

# Syllabus for B.Tech(Information Technology) Second Year

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

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



### IT

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	IT401	Object Oriented Programming & UML	3	1	0	4	4
<b>Total of Theory</b>						<b>18</b>	<b>17</b>
B. PRACTICAL							
6	HU481	Technical Report Writing & Language Lab Practice	0	0	3	3	2
7	M(CS)491	Numerical Methods	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	IT491	Object Oriented Programming & UML (IT)	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.

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### Physics-2

Code: PH-301

Contacts: 4L

Credit: 3+1

Module 1:

Vector Calculus:

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:

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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*

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

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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

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

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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

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

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### 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.

### 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]

3. 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)
4. 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]

1. Binary Number System & Boolean Algebra (recapitulation ) [1L]; BCD, ASCII, EBDIC, 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)
2. 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]

- a) Sequential Circuits - Basic Flip-flop & Latch [1L], Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops [3L], (4L)
- b) 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]

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- 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

#### Reference:

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- Cengage Learning.  
Leach & Malvino—Digital Principles & Application, 5/e, Mc Graw Hill  
Floyd & 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.



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### 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.  
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.

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### 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]

#### 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,

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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

#### Physics 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

#### 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:

- i. Failure to perform each experiment mentioned in b] and c] should be compensated by two experiments mentioned in the above list.
- ii. 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]
- iii. Experiment in b] and c] can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:

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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

5. Kingsler and Frey
6. D.P. Roychaudhuri
7. N.K. Bajaj (Waves and Oscillations)
8. K. Bhattacharya
9. R.P. Singh ( Physics of Oscillations and Waves)
10. A.B. Gupta (College Physics Vol.II)
11. Chattopadhyaya and Rakshit (Vibration, Waves and Acoustics)

Optics

1. Möler (Physical Optics)
2. A.K. Ghatak
3. E. Hecht (Optics)
4. E. Hecht (Schaum Series)
5. F.A. Jenkins and H.E. White
6. Chita Ranjan Dasgupta ( Degree Physics Vol 3)

Quantum Physics

1. Eisberg and Resnick
2. A.K. Ghatak and S. Lokenathan
3. S.N. Ghoshal (Introductory Quantum Mechanics)
4. E.E. Anderson (Modern Physics)
5. Haliday, Resnick and Crane (Physics vol.III)
6. 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

1. A.K. Ghatak and Thyagarajan (Laser)
2. Tarasov (Laser)
3. P.K. Chakraborty (Optics)
4. B. Ghosh and K.G. Majumder (Optics)
5. B.B. Laud (Laser and Non-linear Optics)
6. 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)

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J.C. Upadhya (Mechanics)

Electricity and Magnetism

2. Reitz, Milford and Christy
3. David J. Griffith
4. D. Chattopadhyay and P.C. Rakshit
5. Shadowitz (The Electromagnetic Field)

Quantum Mechanics

7. Eisberg and Resnick
8. A.K. Ghatak and S. Lokenathan
9. S.N. Ghoshal (Introductory Quantum Mechanics)
10. E.E. Anderson (Modern Physics)
11. Haliday, Resnick and Crane (Physics vol.III)
12. Binayak Dutta Roy [Elements of Quantum Mechanics]

Statistical Mechanics

8. Sears and Sallinger (Kinetic Theory, Thermodynamics and Statistical Thermodynamics)
9. Mondal (Statistical Physics)
10. S.N. Ghoshal ( Atomic and Nuclear Physics)
11. Singh and Singh
12. B.B. Laud (Statistical Mechanics)
13. F. Reif (Statistical Mechanics)

Dielectrics

7. 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

3. Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.
4. Construction of simple Decoder & Multiplexer circuits using logic gates.
5. Realization of RS / JK / D flip flops using logic gates.
6. Design of Shift Register using J-K / D Flip Flop.
7. Realization of Synchronous Up/Down counter.
8. Design of MOD- N Counter
9. 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)

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### 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

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)

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### 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)

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.

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

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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.

**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.



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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: 2L**

**Credits: 3**

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, Shannon'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*); Shannon-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:

- 11.2 An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley

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India.

11.3 Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

References:

7. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
8. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
9. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
10. 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.

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  $\lambda$  transitions - Significance, acceptance of languages. [1L]

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Conversions and Equivalence: Equivalence between NFA with and without  $\hat{\lambda}$  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]

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>

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edition, PHI.

“Formal Languages and Automata Theory”, C.K.Nagpal, Oxford

### REFERENCES:

- 5.1 “Switching & Finite Automata”, ZVI Kohavi, 2nd Edn., Tata McGraw Hill
- 5.2 “Introduction to Computer Theory”, Daniel I.A. Cohen, John Wiley
- 5.3 “Introduction to languages and the Theory of Computation”, John C Martin, TMH
- 5.4 “Elements of Theory of Computation”, Lewis H.P. & Papadimitrou C.H. Pearson, PHI.

### Object Oriented Programming & UML

Code: IT401

Contacts: 3L+1T

Credits: 4

### Prerequisites of Object Oriented Programming & UML:

The fundamental point in learning programming is to develop the critical skills of formulating programmatic solutions for real problems. It will be based on basic knowledge of algorithms and procedural programming language. Once the basic skill of writing programs using loop, methods and arrays will be clear then the student can develop object oriented software using class encapsulation and inheritance.

**Module-1:** [10L]

#### **Introduction:**

Why object orientation, History and development of object oriented programming language, concepts of object oriented programming language. [1L] Difference between OOP and other conventional programming – advantages and disadvantages. [1L] Data types, variables. Array, operators. [1L] String, I/O. [1L] Control statements. [1L]

#### **Object oriented design:**

Major and minor elements, class fundamentals. [1L]; Declaring objects, instantiation of class, introducing methods. [1L]; Constructing objects using constructor. [1L]; Static variable, constants. [1L]; Visibility modifiers. [1L]

#### Learning outcome of Introduction of OOP:

Students will be able to implement basic data structure and control statements in object oriented programming. They can write programs around its data i.e, objects and a set of well-defined interfaces to that data. Student will be able to design class with its basic features.

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

**Object Properties:** Introduction to basic features of a class (encapsulation, polymorphism etc) [1L]; Data field encapsulation. [1L]; Passing objects to methods. [1L]; Array of objects, 'This' keyword [1L]; Relationships among objects: aggregation, composition, dependency, links. [1L]; Relationship among classes: association, aggregation. [1L]

Meta class, meta object. [1L]; Grouping constructs. [1L]

#### Learning outcome of Object oriented design:

Student will be able to design object oriented programs with the concept of object, class, abstraction, encapsulation, inheritance etc. to provide flexibility, modularity and re-usability in programming. They can also be able to design Meta classes and grouping construct.

**Module-3:** [11L]

#### **Basic concepts of object oriented programming using Java:**

Using objects as parameters, closure look at argument passing, returning objects. [1L]; Introducing access control, Final keyword, garbage collection, Nested and inner classes. [1L]; Class abstraction and encapsulation,

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Overloading of methods (overloading of constructor). [1L]; Super class, subclasses, super keyword, inheritance, types, member access.[1L]; Multilevel hierarchy, process of constructor calling in inheritance. [1L]; Overriding methods, overriding vs. overloading, polymorphism. [1L]; Abstract class, interface & comparison between abstract class and interface [1L]; Packages, importing packages. [1L]; Exception handling basics, types, using try & catch, throw, throws & finally. [1L]; Threading, synchronization & priorities, thread class, creating thread. [1L]; Basic applet programming. Life cycle. [1L];

### Learning outcome of OOP using Java:

Students can write programs using Java to implement OOP i.e, encapsulation, polymorphism, aggregation etc., by which they will be able to compare the difference between OOP and other conventional programming languages. They will write programs by using the built-in support for multithreaded programming in java. They will also implement the GUI based event-driven application using Java applets.

### **Module-4:** [8L]

#### **Fundamentals of Object Oriented design in UML:**

Introduction to UML: Why Modeling, Overview of UML, Conceptual Model, Architecture of UML [1L]; UML Modeling Types: Structural Modeling, Behavioral Modeling, Architectural Modeling [1L]; Basic Notations in UML [1L]; Class Diagram [1L]; Interaction and Collaboration Diagrams. [1L]; Sequence Diagram. [1L]; State chart Diagram and Activity Diagram. [1L]; Implementation Diagram and UML extensibility- model constraints.[1L]

### Learning outcome of Object oriented design in UML:

Student will be able to design software through UML diagrams and identify the components of object oriented design and develop the relationship among them. They can also able to use UML to design software like Payroll Management System, Library Management System etc.

### Textbooks/References:

1. Rumbaugh, James Michael, Blaha-"Object Oriented Modelling and Design"-Prentice Hall, India
2. Ali Bahrami,-"Object Oriented System Development"-Mc Graw Hill
3. Patrick Naughton, Herbert Schildt-"The complete reference-Java2"-TMH
4. Sourav Sahay-"Object-Oriented Programming with C++"-Oxford
5. Jason T. Roff, UML: A Beginner's Guide, TMH
6. Grady Booch, Ivar Jacobson, James Rumbaugh, , "The Unified Modeling Language Reference Manual", Pearson Ed.
7. Blaha, Rumbaugh, "Object-Oriented Modeling and Design with UML", Pearson Ed.

### Practical

#### **Communication Skill & Report Writing**

**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 )

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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*

*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

Code : M(CS) 491

Contacts : 2L

Credits :1

1. Assignments on Newton forward /backward, Lagrange's interpolation.

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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

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

#### **Software Tools**

**Code : CS 492**

**Contacts : 3L**

**Credits :2**

8. Introduction to Visual Basic & difference with BASIC. Concept about form Project, Application, Tools, Toolbox, Controls & Properties. Idea about Labels, Buttons, Text Boxes.
  - i. Data basics, Different type variables & their use in VB,
  - ii. Sub-functions & Procedure details, Input box () & MsgBox ().
  - iii. Making decisions, looping
  - iv. List boxes & Data lists, List Box control, Combo Boxes, data Arrays.
  - v. Frames, buttons, check boxes, timer control,
  - vi. Programming with data, ODBC data base connectivity.
  - vii. Data form Wizard, query, and menus in VB Applications,
  - viii. Graphics.
  - ix.
9. 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.

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#### **Object Oriented Programming & UML**

**Code: IT491**

**Contacts: 3**

**Credits: 2**

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, vectors, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming, handling errors and exceptions, applet programming and graphics programming

Note: Use Java for programming.



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### IT 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	IT501	Design & Analysis of Algorithm	3	1	0	4	4
3	IT502	Computer Architecture	3	1	0	4	4
4	IT503	Operating System	3	0	0	3	3
5	F. E.						
	IT504A	Circuit Theory & Network (EE)					
	IT504B	Data Communication (ECE)					
	IT504C	Digital Signal Processing (ECE)					
	IT504D	Operation Research (M)	3	0/1	0	3/4	3/4
<b>Total of Theory</b>						<b>17/18</b>	<b>17-18</b>
B. PRACTICAL							
6	IT591	Algorithm Lab	0	0	3	3	2
7	IT592	Computer Architecture	0	0	3	3	2
8	IT593	UNIX & Shell Programming	0	0	3	3	2
9	F.E.		0	0	3	3	2
	IT594A	A. Circuit Theory & Network (EE)					
	IT594B	B. Data Communication (ECE)					
	IT594C	C. Digital Signal Processing (ECE)					
	IT594D	D. Operation Research (M)					
<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	IT.601	Data Base Management System	3	0	0	3	3
3	IT602	Software Engg	3	0	0	3	3
4	IT603	Computer Networking	3	0	0	3	3
5	P.E.		3	0	0	3	3
	IT604A	Information Theory & Coding					
	IT604B	Computer Graphics					
	IT604C	E-Commerce					
	IT604D	ERP					
6	F. E.		3	0/1	0	3/4	3/4
	IT605A	Discrete Mathematics (M)					
	IT605B	Human Resource Management (HSS)					
	IT605C	Soft Computing (CSE)					
	IT605D	Artificial Intelligence (CSE)					
<b>Total of Theory</b>						<b>17/18</b>	<b>17-18</b>
B. PRACTICAL							
7	IT691	Data Base Management System Lab	0	0	3	3	2
8	IT692	Software Engineering-SK	0	0	3	3	2
9	IT693	Computer Networking	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. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

#### Design & Analysis of Algorithm

Code: IT501

Contact: 3L + 1T

Credits: 4

Models of Computation:	[2L]
Random Access Machine (RAM), Relationship between Turing Machine and RAM	
Complexity Analysis:	[2L]
Time and Space Complexity, Different Asymptotic notations – their mathematical significance	
Algorithm Design Techniques:	[2L]
Recursion – definition, use and limitations, Examples – Tower of Hanoi problem, Tail recursion	
Divide and Conquer:	[3L]
Basic method, use, Examples – Binary Search, Merge Sort, Quick Sort, Heap Sort and their complexity	
Dynamic Programming:	[3L]
Basic method, use, Examples – Matrix Chain Manipulation, All pair shortest paths, single source shortest path, Travelling Salesman Problem	
Branch and Bound:	[2L]

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Basic method, use, Examples – The 15 puzzle problem Backtracking:	[3L]
Basic method, use, Examples – 8 queens problem, Graph coloring problem, Hamiltonian problem Greedy Method:	[3L]
Basic method, use, Examples – Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm Lower Bound Theory:	[2L]
Bounds on searching and sorting techniques using partial and total order Disjoint set manipulation:	[2L]
Set manipulation algorithm like UNION-FIND, union by rank, path compression Graph traversal algorithm:	[1L]
Breadth First Search (BFS) and Depth First Search (DFS) – complexity and comparison String matching problem:	[2L]
Different techniques including Knuth Morris and Pratt algorithm, complexities Matrix Manipulation Algorithm:	[4L]
Strassen's matrix manipulation algorithm and its application to solution of simultaneous linear equations using LUP decomposition, Inversion of matrix and Boolean matrix multiplication Notion of NP-completeness:	[3L]
P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's theorem (Statement only), Clique decision problem Approximation Algorithms:	[4L]
Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes, 0/1 Knapsack problem, vertex cover problem, travelling salesman problem, set covering problem	

### Computer Architecture

**Code: IT502**

**Contact: 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)

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:

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

Text books:  
[To be detailed]

### Operating System

**Code: IT502**

**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", Practice Hall NJ.
3. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
4. Dhamdhare: Operating System TMH
5. Stallng, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
6. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

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### Free Elective

#### Circuit Theory & Network

**Code: IT504A**

**Contact: 3L+1T**

**Credits: 4**

Module	Content	Hrs
1.	<p><b>a) Resonant Circuits:</b> Series and Parallel resonance [1L], (*) <b>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].</b></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, (*) <b>Incident matrix, Tie set matrix [2L], Determination of loop current and node voltages [2L].</b></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, (*) <b>R-L-C Circuits, AC Transients in sinusoidal R-L, R-C and R-L-C Circuits, Solution of Problems [2L].</b></p>	4  4  2
4.	<p><b>Laplace transform:</b> Concept of Complex frequency [1L], transform of f(t) into F(s) [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>(*) <b>Laplace transform and Inverse Laplace transform [2L].</b></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  $\pi$ .

#### 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  $i_{sc} = 9 \text{ A}$ . To find out the equivalent Norton's impedance  $R_N$ , deactivate all the independent sources, resulting in a circuit of Fig.2.(b),  $R_N = (4 \times 12)/(4+12) = 3 \text{ Ohms}$ . Thus we obtain Norton equivalent circuit of Fig.2 (c).

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#### 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.**

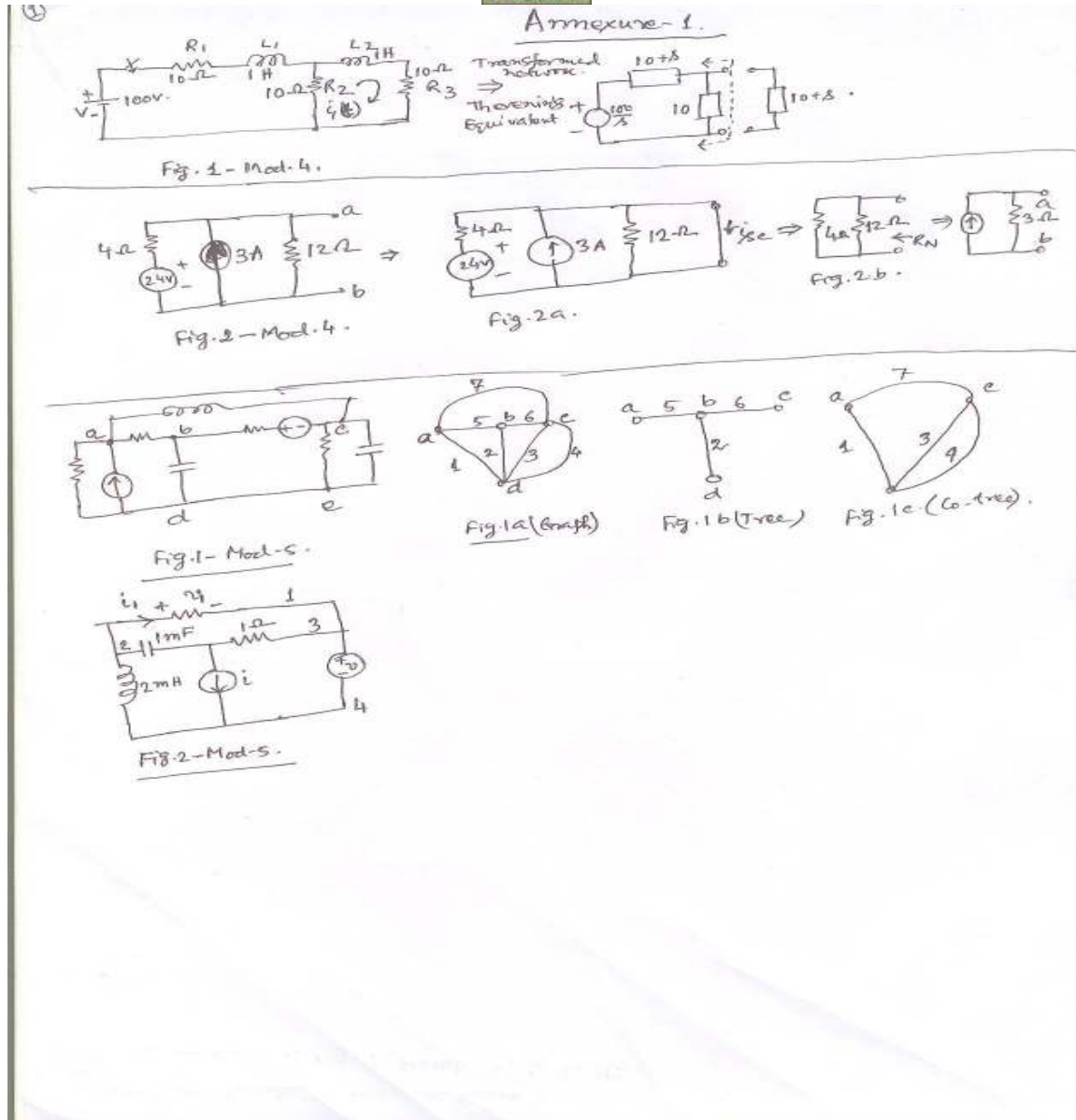
Text Books:

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: IT504B**

**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: IT504C**

**Contact: 3L + 1T**

**Credits: 4**

#### **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:***



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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:

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

### REFERENCE BOOKS:

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

### Operation Research

Code: IT504D

Contact: 3L + 1T

Credits: 4

### Module I

#### Linear Programming Problems (LPP):

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

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### **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

### **Practical**

#### **Design & Analysis Algorithm Lab**

**Code: IT591**

**Contact: 3P**

**Credits: 2**

**(Will be uploaded shortly)**

#### **Computer Architecture Lab**

**Code: IT592**

**Contact: 3P**

**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]

HDL introduction

Basic digital logic base programming with HDL

8-bit Addition, Multiplication, Division

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8-bit Register design  
Memory unit design and perform memory operations.  
8-bit simple ALU design  
8-bit simple CPU design  
Interfacing of CPU and Memory

### UNIX & Shell Programming

**Code: IT593**

**Contact: 3P**

**Credits: 2**

Module 1: Introduction to UNIX system.

Introduction to UNIX, layered UNIX architecture, shells, UNIX commands and vi editor.

Module 2: Basic System Administration in UNIX

Administration tasks, user account management, start and shutdown scripts, process and its manipulation, file system management.

Module 3: Introduction to shell and filters

Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command-Line Editing, Quotes, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files.

Module 4: Regular Expressions Grep and Sed:

Regular Expression

Use regular expression syntax to: match any single character, match the beginning and/or end of a line, match a choice of characters, match zero or multiple characters, match a precise number of characters

Grep :

Operation, grep Family, Searching for File Content.

Sed :

Scripts, Operation, Addresses, commands, Applications, grep and sed.

Tools and trade

For extracting data from a file, combining and sorting files, tr command for translating files from one format to another, uniq command for removing duplicate entries from a search filter.

Module 5: Shell Variables and Positional Parameters

Create and access user-defined variables, scope of variables have in a shell script, Use of positional parameters in a shell script, the shell's special variables

Process the arguments passed into a script from the command line, use of the shift and set commands to control positional parameters.

Module 6: Expressions, Flow control and Decisions, Loops and Functions

Usage of Expressions to find values in shell programs.

Usage of different types of flow control and decision in shell programs.

Usage of different types of Loops in shell programs.

Understanding usage of functions in shell programming, passing parameters, returning values from functions, nested functions, function call from prompt.

Module 7: Signals and Traps

Sending signals, trapping signals, ignoring signals and resting traps. Programs in UNIX-C showing usage of signals and traps.

Module 8: awk programming

Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Module 9: Korn Shell Programming :

Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

Module 10: Posix Threads:

Concepts of threads, Multithread programming in UNIX using Posix threads to implement concurrency and parallelism. Programmes on Thread creation and producer/consumer problem.

Books:

1. *The Unix Programming Environment*, Kernighan & Pike, Prentice Hall,
2. *Unix and shell Programming* by B.A. Forouzan & R.F. Giberg, Thomson

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3. *Pthreads Programming*, B.Nichols, D.Buttlar, J.Proulx, O'Reilly,
4. *The AWK Programming Language*, Aho, Kernighan, Weinberger, Addison-Wesley
5. *sed & awk*, Dale Dougherty, O'Reilly.
6. *Unix Shell Programming*, by Stephen G. Kochan, 3rd edition, SAMS
7. *UNIX: For Programmers and Users*, Graham Glass and King Ables, Pearson
8. *UNIX® Shells by Example*, Ellie Quigley, Pearson
9. *The Complete Reference Unix*, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH

### Circuits and Networks\_Lab

**Code: IT594A**

**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
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:IT594B**

**Contact: 3P**

**Credits: 2**

**(Will be uploaded shortly)**

### DSP Lab

**Code: IT594C**

**Contact: 3P**

**Credits: 2**

### Simulation Laboratory using standard Simulator:

1. Sampled sinusoidal signal, various sequences and different arithmetic operations.
2. Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
3. Z-transform of various sequences – verification of the properties of Z-transform.
4. Twiddle factors – verification of the properties.
5. DFTs / IDFTs using matrix multiplication and also using commands.
6. Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.
7. Verifications of the different algorithms associated with filtering of long data sequences and Overlap – add and Overlap-save methods.
8. Butterworth filter design with different set of parameters.
9. FIR filter design using rectangular, Hamming and Blackman windows.

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

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

### OR Lab

Code: IT594D

Contact: 3P

Credits: 2

### Software based lab using C /C++

1. Assignment on Transportation problem.
2. Assignment on Assignment problem
3. Assignment on Duality
4. Assignment on Simplex method (Including Charns' Big-M Method)
5. Assignment on Shortest Path by using Dijkstra's or Floyd's Algorithm
6. Assignment on Maximal Flow Problem (Ford-Fulkerson Method).
7. Assignment on PERT/CPM
8. Familiarization with O.R package: TORA

## 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.
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.

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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 , Revised edition, Tata McGraw Hill(TMh)
3. Management – Stoner, James A. F. (Pearson)
4. Management - Ghuman, Tata McGraw Hill(TMh)

### Database Management System

IT-601

Contracts: 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 bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base 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 .

### Text Books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.Graw Hill.
2. Elmasri Ramez and Navathe 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

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### Software Engineering

IT-602

Contracts: 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 Bottop-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

### Computer Networking

IT-603

Contracts: 3L

Credits- 3

#### Module I

**Overview of data communication and Networking: [5L]**

Introduction; Data communications: components, data representation(ASCII,ISO etc.),direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

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### Physical level: [5L]

Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital)& transmission media ( guided & non-guided); TDM, FDM, WDM; Circuit switching: time division & space division switch, TDM bus; Telephone network;

### Module II

#### Data link layer: [6L]

Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

#### Medium access sub layer: [5L]

Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fast Ethernet;

### Module III

#### Network layer: [8L]

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, classful address, subnetting; Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

#### Transport layer: [6L]

Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos.

### Module IV

#### Application layer: [5L]

DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

#### Modern topics: [5L]

ISDN services & ATM ; DSL technology, Cable modem, Sonet.

Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

#### Text Books:

1. B. A. Forouzan – “Data Communications and Networking (3<sup>rd</sup> Ed.) “ – TMH
2. A. S. Tanenbaum – “Computer Networks (4<sup>th</sup> Ed.)” – Pearson Education/PHI
3. W. Stallings – “Data and Computer Communications (5<sup>th</sup> Ed.)” – PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas
7. Miller, Digital & Data Communication, Jaico
8. Shay, Understanding Data Communication & Network, Vikas

#### Reference Books:

1. Kurose and Rose – “ Computer Networking -A top down approach featuring the internet” – Pearson Education
2. Leon, Garica, Widjaja – “Communication Networks” – TMH
3. Walrand – “Communication Networks” – TMH.
4. Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4<sup>th</sup> Ed.)” – Pearson Education/PHI

### Professional Elective

#### **Information Theory & Coding**

**IT-604A**

**Contracts: 3L**

**Credits- 3**

#### **Source Coding [7L]**

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



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### 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

#### IT-604B

Contracts: 3L

Credits- 3

Graphics display devices, Input devices, Rendering pipeline:	[2L]
Mathematical concepts:	[4L]
Lines and line representations, Vector and affine spaces, Polygons and polygon interiors, Dot and cross products, Planes and plane representations, Line-line and line-plane intersections, Homogeneous coordinates	
Raster graphics, windowing and clipping:	[4L]
Line and Circle drawing algorithms, Windowing, Clipping: Cohen and Sutherland line clipping, Newman and Sproull, Cyrus-beck clipping method	
Transformations:	[6L]
2D and 3D Geometrical Transformations – scaling, translation, rotation, shear, Viewing Transformations: parallel and perspective projection, Affine transformation	
Viewing:	[4L]
Orthographic viewing, Foley VanDam perspective, Mathematics of perspective, Projection taxonomy	
Curves and surfaces:	[4L]
Cubic splines, Bezier curves, B-splines, Tensor product surfaces, Surface of revolution Sweep surfaces, Fractal curves and surfaces	
Hidden Line/surface elimination	[2L]
Scan Conversion:	[3L]
DDA, Bresenham, Polygon scan conversion, Antialiasing	
Illumination and Shading Models:	[2L]
Polygon Shading: Gouraud, Phong	
Introduction to Ray-tracing:	[3L]
Human vision and color, Lighting, Reflection and transmission models	
Animation	[2L]

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Books:

1. *Computer Graphics (Principles and Practice)* by Foley, van Dam, Feiner and Hughes, Addison Wesley (Indian Edition)
2. *Computer Graphics* by D Hearn and P M Baker, Prentice Hall of India
3. *Mathematical Elements for Computer Graphics* by D F Rogers, McGraw Hill
4. *Procedural Elements for Computer Graphics* by D F Rogers, McGraw Hill

### E-Commerce

**IT-604C**

**Contracts: 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

### ERP

**IT-604D**

**Contracts: 3L**

**Credits- 3**

(Will be uploaded shortly)

### Free Elective

#### Discrete Mathematics

**IT-605A**

**Contracts: 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

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### 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:

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

### Human Resource Management (HSS)

IT-605B

Contracts: 3L

Credits- 3

**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.

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### Soft Computing

IT-605C

Contracts: 3L

Credits- 3

#### Introduction to artificial neural network

[10L

Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Applications of Artificial Neural Networks.

Competitive learning networks, Kohonen self organizing networks, Hebbian learning; Hopfield Networks, Associative Memories, The boltzman machine; Applications.

#### Fuzzy Logic

[12L

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.Fuzzy Logic: Classical Logic.

Genetic algorithms(Gas),Evolution strategies(Ess),Evolutionary programming(EP),Genetic Programming(GP),Selecting,crossover,mutation,schema analysis,analysis of selection algorithms;convergence;Markov & other stochastic models.

[10L]

Other Soft computing approaches

[7L

Simulated Annealing, Tabu Search, Ant colony based optimisation, etc.

#### Text:

1. "Neuro-Fuzzy and Soft computing", Jang, Sun, Mizutani, Pearson
2. "Neural networks: a comprehensive foundation", Haykin, Pearson
3. "Genetic Algorithms", Goldberg, Pearson
4. "Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, PHI.

#### Reference:

1. "An Introduction to Neural Networks", Anderson J.A., PHI, 1999.
2. "Introduction to the Theory of Neural Computation", Hertz J. Krogh, R.G. Palmer, Addison-Wesley, California, 1991.
3. "An Introduction to Genetic Algorithm", Melanie Mitchell, PHI, 1998.
4. "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.
5. "Neural Networks: Algorithms, Applications and Programming Techniques", Freeman J.A. & D.M. Skapura, Addison Wesley, Reading, Mass, (1992).

### Artificial Intelligence

IT-605D

Contracts: 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]

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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.

### **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:**

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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

### Practical

#### **Database Management System Lab**

**Code: IT691**

**Contact: 3P**

**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: IT692**

**Contact: 3P**

**Credits: 2**

**Pre-requisite:** For Software Engineering Lab, design a project proposal which will be used throughout the lab for performing different experiments using CASE Tools.

1. Preparation of requirement document for proposed project in standard format.
2. Project Schedule preparation using tools like MSPProject. Generation of Gantt and PERT chart from schedule. Prepare Project Management Plan in standard format.

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3. Draw Use Case diagram, Class diagram, Sequence diagram and prepare Software Design Document using tools like Rational Rose.
4. Estimate project size using Function Point (FP)/Use Case Point. Use Excel/Open Office template for calculation.
5. Design Test Script/Test Plan (both Black box and WhiteBox approach) for a small component of the proposed project. (Develop that component using programming languages like c/Java/VB etc.)
6. Generate Test Result and perform defect root cause analysis using Pareto or Fishbone diagram.
7. Compute Process and Product Metrics (e.g Defect Density, Defect Age, Productivity, Cost etc.)
8. Familiarization with any Version Control System like CVS/VSS/Pvcs etc.

(Following projects can be used as dummy projects:

Library Management System  
Railway Reservation System  
Employee Payroll  
Online Banking System  
Online Shopping Cart  
Online Examination)

### **Computer Networking Lab**

**Code: IT693**

**Contact: 3P**

**Credits: 2**

- IPC (Message queue)
- NIC Installation & Configuration (Windows/Linux)
- Familiarization with
  - Networking cables (CAT5, UTP)
  - Connectors (RJ45, T-connector)
  - Hubs, Switches
- TCP/UDP Socket Programming
- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server
- Implementation of
  - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
  - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
  - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

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### Proposed Structure

#### Fourth Year - Seventh Semester

A. THEORY								
Sl. No.	Field	Theory	Contact Hours/Week				Cr. Pts	
			L	T	P	Total		
1	<b>P.C.701</b>	11. Internet Technology	3	0	0	3	3	
2	<b>P.C.702</b>	12. Multimedia	3	0	0	3	3	
3	<b>P. E.701</b>	A. Pattern Recognition B. Soft Computing C. Advanced Operating System D. Image Processing E. Animation	3	0	0	3	3	
4	<b>P.E.702</b>	A. Distributed Operating System B. Cloud Computing C. Data Mining D. Robotics E. Sensor Networks F. Mobile Computing	3	0	0	3	3	
5	<b>F. E.701 (No Lab)</b>	A. Bio Informatics (BI) B. Control System (EE) C. Modelling & Simulation (M) D. Microelectronics & VLSI Design	3	0	0	3	3	
<b>Total of Theory</b>						<b>15</b>	<b>15</b>	
B. PRACTICAL								
6	<b>HU</b>	<b>Group Discussion</b>	0	0	0	3	2	
7	<b>P.C.791</b>	11. Internet Technology	0	0	3	3	2	
8	<b>P.C792</b>	12. Multimedia	0	0	3	3	2	
9	<b>P.E.791</b>	A. Pattern Recognition B. Soft Computing C. Advanced Operating System D. Image Processing E. Animation	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>279</b>



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### Fourth Year - Eighth Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Cr. Pts
			L	T	P	Total	
1	HU	Organisational Behaviour / Project Management	2	0	0	2	2
2	P. E.801	A. Advanced Computer Architecture B. Parallel Computing C. Natural Language Processing D. Cryptography & Network Security	3	0	0	3	3
3	F. E.	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. PRACTICAL							
3	Design	Design problem 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>