
6. 8-bit simple ALU design
7. 8-bit simple CPU design
8. Interfacing of CPU and Memory

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### CSE Proposed 3<sup>rd</sup> Year Syllabus Third Year - Fifth Semester

A. THEORY							
Sl.No	Field	Theory	Contact Hours/Week				Cr. Pts
			L	T	P	Total	
1	HU501	Economics for Engineers	3	0	0	3	3
2	CS501	Design & Analysis of Algorithm	3	1	0	4	4
3	CS502	Microprocessors & Microcontrollers	3	1	0	4	4
4	CS503	Discrete Mathematics	3	0	0	3	3
5	Free Elective						
	CS504A	Circuit Theory & Network (ECE)	3	0/1	0	3/4	3/4
	CS504B	Data Communication (ECE)					
	CS504C	Digital Signal Processing (ECE)					
CS504D	Object Oriented Programming (IT)						
<b>Total of Theory</b>						<b>17/18</b>	<b>17-18</b>
B. PRACTICAL							
6	CS591	Design & Analysis of Algorithm	0	0	3	3	2
7	CS592	Microprocessors & Microcontrollers	0	0	3	3	2
8	CS593	System Programme	0	0	3	3	2
9	F.E.		0	0	3	3	2
	CS594A	Circuit Theory & Network (ECE)					
	CS594B	Data Communication (ECE)					
	CS594C	Digital Signal Processing (ECE)					
	CS594D	Object Oriented Programming (IT)					
<b>Total of Practical</b>						<b>12</b>	<b>8</b>
<b>Total of Semester</b>						<b>29/30</b>	<b>25-26</b>

### Third Year - Sixth Semester

A. THEORY							
Sl.No	Field	Theory	Contact Hours/Week				Cr. Pts
			L	T	P	Total	
1	HU601	Principles of Management	2	0	0	2	2
2	CS601	Data Base Management System	3	0	0	3	3
3	CS602	Software Engg	3	0	0	3	3
4	CS603	Operating System	3	0	0	3	3
5	P.E		3	0	0	3	3
	CS604A	Information Theory & Coding					
	CS604B	Computer Graphics					
	CS604C	Artificial Intelligence					
	CS604D	ERP					
6	F. E.		3/3	0/1	0/0	3/4	3/4
	CS605A	Operation Research (M)					
	CS605B	Human Resource Management (HSS)					
	CS605C	Multimedia Technology (IT)					
	CS605D	E-Commerce (IT)					
<b>Total of Theory</b>						<b>17/18</b>	<b>17-18</b>
B. PRACTICAL							
7	CS691	8. Data Base Management System Lab	0	0	3	3	2
8.	CS692	9. Software Engg Lab	0	0	3	3	2
9.	CS693	10. UNIX & Shell Programming	0	0	3	3	2
10	Seminar		0	0	3	3	2
<b>Total of Practical</b>						<b>12</b>	<b>8</b>
<b>Total of Semester</b>						<b>29-30</b>	<b>25-26</b>



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SEMESTER – V

### Theory

#### Economics for Engineers

HU-501

Contracts: 3L

Credits- 3

1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.
3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value Of Money, Debt repayment, Nominal & Effective Interest.
4. Present Worth Analysis : End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
5. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate Of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.
6. Uncertainty In Future Events - Estimates And Their Use In Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.
7. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.
8. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life Of A New Asset, Marginal Cost, Minimum Cost Life Problems.
9. Inflation And Price Change – Definition, Effects, Causes, Price Change With Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

#### Readings

- 1) Donald Newnan, Ted Eschenbach, Jerome Lavelle : *Engineering Economic Analysis*, OUP
- 2) John A. White, Kenneth E. Case, David B. Pratt : *Principles of Engineering Economic Analysis*, John Wiley
- 3) Sullivan and Wicks, “ *Engineering Economy*”, Pearson
- 4) R.Paneer Seelvan, “ *Engineering Economics*”, PHI
- 5) Michael R. Lindeburg : *Engineering Economic Analysis*, Professional Pub.

#### Design & Analysis of Algorithm

Code: CS501

Contact: 3L + 1T

Credits: 4

(Will be uploaded shortly)

#### Microprocessors & Microcontrollers

Code: CS502

Contact: 3L + 1T

Credits: 4

#### Module -1:

Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages. 1L

Architecture of 8085 Microprocessor. Address/data bus demultiplexing, status Signals and the control signal generation. Instruction set of 8085 microprocessor, Classification of instruction, addressing modes, timing diagram of the instructions ( a few examples). 7L

#### Module -2:

Assembly language programming with examples, Interrupts of 8085 processor, programming using interrupts. 5L

Serial and parallel data transfer – programmed I/O, interrupts driven I/O, DMA, asynchronous and synchronous serial transmission using SID and SOD pins of 8085 processor. 2L



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### Module 3:

Introduction to MCS-51 microcontroller –Architecture, pin details, memory organization, Hardware features of MCS-51, external memory interfacing, timers, interrupts, power management, serial port, addressing modes, assembly language programming. 5L  
8086 microprocessor- Architecture, pin details, addressing modes, instruction set, Assembly language programming interrupts. 3L

Support IC chips- 8255, 8253, 8259, 8279 and 8251 and their interfacing with 8085, 8086 and microcontroller 8051. 8L

### Module -4:

Keyboard and Multiplexed display, LCD interfacing, with 8085, 8086, and 8051. 3L

Memory interfacing with 8085, 8086, and 8051- ADC and DAC interfacing with the processor 8085, 8086 and 8051. 2L

Brief introduction to PIC microcontroller (16F877) 1L

### TEXTS :

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan (Oxford university press)
2. 8051 Microcontroller – K. Ayala (Cengage learning)
3. MICROPROCESSOR architecture, programming and Application with 8085 - R.Gaonkar (Penram Publishing LTD. ) international
4. 8051 Microprocessor –V. Udayashankara and M.S Mallikarjunaswami (TMH).
5. Microprocessor 8085 and its Interfacing—S Mathur (PHI)
6. An Introduction to Microprocessor and Applications –Krishna Kant (Macmillan)

### Reference:

1. 8086 Microprocessor –K Ayala (Cengage learning)
2. The 8085 Microprocessor, Architecture, Programming and Interfacing- K Uday Kumar, B .S Umashankar (Pearson)
3. The X-86 PC Assembly language, Design and Interfacing - Mazidi, Mazidi and Causey (PEARSON)
4. The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)
5. Microprocessors – The 8086/8088, 80186/80386/80486 and the Pentium family – N. B. Bahadure (PHI).
6. The 8051 microcontrollers – Uma Rao and Andhe Pallavi (PEARSON).

### Discrete Mathematics

Code: CS503

Contact: 3L

Credits: 3

#### Module I:

**Introduction to Propositional Calculus:** Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Biconditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related examples.

10L

#### Module II:

Theory of Numbers: Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples; Congruences, Residue classes of

integer modulo  $n$  ( $Z_n$ ) and its examples;

Order, Relation and Lattices: POSET, Hasse Diagram, Minimal, Maximal, Greatest and Least elements in a POSET, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices.

10L

#### Module III:

Counting Techniques: Permutations, Combinations, Binomial coefficients, Pigeon-hole Principle, Principles of inclusion and exclusions; Generating functions, Recurrence Relations and their solutions using generating function, Recurrence relation of Fibonacci numbers and its solution, Divide-and-Conquer algorithm and its recurrence relation and its simple application in computer.

10L

#### Module IV:

Graph Coloring: Chromatic Numbers and its bounds, Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring.

Matchings: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems.

6L

Text Books:

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1. Russell Merris, Combinatorics, WILEY-INTERSCIENCE SERIES IN DISCRETE MATHEMATICS AND OPTIMIZATION
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning.
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH

### References:

1. J.K. Sharma, Discrete Mathematics, Macmillan
2. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
3. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
4. Douglas B. West, Introduction to graph Theory, PHI

Douglas B. West, Introduction to graph Theory *Free Elective*

### Circuit Theory & Network

Code: CS504A

Contact: 3L + 1T

Credits: 4

Module	Content	Hrs
1.	<p><b>a) Resonant Circuits:</b> Series and Parallel resonance [1L], (*) <i>Impedance and Admittance Characteristics, Quality Factor, Half Power Points, Bandwidth [2L], Phasor diagrams, Transform diagrams [1L], Practical resonant and series circuits, Solution of Problems [Tutorial - 1L].</i></p> <p><b>b) Mesh Current Network Analysis:</b> Kirchoff's Voltage law, Formulation of mesh equations [1L], Solution of mesh equations by Cramer's rule and matrix method [2L], Driving point impedance, Transfer impedance [1L], Solution of problems with DC and AC sources [1L].</p>	4 6
2.	<p><b>a) Node Voltage Network Analysis:</b> Kirchoff's Current law, Formulation of Node equations and solutions [2L], driving point admittance, transfer Admittance [1L], Solution of problems with DC and AC sources [1L].</p> <p><b>b) Network Theorems:</b> Definition and Implication of Superposition Theorem [1L], Thevenin's theorem, Norton's theorem [1L], Reciprocity theorem, Compensation theorem [1L], maximum Power Transfer theorem [1L], Millman's theorem, Star delta transformations [1L], Solutions and problems with DC and AC sources [1L].</p>	4 6
3.	<p><b>Graph of Network:</b> Concept of Tree and Branch [1L], tree link, junctions, (*) <i>Incident matrix, Tie set matrix [2L], Determination of loop current and node voltages [2L].</i></p> <p><b>Coupled Circuits:</b> Magnetic coupling, polarity of coils, polarity of induced voltage, concept of Self and mutual inductance, Coefficient of coupling, Solution of Problems.</p> <p><b>Circuit transients:</b> DC transients in R-L and R-C Circuits with and without initial charge, (*) <i>R-L-C Circuits, AC Transients in sinusoidal R-L, R-C and R-L-C Circuits, Solution of Problems [2L].</i></p>	4 4 2
4.	<p><b>Laplace transform:</b> Concept of Complex frequency [1L], transform of <math>f(t)</math> into <math>F(s)</math> [1L], transform of step, exponential, over damped surge, critically damped surge, damped and un-damped sine functions [2L], properties of Laplace transform [1L], linearity, real differentiation, real integration, initial value theorem and final value theorem [1L], inverse Laplace transform [1L], application in circuit analysis, Partial fraction expansion, Heaviside's expansion theorem, Solution of problems [1L].</p> <p>(*) <i>Laplace transform and Inverse Laplace transform [2L].</i></p> <p><b>Two Port Networks:</b> Relationship of Two port network variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, relationship between parameter sets, network functions for ladder network and general network.</p>	8 4

Old module 9 viz. SPICE deleted for consideration in Sessional Subject.

### Problems for Module 1a:

- Ex. 1.** A parallel RLC Circuit has  $R=100\text{ K Ohms}$ ,  $L=10\text{ mH}$ ,  $C=10\text{ nF}$ . Find resonant frequency, bandwidth and Quality factor.
- Ex. 2.** Two coils one of  $R=0.51\text{ Ohms}$ ,  $L=32\text{ mH}$ , other of  $R=1.3\text{ Ohms}$ ,  $L=15\text{ mH}$ , and two capacitors of  $25\text{ micro F}$  and  $62\text{ micro F}$  are in series with a resistance of  $0.24\text{ Ohms}$ . Determine resonance frequency and Q of each coil.
- Ex. 3.** In a series circuit with  $R=50\text{ Ohms}$ ,  $L=0.05\text{ Ohms}$  and  $C=20\text{ micro F}$ , frequency of the source is varied till the voltage across the capacitor is maximum. If the applied voltage is  $100\text{ V}$ , find the maximum voltage across the capacitor and the frequency at which this occurs. Repeat the problem with  $R=10\text{ Ohms}$ .

### Problems for Module 1b and 2:

Examples for mesh current in networks like T,  $\pi$ , bridged T and combination of T and  $\pi$ .

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See Annexure-1 for the figures

### Problems for Module- 2a:

**Ex.1.** The network of Fig.1 – Mod.4 is in the zero state until  $t=0$  when switch is closed. Find the current  $i_1(t)$  in the resistor  $R_3$ .  
Hints: the Fig.1 – Mod.4 shows the same network in terms of transform impedance with the Thevenin equivalent network.

**Ex.2.** Find the Norton's equivalent circuit for the circuit Fig.2 – Mod.4.

Hints: As a 1<sup>st</sup> step, short the terminals  $ab$ . This results in the Circuit of Fig.2.(a). By applying KCL at node  $a$ , we have,  $(0-24)/4 + i_{sc} = 0$ ; i.e  $i_{sc} = 9$  A. To find out the equivalent Norton's impedance  $R_N$ , deactivate all the independent sources, resulting in a circuit of Fig.2.(b),  $R_N = (4 \times 12)/(4+12) = 3$  Ohms. Thus we obtain Norton equivalent circuit of Fig.2 (c).

### Problems for Module – 2b:

**Ex.1.** Draw the graph, one tree and its co tree for the circuit shown in Fig.1 – mod.5.

Hints: In the circuit there are four nodes ( $N=4$ ) and seven branches ( $B=7$ ). The graph is so drawn and appears as in Fig. 1 (a). Fig.1(b) shows one tree of graph shown in Fig. 1(a). The tree is made up of branches 2, 5 and 6. The co tree for the tree of Fig.1 (b) is shown in Fig. 1(c). The co tree has  $L = B - N + 1 = 7 - 4 + 1 = 4$  Links.

**Ex.2. (a).** For the circuit shown in Fig.2- Mod.5, construct a tree so that  $i_1$  is a link current. Assign a complete set of link currents and find  $i_1(t)$ .

**(b).** Construct another tree in which  $v_1$  is a tree branch voltage. Assign a complete set of tree branch voltages and  $v_1(t)$ .  
Take  $i(t) = 25 \sin 1000t$  A,  $v(t) = 15 \cos 1000t$ .

**Tutorials: (\*) : Bold and Italics.**

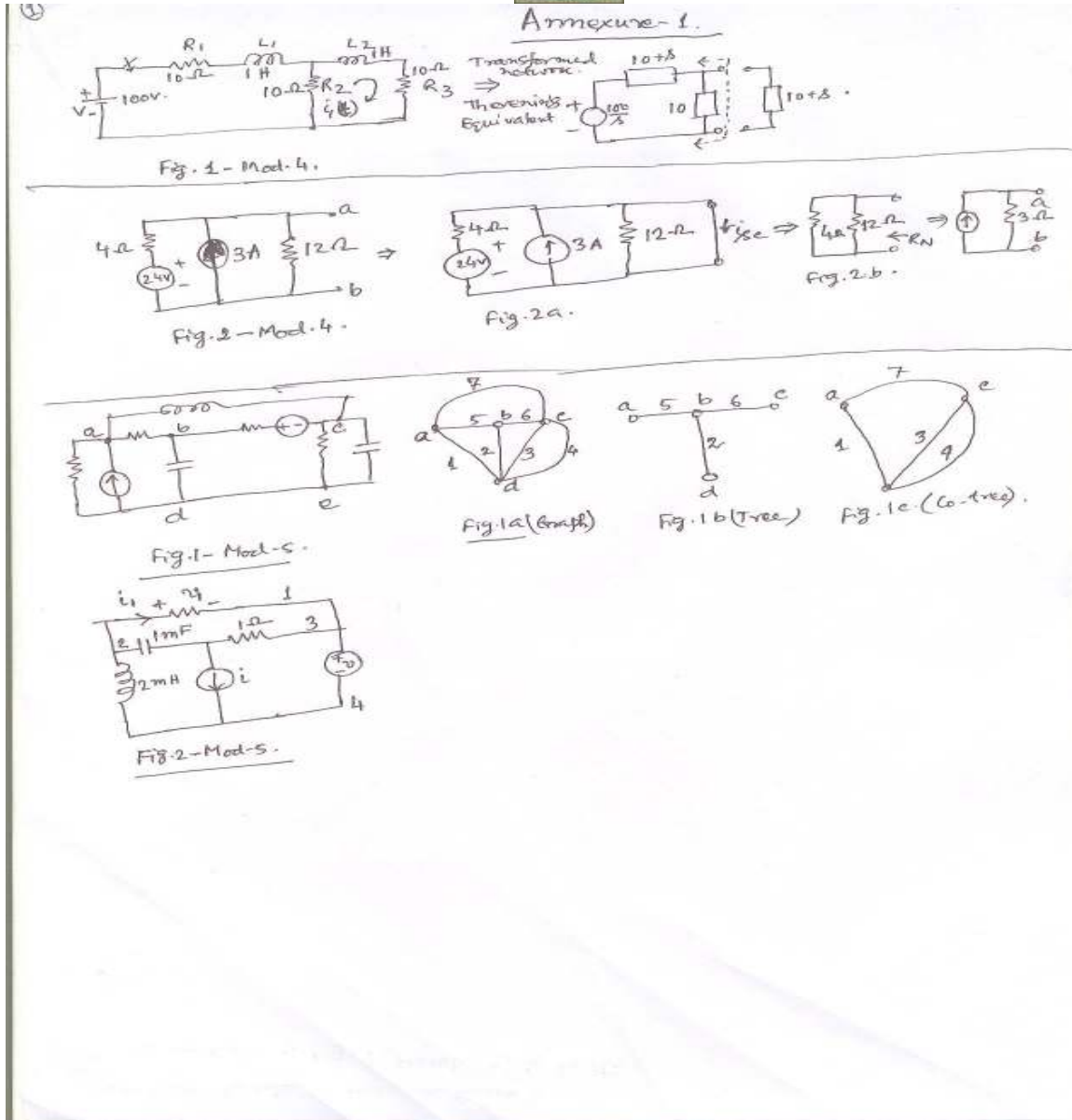
Text Books:

1. Valkenburg M. E. Van, "Network Analysis", Prentice Hall/Pearson Education
2. Hayt "Engg Circuit Analysis" 6/e Tata McGraw-Hill
3. D.A.Bell- Electrical Circuits- Oxford

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### Reference Books:

1. A.B.Carlson-Circuits- Cenage Learning
2. John Bird- Electrical Circuit Theory and Technology- 3/e- Elsevier (Indian Reprint)
3. Skilling H.H.: "Electrical Engineering Circuits", John Wiley & Sons.
4. Edminister J.A.: "Theory & Problems of Electric Circuits", McGraw-Hill Co.
5. Kuo F. F., "Network Analysis & Synthesis", John Wiley & Sons.

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6. R.A.DeCarlo & P.M.Lin- Linear Circuit Analysis- Oxford
7. P.Ramesh Babu- Electrical Circuit Analysis- Scitech
8. Sudhakar: "Circuits & Networks:Analysis & Synthesis" 2/e TMH
9. M.S.Sukhija & T.K.NagSarkar- Circuits and Networks-Oxford
10. Sivandam- "Electric Circuits and Analysis", Vikas
11. V.K. Chandna, "A Text Book of Network Theory & Circuit Analysis",Cyber Tech
12. Reza F. M. and Seely S., "Modern Network Analysis", Mc.Graw Hill .
13. M. H. Rashid: "Introduction to PSpice using OrCAD for circuits and electronics", Pearson/PHI
14. Roy Choudhury D., "Networks and Systems", New Age International Publishers.
15. D.Chattopadhyay and P.C.Rakshit: "Electrical Circuits" New Age

## **Data Communication**

**Code: CS504B**

**Contact: 3L + 1T**

**Credits: 4**

Data Communication Fundamentals: Layered Network Architecture; Data and Signal; Guided Transmission Media; Unguided Transmission Media; Transmission Impairments and Channel Capacity; Transmission of Digital Signal; Analog Data to Analog Signal; Digital Data to Analog Signal; Multiplexing of Signals: The telephone system and DSL technology; Cable MODEM and SONET

Data Link control: Interfacing to the media and synchronization; Error Detection and Correction; Flow and Error control; Data Link Control.

Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; Congestion control in packet switched networks; X.25; Frame Relay; Asynchronous Transfer Mode Switching (ATM).

Broadcast communication networks: Network Topology; Medium Access Control Techniques; IEEE CSMA/CD based LANs; IEEE Ring LANs; High Speed LANs – Token Ring Based; High Speed LANs – CSMA/CD based; Wireless LANs; Bluetooth; Cellular Telephone Networks; Satellite Networks.

Internetworking: Internetworking Devices; Internet Protocols; TCP/IP; Transport and Application layer protocols.

Network Security: Cryptography; Secured Communication; Firewalls.

## References:

- D. Data Communications and Networking, Behrouz A. Forouzan, TMH
- DI. Data and Computer Communications, William Stallings, PHI
- DII. Computer Networks, Andrew S. Tanenbaum, PHI

## **Digital Signal Processing**

**Code: CS504C**

**Contact: 3L + 1T**

**Credits: 4**

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### MODULE – I: 9L

#### *Discrete-time signals:*

Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences. 3L

#### *LTI Systems:*

Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems. 6L

### MODULE –II: 11L

#### *Z-Transform:*

Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Z-transform, initial value theorem, Parseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises. 6L

#### *Discrete Fourier Transform:*

Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises. 5L

#### *Fast Fourier Transform:*

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises. 4L

### MODULE – III: 5L

#### *Filter Design:*

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows. 5L

### MODULE – IV: 7L

#### *Digital Signal Processor:*

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language. 4L

#### *FPGA:*

Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA. 3L

### TEXT BOOKS:

3. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
4. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
5. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
6. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.
7. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

### REFERENCE BOOKS:

3. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
4. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
5. Digital Signal Processing; A Hands on Approach, C. Schuler & M.Chugani, TMH Publishing Co.
6. Digital Signal Processing, A. Nagoor Kani, TMH Education
7. Digital Signal Processing S. Poornachandra & B. Sasikala, MH Education
8. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
9. Texas Instruments DSP Processor user manuals and application notes.
10. Digital Signal Processing – A practical Approach (second Edition) – Emmanuel C. Ifeacheer & Barrie W. Jervis, Pearson Education
11. Xilinx FPGA user manuals and application notes.

### Object Oriented Programming

Code: CS504D

Contact: 3L + 1T

Credits: 4

(Will be uploaded shortly)

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**Practical**

### Design & Analysis Algorithm Lab

Code: CS591

Contact: 3P

Credits: 2

**(Will be uploaded shortly)**

### Microprocessor & Microcontroller Lab

Code: CS592

Contact: 3P

Credits: 2

Sl. No.	Name of the Experiments	No.of hours
1)	Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical) Assignments based on above.	3
2)	a) Familiarization with 8085 & 8051 simulator on PC. Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. Assignments based on above	3
3)	<b>Programming using kit and simulator for:</b> i) Table look up ii) Copying a block of memory iii) Shifting a block of memory iv) Packing and unpacking of BCD numbers v) Addition of BCD numbers vi) Binary to ASCII conversion vii) String Matching, Multiplication using shift and add method and Booth's Algorithm	6
4)	Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly.	3
5)	<b>:Study of timing diagram of an instruction on oscilloscope..</b>	3
6)	Interfacing of 8255: <b>Keyboard and Multi-digit Display with multiplexing using 8255</b>	6
7)	Study of 8051 Micro controller kit and writing programs as mentioned in S/L3. Write programs to interface of Keyboard, DAC and ADC using the kit.	3
8)	Serial communication between two trainer kits	3

**Total 30 hours (10 classes each of 3 periods)**

### System Program Lab

Code: CS593

Contact: 3P

Credits: 2

**(Will be uploaded shortly)**

### Circuits and Networks Lab

Code: CS594A

Contacts: 3P

Credits: 2

1. Characteristics of Series & Parallel Resonant circuits
2. Verification of Network Theorems
3. Transient Response in R-L & R-C Networks ; simulation / hardware
4. Transient Response in RLC Series & Parallel Circuits & Networks ; simulation / hardware
5. Determination of Impedance (Z), and Admittance (Y) parameters of Two-port networks
6. Generation of periodic, exponential, sinusoidal, damped sinusoidal, step, impulse, and ramp signals using MATLAB



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7. Representation of Poles and Zeros in s-plane, determination of partial fraction expansion in s-domain and cascade connection of second-order systems using MATLAB
8. Determination of Laplace Transform, different time domain functions, and Inverse Laplace
9. Transformation using MATLAB

Note: An Institution / college may opt for some other hardware or software simulation wherever possible in place of MATLAB

### Data Communication Lab

Code: CS594B  
Contact: 3P  
Credits: 2

(Will be uploaded shortly)

### DSP Lab

Code: CS594C  
Contact: 3P  
Credits: 2

### Simulation Laboratory using standard Simulator:

- c) Sampled sinusoidal signal, various sequences and different arithmetic operations.
- d) Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
- e) Z-transform of various sequences – verification of the properties of Z-transform.
- f) Twiddle factors – verification of the properties.
- g) DFTs / IDFTs using matrix multiplication and also using commands.
- h) Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.
- i) Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap-save methods.
- j) Butterworth filter design with different set of parameters.
- k) FIR filter design using rectangular, Hamming and Blackman windows.

### Hardware Laboratory using either 5416 or 6713 Processor and Xilinx FPGA:

3. Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor, study of MAC instruction.
4. Writing of small programs in VHDL and downloading onto Xilinx FPGA.
5. Mapping of some DSP algorithms onto FPGA.

### OOP Lab

Code: CS594D  
Contact: 3P  
Credits: 2

(Will be uploaded shortly)

## SEMESTER – VI

### Theory

### Principles of Management

HU-601  
Contracts: 2L  
Credits- 2

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management : Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.



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3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship
6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.
9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

### Readings

1. Management : Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz (TMH)
3. Management – Stoner, James A. F. (Pearson)

### Database Management System

**CS-601**

**Contact: 3L**

**Credits: 3**

#### Introduction [4L]

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

#### Entity-Relationship Model [6L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

#### Relational Model [5L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

#### SQL and Integrity Constraints [8L]

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

#### Relational Database Design [9L]

Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

#### Internals of RDBMS [7L]

Physical data structures, Query optimization : join algorithm, statistics and cost based optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock based protocols, two phase locking.

#### File Organization & Index Structures [6L]

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

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### Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
7. Ullman JD., "Principles of Database Systems", Galgottia Publication.

### Reference:

1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

### Software Engineering

CS-602

Contact: 3L

Credits: 3

#### Module I

Overview of System Analysis & Design , Business System Concept, System Development Life Cycle, Waterfall Model , Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. [10L]

#### Module II

System Requirement Specification – DFD, Data Dictionary, ER diagram, Process Organization & Interactions. [5L]

System Design – Problem Partitioning, Top-Down And Bottom-Up design ;Decision tree, decision table and structured English; Functional vs. Object- Oriented approach. [5L]

#### Module III

Coding & Documentation - Structured Programming, OO Programming, Information Hiding, Reuse, System Documentation. [4L]

Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment . , Validation & Verification Metrics, Monitoring & Control. [8L]

#### Module IV

Software Project Management – Project Scheduling , Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. [7L]

CASE TOOLS : Concepts, use and application. [5L]

### Books:

#### Text:

1. R. G. Pressman – Software Engineering, TMH
2. Behforooz, Software Engineering Fundamentals, OUP
3. Ghezzi, Software Engineering, PHI
4. Pankaj Jalote – An Integrated Approach to Software Engineering, NAROSA.
5. Object Oriented & Classical Software Engineering (Fifth Edition), SCHACH, TMH
6. Vans Vlet, Software Engineering, SPD
7. Uma, Essentials of Software Engineering, Jaico
8. Sommerville, Ian – Software Engineering, Pearson Education
9. Benmenachen, Software Quality, Vikas

#### Reference:

1. IEEE Standards on Software Engineering.
2. Kane, Software Defect Prevention, SPD

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### Operating System

CS-603

Contact: 3L

Credits: 3

#### Introduction [4L]

Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

#### System Structure[3L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

#### Process Management [17L]

**Processes [3L]:** Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.

**Threads [2L]:** overview, benefits of threads, user and kernel threads.

**CPU scheduling [3L]:** scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

**Process Synchronization [5L]:** background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

**Deadlocks [4L]:** system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

#### Storage Management [19L]

**Memory Management [5L]:** background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

**Virtual Memory [3L]:** background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

**File Systems [4L]:** file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

**I/O Management [4L]:** I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

**Disk Management [3L]:** disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

#### Protection & Security [4L]

Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

#### Text Books / References :

1. Milenkovic M., "Operating System : Concept & Design", McGraw Hill.
2. Tanenbaum A.S., "Operating System Design & Implementation", Prentice Hall NJ.
3. Silberschatz A. and Peterson J. L., "Operating System Concepts", Wiley.
4. Dhamdhere: Operating System TMH
5. Stallings, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
6. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

#### Professional Elective

### Information Theory & Coding

CS-604A

Contact: 3L

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**Credits: 3**

### Source Coding [7L]

Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.

### Channel Capacity And Coding [7L]

Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

### Linear And Block Codes For Error Correction [8L]

Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.

### Cyclic Codes [7L]

Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

### BCH Codes [8L]

Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.

### Convolutional Codes [8L]

Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

### Books

1. Information theory, coding and cryptography - Ranjan Bose; TMH.
2. Information and Coding - N Abramson; McGraw Hill.
3. Introduction to Information Theory - M Mansurpur; McGraw Hill.
4. Information Theory - R B Ash; Prentice Hall.
5. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.

### Computer Graphics

**CS-604B**

**Contact: 3L**

**Credits: 3**

Introduction to Computer Graphics & Graphics Systems [4L]

Overview of CG, definitions of CG, types of CG, storage tubes displays, CRT technologies - Raster Scan Display, Computer graphics software.

### Scan Conversion [6L]

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

### 2D Transformation [8L]

Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines.

### Viewing [4L]

Viewing pipeline, Window to Viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

### 3D Transformation & Viewing [10L]

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3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space; reflection through an arbitrary plane; general parallel projection transformation; clipping, Viewport clipping, 3D viewing, perspectives & Depth Cueing.

### Curves and Fractals [4L]

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

### Hidden Surfaces [4L]

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

### Color & Shading Models [5L]

Introduction, Modeling Light Intensities and Sources, Diffuse Reflection, Lambert's Cosine Law, Specular Reflection, Halftoning, Color Models - RGB Color, CMY Color..

### Books:

1. Computer Graphics (C version 2<sup>nd</sup> Ed.) – Hearn D, Baker M P , Pearson.
2. Computer Graphics –A programming Approach– Harrington,Steven; McGraw Hill
3. Computer Graphics – principles and practice - Foley, Van Dam, Feiner and Huges; Pearson.
4. Computer Graphics (2<sup>nd</sup> Edition) - Hearn D, Banker M.P.;PHI
5. Schaum's outlines Computer Graphics(2<sup>nd</sup> Ed)- Z. Xiang, R. Plastock; TMH
6. Introduction to Computer Graphics – A. Mukhopadhyaya, A. Chattopadhyay; Vikas Publishing House Pvt. Ltd

### Artificial Intelligence

CS-604C

Contact: 3L

Credits: 3

### Introduction [2]

Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

### Intelligent Agents [2]

Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

### Problem Solving [2]

Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

### Search techniques [5]

Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

### Heuristic search strategies [5]

Greedy best-first search, A\* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

### Adversarial search [3]

Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

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### **Knowledge & reasoning [3]**

Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.

### **Using predicate logic [2]**

Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

### **Representing knowledge using rules [3]**

Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

### **Probabilistic reasoning [4]**

Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.

### **Planning [2]**

Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

### **Natural Language processing [2]**

Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

### **Learning [2]**

Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

### **Expert Systems [2]**

Representing and using domain knowledge, expert system shells, knowledge acquisition.

### **Basic knowledge of programming language like Prolog & Lisp. [6]**

#### **Books:**

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS
7. Artificial Intelligence, Russel, Pearson

**ERP**

**CS-604D**

**Contact: 3L**

**Credits: 3**

(Will be uploaded shortly)

**Free Elective**

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### Operation Research

CS-605A

Contact: 3L

Credits: 3

#### Module I

#### Linear Programming Problems (LPP):

Basic LPP and Applications; Various Components of LP Problem Formulation.

#### Solution of Linear Programming Problems:

Solution of LPP: Using Simultaneous Equations and Graphical Method;

Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples. 5L

Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems. 12L

#### Module II

#### Network Analysis:

Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). 6L

#### Inventory Control:

Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.

3L

#### Module III

#### Game Theory:

Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.

5L

#### Module IV

#### Queuing Theory:

Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): ( $\infty$  / FIFO) and (M/M/1: N / FIFO) and problems.

5L

#### Text Books:

1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

#### References:

1. Kanti Swaroop — "Operations Research", Sultan Chand & Sons
2. Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
3. R. Panneerselvam - "Operations Research", PHI
4. A.M. Natarajan, P. Balasubramani and A. Tamilarasi - "Operations Research", Pearson
5. M. V. Durga Prasad – "Operations Research", CENGAGE Learning
6. J. K. Sharma - "Operations Research", Macmillan Publishing Company

### Human Resource Management (HSS)

CS-605B

Contact: 3L

Credits: 3

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**Introduction :** HR Role and Functions, Concept and Significance of HR, Changing role of HR managers - HR functions and Global Environment, role of a HR Manager.

**Human Resources Planning :** HR Planning and Recruitment: Planning Process - planning at different levels - Job Analysis - Recruitment and selection processes - Restructuring strategies - Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.

**Training and Development :** need for skill upgradation - Assessment of training needs - Retraining and Redeployment methods and techniques of training employees and executives - performance appraisal systems.

**Performance Management System :** Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors-Competency management.

**Industrial Relations :** Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management.

**Case study.**

### Books :

1. Gary Dessler, Human Resource Management - (8th ed.,) Pearson Education, Delhi
2. Decenzo & Robbins, Personnel / Human Resource Management, 3rd ed., John Wiley & Sons (Pvt.) Ltd.
3. Biswajeet Patanayak, Human Resource Management, PHI, New Delhi
4. Luis R. Gomez, Mejia, Balkin and Cardy, Managing Human Resources PHI, New Delhi.

### Multimedia Technology

CS-605C

Contact: 3L

Credits: 3

### Introduction [2L]

Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications

### Text and Audio [6L]

Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption;

Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI

### Image and Video (8L)

Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.

### Synchronization [4L]

Temporal relationships, synchronization accuracy specification factors, quality of service

### Storage models and Access Techniques [(4L)]

Magnetic media, optical media, file systems (traditional, multimedia)

Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD

### Image and Video Database [8L]

Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing

### Document Architecture and Content Management [9L]

Content Design and Development, General Design Principles



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Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications

### **Multimedia Applications [4L]**

Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.

#### **Books:**

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
2. Nalin K. Sharda , Multimedia Information System , PHI.
3. Fred Halsall , Multimedia Communications , Pearson Ed.
4. Koegel Buford , Multimedia Systems , Pearson Ed.
5. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
6. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.
7. J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.
8. Prabhat K. Andleigh & Kiran Thakrar , Multimedia Systems Design , PHI.

### **E-Commerce**

**CS-605D**

**Contact: 3L**

**Credits: 3**

**Introduction to E-Commerce [6L]:** Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

**Business to Business E-Commerce [7L]:** Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

**Legal issues [5L]:** Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

**Security Issues [6L]:** Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security.

**Business to Consumer E-Commerce [8L]:** Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with VB, ASP, SQL.

**E-business [7L]:** Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

#### **Books:**

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
3. E-Commerce through ASP by W Clarke- BPB
4. Beginning E-Commerce with VB, ASP, SQL Server 7.0 & MTS by Mathew Reynolds, Wrox Publishers
5. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press

### **Practical**

**Database Management System Lab**

**Code: CS691**

**Contact: 3P**

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**Credits: 2**

### Structured Query Language

#### 1. Creating Database

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

#### 2. Table and Record Handling

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

#### 3. Retrieving Data from a Database

- The SELECT statement
- Using the WHERE clause
- Using Logical Operators in the WHERE clause
- Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING

### Clause

- Using Aggregate Functions
- Combining Tables Using JOINS
- Subqueries

#### 4. Database Management

- Creating Views
- Creating Column Aliases
- Creating Database Users
- Using GRANT and REVOKE

**Cursors in Oracle PL / SQL  
Writing Oracle PL / SQL Stored Procedures**

### Software Engineering Lab

**Code: CS692**

**Contact: 3P**

**Credits: 2**

(Will be uploaded shortly)

### UNIX & Shell Programming

**Code: CS693**

**Contact: 3P**

**Credits: 2**

(Will be uploaded shortly)

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**Proposed**

**Fourth Year - Seventh Semester**

Sl. No.	Field	Theory	A. THEORY				Cr. Pts
			Contact Hours/Week				
			L	T	P	Total	
1	CS701	11. Computer Networks	3	0	0	3	3
2	CS702	12. Compiler Design	3	0	0	3	3
3	CS703	A. Pattern Recognition B. Soft Computing C. Advanced Operating System D. Image Processing	3	0	0	3	3
4	CS704	A. Distributed Operating System B. Cloud Computing C. Data Mining D. Robotics E. Sensor Networks F. Mobile Computing	3	0	0	3	3
5	F. E.701	A. Internet Technology (IT) B. Microelectronics & VLSI Design (ECE) C. Control System (EE) D. Modelling & Simulation (M)	3	0	0	3	3
<b>Total of Theory</b>						<b>15</b>	<b>15</b>
<b>B. PRACTICAL</b>							
6	HU	Group Discussion	0	0	0	3	2
7	CS791	Network Lab	0	0	3	3	2
8	CS793	A. Pattern Recognition B. Soft Computing C. Advanced Operating System D. Image Processing	0	0	3	3	2
9	F.E.791	A. Internet Technology (IT) B. Microelectronics & VLSI Design (ECE) C. Control System (EE) D. Modelling & Simulation (M)	0	0	3	3	2
10	<b>Industrial training</b>		<b>4 wks during 6<sup>th</sup> -7<sup>th</sup> Sem-break</b>				2
11	<b>Project part 1</b>					3	2
<b>Total of Practical</b>						<b>15</b>	<b>12</b>
<b>Total of Semester</b>						<b>30</b>	<b>27</b>

**Fourth Year - Eighth Semester**

Sl. No.	Field	Theory	A. THEORY				Cr. Pts
			Contact Hours/Week				
			L	T	P	Total	
1	HU	Organisational Behaviour / Project Management	2	0	0	2	2
2	CS801	A. Advanced Computer Architecture B. Parallel Computing C. Natural Language Processing D. Cryptography & Network Security	3	0	0	3	3
3	F. E.801	A. Technology Management (HSS) B. Cyber Law & Security Policy (HSS) C. Optical Networking (ECE) D. Low Power Circuits & Systems (ECE)	3	0	0	3	3
<b>Total of Theory</b>						<b>8</b>	<b>8</b>
<b>B. PRACTICAL</b>							
3	Design	Design Lab / Industrial problem related practical training	0	0	6	6	4
4	Project.	Project-2	0	0	12	12	6
10	<b>Grand Viva</b>						3
<b>Total of Practical</b>						<b>18</b>	<b>13</b>
<b>Total of Semester</b>						<b>26</b>	<b>21</b>

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### Advanced Computer Architecture

Review of Basic Organization and Architectural Techniques: RISC processors; Characteristics of RISC processors; RISC versus CISC; Classification of Instruction Set Architectures; Review of performance measurement techniques; Basic parallel processing techniques: instruction level, thread level and process level; Classification of parallel architectures.

Instruction Level Parallelism: Basic concepts of pipelining; Arithmetic pipelines; Instruction pipelines; Hazards in a pipelined processors: structural, data, and control hazards; Overview of hazard resolution techniques; Dynamic instruction scheduling ; Branch prediction techniques; Instruction-level parallelism using software approaches; Superscalar techniques; Speculative execution; Review of use of ILP in modern processors.

Hierarchical Memory Organization: Basic concept of hierarchical memory organization; Main memories; Cache memory design and implementation; Virtual memory design and implementation; Secondary memory technology; RAID.

Thread Level Parallelism: Centralized vs. distributed shared memory; Interconnection topologies; Multiprocessor architecture; Symmetric multiprocessors; Cache coherence problem; Memory consistency; Multicore architecture; Review of modern multiprocessors

Process Level Parallelism; Distributed memory computers; Cluster Computing; Grid Computing; Cloud computing

### Low Power Circuits and Systems

Basics of MOS circuits: MOS Transistor structure and device modeling; MOS Inverters; MOS Combinational Circuits – Different Logic Families

Sources of Power dissipation: Dynamic Power Dissipation: Short Circuit Power; Switching Power; Glitching Power: Static Power Dissipation

Supply Voltage Scaling Approaches: Device feature size scaling; Multi-Vdd Circuits; Architectural level approaches: Parallelism, Pipelining; Voltage scaling using high-level transformations; Dynamic voltage scaling; Power Management.

Switched Capacitance Minimization Approaches: Hardware Software Tradeoff; Bus Encoding; Two's complement Vs Sign Magnitude; Architectural optimization; Clock Gating; Logic styles

Leakage Power minimization Approaches: Variable-threshold-voltage CMOS (VTCMOS) approach; Multi-threshold-voltage CMOS (MTCMOS) approach ; Dual-Vt assignment approach (DTCMOS); Transistor stacking.

Special Topics: Adiabatic Switching Circuits; Battery-aware Synthesis; Variation tolerant design

### References:

1. Sung\_Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata McGraw Hill
2. Neil H. E. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2<sup>nd</sup> Edition, Addison Wesley (Indian reprint).
3. A. Bellamour, and M. I. Elmasri, *Low Power VLSI CMOS Circuit Design*, Kluwer Academic Press, 1995
4. Anantha P. Chandrakasan and Robert W. Brodersen, *Low Power Digital CMOS Design*, Kluwer Academic Publishers, 1995
5. Kaushik Roy and Sharat C. Prasad, *Low-Power CMOS VLSI Design*, Wiley-Interscience, 2000

### Data Communication

Data Communication Fundamentals: Layered Network Architecture; Data and Signal; Guided Transmission Media; Unguided Transmission Media; Transmission Impairments and Channel Capacity; Transmission of Digital Signal; Analog Data to Analog Signal; Digital Data to Analog Signal; Multiplexing of Signals: The telephone system and DSL technology; Cable MODEM and SONET

Data Link control: Interfacing to the media and synchronization; Error Detection and Correction; Flow and Error control; Data Link Control.

Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; Congestion control in packet switched networks; X.25; Frame Relay; Asynchronous Transfer Mode Switching (ATM).

# Syllabus for B.Tech(Computer Science & Engineering) Second Year & 3<sup>rd</sup> Year (Proposed)

Revised Syllabus of B.Tech CSE (for the students who were admitted in Academic Session 2010-2011)



Broadcast communication networks: Network Topology; Medium Access Control Techniques; IEEE CSMA/CD based LANs; IEEE Ring LANs; High Speed LANs – Token Ring Based; High Speed LANs – CSMA/CD based; Wireless LANs; Bluetooth; Cellular Telephone Networks; Satellite Networks.

Internetworking: Internetworking Devices; Internet Protocols; TCP/IP; Transport and Application layer protocols.

Network Security: **Cryptography; Secured Communication; Firewalls.**

## References:

8. Data Communications and Networking, Behrouz A. Forouzan, TMH
9. Data and Computer Communications, William Stallings, PHI
10. Computer Networks, Andrew S. Tanenbaum, PHI