

**School of Information Technology ( formerly known as IIT-C)  
New Course Structure of B.E. in IT(in-house course of WBUT)**

**First Semester**

| <b>A. <u>THEORY</u></b>    |                        |                                       |                            |   |   |           |                  |
|----------------------------|------------------------|---------------------------------------|----------------------------|---|---|-----------|------------------|
|                            | Code                   | Subjects                              | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                            |                        |                                       | L                          | T | P | Total     |                  |
| 1.                         | <a href="#">M-101</a>  | Mathematics-I                         | 3                          | 1 | 0 | 4         | 4                |
| 2.                         | <a href="#">PH-101</a> | Physics-I                             | 3                          | 1 | 0 | 4         | 4                |
| 3.                         | <a href="#">EC-101</a> | Electronics Fundamentals              | 3                          | 1 | 0 | 4         | 4                |
| 4.                         | <a href="#">CS-101</a> | Introduction to Computer Programming  | 3                          | 0 | 0 | 3         | 3                |
| 5.                         | <a href="#">HU-101</a> | Humanities                            | 2                          | 1 | 0 | 3         | 3                |
| 6.                         | <a href="#">EE-101</a> | Fundamentals of Electrical Technology | 3                          | 1 | 0 | 4         | 4                |
| <b>Total of Theory</b>     |                        |                                       |                            |   |   | <b>22</b> | <b>22</b>        |
| <b>B. <u>PRACTICAL</u></b> |                        |                                       |                            |   |   |           |                  |
| <b>B. <u>PRACTICAL</u></b> |                        |                                       |                            |   |   |           |                  |
|                            | Code                   | Subjects                              | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                            |                        |                                       | L                          | T | P | Total     |                  |
| 1.                         | <a href="#">EC-191</a> | Basic Electronics Lab                 | 0                          | 0 | 3 | 3         | 2                |
| 2.                         | <a href="#">CS-191</a> | PC Environment Lab                    | 0                          | 0 | 3 | 3         | 2                |
| 3.                         | <a href="#">CS-192</a> | Introduction to Programming Lab       | 0                          | 0 | 3 | 3         | 2                |
| 4.                         | <a href="#">ME-191</a> | Engineering Drawing                   | 0                          | 0 | 3 | 3         | 2                |
| <b>Total of Practical</b>  |                        |                                       |                            |   |   | <b>12</b> | <b>8</b>         |

**Second Semester**

| <b>A. <u>THEORY</u></b>    |                         |   |                            |   |   |           |                  |
|----------------------------|-------------------------|---|----------------------------|---|---|-----------|------------------|
|                            | Code                    | Subjects                                  | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                            |                         |   | L                          | T | P | Total     |                  |
| 1.                         | <a href="#">MT-201</a>  | Mathematics-II                            | 3                          | 1 | 0 | 4         | 4                |
| 2.                         | <a href="#">PHT-201</a> | Physics-II                                | 3                          | 0 | 0 | 3         | 3                |
| 3.                         | <a href="#">CST-201</a> | Network Theory & transmission Lines       | 3                          | 0 | 0 | 3         | 3                |
| 4.                         | <a href="#">EET-201</a> | Logic Design & Digital Circuit            | 3                          | 0 | 0 | 3         | 3                |
| 5.                         | <a href="#">CST-202</a> | Data Structure & Algorithm                | 3                          | 1 | 0 | 4         | 4                |
| 6.                         | <a href="#">EIT-202</a> | Electrical Instrumentation & Measurements | 3                          | 0 | 0 | 3         | 3                |
| <b>Total of Theory</b>     |                         |   |                            |   |   | <b>20</b> | <b>20</b>        |
| <b>B. <u>PRACTICAL</u></b> |                         |   |                            |   |   |           |                  |
| <b>B. <u>PRACTICAL</u></b> |                         |   |                            |   |   |           |                  |
|                            | Code                    | Subjects                                  | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                            |                         |   | L                          | T | P | Total     |                  |
| 1.                         | <a href="#">CST-291</a> | Network & Circuit Theory Lab              | 0                          | 0 | 3 | 3         | 2                |
| 2.                         | <a href="#">EET-291</a> | Digital Logic & Circuit Design            | 0                          | 0 | 3 | 3         | 2                |
| 3.                         | <a href="#">CST-293</a> | Programming in C                          | 0                          | 0 | 3 | 3         | 2                |
| 4.                         | <a href="#">ITT-291</a> | Business Data Processing                  | 0                          | 0 | 3 | 3         | 2                |
| <b>Total of Practical</b>  |                         |   |                            |   |   | <b>12</b> | <b>8</b>         |

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**Third Semester**

| <b>A. THEORY</b>       |                         |                              |                            |   |   |           |                  |
|------------------------|-------------------------|------------------------------|----------------------------|---|---|-----------|------------------|
|                        | Code                    | Subjects                     | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                        |                         |                              | L                          | T | P | Total     |                  |
| 1.                     | <a href="#">MT-301</a>  | Mathematics-III              | 3                          | 1 | 0 | 4         | 4                |
| 2.                     | <a href="#">CST-301</a> | Microprocessor & Interfacing | 3                          | 1 | 0 | 4         | 4                |
| 3.                     | <a href="#">CST-302</a> | Computer Architecture        | 3                          | 1 | 0 | 4         | 4                |
| 4.                     | <a href="#">MT-303</a>  | Numerical Methods            | 3                          | 0 | 0 | 3         | 3                |
| 5.                     | <a href="#">MT-302</a>  | Operations Research          | 3                          | 0 | 0 | 3         | 3                |
| 6.                     | <a href="#">CST-304</a> | Object Oriented Methodology  | 3                          | 1 | 0 | 4         | 4                |
| <b>Total of Theory</b> |                         |                              |                            |   |   | <b>22</b> | <b>22</b>        |

**B. PRACTICAL:**

| <b>B. PRACTICAL</b>       |                         |                                    |                            |   |   |           |                  |
|---------------------------|-------------------------|------------------------------------|----------------------------|---|---|-----------|------------------|
|                           | Code                    | Subjects                           | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                           |                         |                                    | L                          | T | P | Total     |                  |
| 1.                        | <a href="#">CST-391</a> | Microprocessor & Interfacing Lab   | 0                          | 0 | 3 | 3         | 2                |
| 2.                        | <a href="#">CST-394</a> | Object Oriented Programming in C++ | 0                          | 0 | 3 | 3         | 2                |
| 3.                        | <a href="#">MT-392</a>  | Optimization Techniques Lab        | 0                          | 0 | 3 | 3         | 2                |
| 4.                        | <a href="#">CST-395</a> | Engineering Graphics Lab           | 0                          | 0 | 3 | 3         | 2                |
| <b>Total of Practical</b> |                         |                                    |                            |   |   | <b>12</b> | <b>8</b>         |

**Fourth Semester**

| <b>A. THEORY</b>       |                         |                                       |                            |   |   |           |                  |
|------------------------|-------------------------|---------------------------------------|----------------------------|---|---|-----------|------------------|
|                        | Code                    | Subjects                              | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                        |                         |                                       | L                          | T | P | Total     |                  |
| 1.                     | <a href="#">ECT-401</a> | Analog & Digital Communication        | 3                          | 1 | 0 | 4         | 4                |
| 2.                     | <a href="#">CST-401</a> | Operating System                      | 3                          | 1 | 0 | 4         | 4                |
| 3.                     | <a href="#">CST-402</a> | Data Communication & Computer Network | 3                          | 1 | 0 | 4         | 4                |
| 4.                     | <a href="#">ITT-401</a> | System Modelling Analysis & Design    | 3                          | 0 | 0 | 3         | 3                |
| 5.                     | <a href="#">CST-403</a> | DataBase Mgmt. System                 | 3                          | 1 | 0 | 4         | 4                |
| 6.                     | <a href="#">MBT-401</a> | Principles of Cost Accounting         | 3                          | 1 | 0 | 4         | 4                |
| <b>Total of Theory</b> |                         |                                       |                            |   |   | <b>23</b> | <b>23</b>        |

**B. PRACTICAL:**

| <b>B. PRACTICAL</b> |                         |          |                            |   |   |       |                  |
|---------------------|-------------------------|----------|----------------------------|---|---|-------|------------------|
|                     | Code                    | Subjects | Contacts<br>(periods/week) |   |   |       | Credit<br>points |
|                     |                         |          | L                          | T | P | Total |                  |
| 1.                  | <a href="#">CST-491</a> | UNIX Lab | 0                          | 0 | 3 | 3     | 2                |

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|                           |                         |                    |   |   |   |          |          |
|---------------------------|-------------------------|--------------------|---|---|---|----------|----------|
| 2.                        | <a href="#">CST-493</a> | Database Mgmt. Lab | 0 | 0 | 3 | 3        | 2        |
| 3.                        | <a href="#">HU-491</a>  | Communication Lab  | 0 | 0 | 3 | 3        | 2        |
| 4.                        | <a href="#">CST-494</a> | JAVA & CORBA Lab   | 0 | 0 | 3 | 3        | 2        |
| <b>Total of Practical</b> |                         |                    |   |   |   | <b>9</b> | <b>8</b> |

**Fifth Semester**

| <b>A. THEORY</b>       |                         |  |                         |   |   |           |               |
|------------------------|-------------------------|--|-------------------------|---|---|-----------|---------------|
|                        | Code                    | Subjects   | Contacts (periods/week) |   |   |           | Credit points |
|                        |                         |  | L                       | T | P | Total     |               |
| 1.                     | <a href="#">CST-501</a> | Communication for Switching Principles & Communication | 3                       | 1 | 0 | 4         | 4             |
| 2.                     | <a href="#">MBT-501</a> | Mgmt. Principles & Practice                            | 3                       | 0 | 0 | 3         | 3             |
| 3.                     | <a href="#">CST-502</a> | Parallel & Distributed Computing                       | 3                       | 1 | 0 | 4         | 4             |
| 4.                     | <a href="#">CST-503</a> | Software Engineering                                   | 3                       | 1 | 0 | 4         | 4             |
| 5.                     | <a href="#">ITT-501</a> | Compiler Design  | 3                       | 0 | 0 | 3         | 3             |
| 6.                     | <a href="#">ITT-502</a> | Formal Language & Automata Theory                      | 3                       | 1 | 0 | 4         | 4             |
| <b>Total of Theory</b> |                         |  |                         |   |   | <b>22</b> | <b>22</b>     |

**B. PRACTICAL:**

| <b>B. PRACTICAL</b>       |                         |   |                         |   |   |           |               |
|---------------------------|-------------------------|---|-------------------------|---|---|-----------|---------------|
|                           | Code                    | Subjects                                    | Contacts (periods/week) |   |   |           | Credit points |
|                           |                         |   | L                       | T | P | Total     |               |
| 1.                        | <a href="#">CST-591</a> | Network Components Lab                      | 0                       | 0 | 3 | 3         | 2             |
| 3.                        | <a href="#">CST-592</a> | Parallel Processing Lab                     | 0                       | 0 | 3 | 3         | 2             |
| 4.                        | <a href="#">CST-595</a> | CASE Tools                                  | 0                       | 0 | 3 | 3         | 2             |
| 5.                        | <a href="#">HUT-581</a> | Language & Communication Skills Development | 0                       | 0 | 3 | 3         | 2             |
| <b>Total of Practical</b> |                         |   |                         |   |   | <b>12</b> | <b>8</b>      |

**Sixth Semester**

| <b>A. THEORY</b>       |                         |  |                         |   |   |           |               |
|------------------------|-------------------------|--|-------------------------|---|---|-----------|---------------|
|                        | Code                    | Subjects                                   | Contacts (periods/week) |   |   |           | Credit points |
|                        |                         |  | L                       | T | P | Total     |               |
| 1.                     | <a href="#">ITT-601</a> | Multimedia & Web Technology                | 3                       | 1 | 0 | 4         | 4             |
| 2.                     | <a href="#">CST-601</a> | Satellite , Mobile & Optical Communication | 3                       | 1 | 0 | 4         | 4             |
| 3.                     | <a href="#">ITT-602</a> | Design & analysis of Algorithms            | 3                       | 0 | 0 | 3         | 3             |
| 4.                     | <a href="#">CST-602</a> | Software Architecture & Testing            | 3                       | 1 | 0 | 4         | 4             |
| 5.                     | <a href="#">CST-603</a> | Image Processing & Pattern Recognition     | 3                       | 1 | 0 | 4         | 4             |
| 6.                     | <a href="#">MBT-601</a> | Managerial Economics                       | 3                       | 0 | 0 | 3         | 3             |
| <b>Total of Theory</b> |                         |  |                         |   |   | <b>22</b> | <b>22</b>     |

**B. PRACTICAL:**

| <b>B. PRACTICAL</b>       |                         |                            |                         |   |   |          |               |
|---------------------------|-------------------------|----------------------------|-------------------------|---|---|----------|---------------|
|                           | Code                    | Subjects                   | Contacts (periods/week) |   |   |          | Credit points |
|                           |                         |                            | L                       | T | P | Total    |               |
| 1.                        | <a href="#">ITT-691</a> | Multimedia Lab             | 0                       | 0 | 3 | 3        | 2             |
| 2.                        | <a href="#">ITT-693</a> | Web Based Software Lab     | 0                       | 0 | 3 | 3        | 2             |
| 3.                        | <a href="#">ITT-695</a> | Communication Software Lab | 0                       | 0 | 3 | 3        | 2             |
| 4.                        | <a href="#">ITT-694</a> | Seminar Presentation       | 0                       | 0 | 3 | 3        | 2             |
| <b>Total of Practical</b> |                         |                            |                         |   |   | <b>9</b> | <b>8</b>      |

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**Seventh Semester**

| <b>A. <u>THEORY</u></b> |                         |                               |                            |   |   |           |                  |
|-------------------------|-------------------------|-------------------------------|----------------------------|---|---|-----------|------------------|
|                         | Code                    | Subjects                      | Contacts<br>(periods/week) |   |   |           | Credit<br>points |
|                         |                         |                               | L                          | T | P | Total     |                  |
| 1.                      | <a href="#">CST-701</a> | Artificial Intelligence       | 3                          | 1 | 0 | 4         | 4                |
| 2.                      | <a href="#">ECT-701</a> | Digital Signal Processing     | 3                          | 0 | 0 | 3         | 3                |
| 3.                      | <a href="#">CST-702</a> | Network Security              | 3                          | 1 | 0 | 4         | 4                |
| 4.                      | <a href="#">HUT-701</a> | Values & Ethics of Profession | 2                          | 0 | 0 | 2         | 2                |
| 5.                      | ITT-<br>701A/B/C/<br>D  | <a href="#">Elective I</a>    | 3                          | 1 | 0 | 4         | 4                |
| 6.                      | ITT-<br>702A/B/C/<br>D  | <a href="#">Elective II</a>   | 3                          | 1 | 0 | 4         | 4                |
| <b>Total of Theory</b>  |                         |                               |                            |   |   | <b>21</b> | <b>21</b>        |

**B. PRACTICAL:**

| <b>B. <u>PRACTICAL</u></b> |                         |                               |                            |   |   |          |                  |
|----------------------------|-------------------------|-------------------------------|----------------------------|---|---|----------|------------------|
|                            | Code                    | Subjects                      | Contacts<br>(periods/week) |   |   |          | Credit<br>points |
|                            |                         |                               | L                          | T | P | Total    |                  |
| 1.                         | <a href="#">ITT-781</a> | Image Processing Lab          | 0                          | 0 | 3 | 3        | 2                |
| 2.                         | <a href="#">ITT-782</a> | DB2 Lab                       | 0                          | 0 | 3 | 3        | 2                |
| 3.                         | <a href="#">ECT-791</a> | Digital Signal Processing Lab | 0                          | 0 | 3 | 3        | 2                |
| <b>Total of Practical</b>  |                         |                               |                            |   |   | <b>9</b> | <b>6</b>         |

**Elective I:**

- [ITT-701A](#) :- Neural Network
- [ITT-701B](#) :- Distributed Database
- [ITT-701C](#) :- Principles of Robotics
- [ITT-701D](#) :- Soft Computing

**Elective II :**

- [ITT-702A](#) :- VLSI System Design
- [ITT-702B](#) :- Windows Programming with VB
- [ITT-702C](#) :- Embedded System & Applications
- [ITT-702D](#) :- Natural Language Processing

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Eight Semester

| A. <u>THEORY</u>       |      |          |                            |   |   |          |                  |
|------------------------|------|----------|----------------------------|---|---|----------|------------------|
|                        | Code | Subjects | Contacts<br>(periods/week) |   |   |          | Credit<br>points |
|                        |      |          | L                          | T | P | Total    |                  |
|                        |      |          |                            |   |   |          |                  |
|                        |      |          |                            |   |   |          |                  |
|                        |      |          |                            |   |   |          |                  |
|                        |      |          |                            |   |   |          |                  |
|                        |      |          |                            |   |   |          |                  |
| <b>Total of Theory</b> |      |          |                            |   |   | <b>0</b> | <b>0</b>         |

**B. PRACTICAL:**

| B. <u>PRACTICAL</u>       |      |          |                            |   |   |          |                  |
|---------------------------|------|----------|----------------------------|---|---|----------|------------------|
|                           | Code | Subjects | Contacts<br>(periods/week) |   |   |          | Credit<br>points |
|                           |      |          | L                          | T | P | Total    |                  |
|                           |      |          |                            |   |   |          |                  |
|                           |      |          |                            |   |   |          |                  |
|                           |      |          |                            |   |   |          |                  |
| <b>Total of Practical</b> |      |          |                            |   |   | <b>0</b> | <b>0</b>         |

**C. SESSIONAL**

| C. <u>Sessional</u>       |         |              |                            |   |   |       |                  |
|---------------------------|---------|--------------|----------------------------|---|---|-------|------------------|
|                           | Code    | Subjects     | Contacts<br>(periods/week) |   |   |       | Credit<br>points |
|                           |         |              | L                          | T | P | Total |                  |
| 1.                        | ITT-881 | Project Work |                            |   |   |       | 10               |
|                           |         |              |                            |   |   |       |                  |
| <b>Total of Sessional</b> |         |              |                            |   |   |       | <b>10</b>        |

**First Semester: 30**  
**Second Semester: 28**  
**Third Semester: 30**  
**Fourth Semester: 31**  
**Fifth Semester: 30**  
**Sixth Semester: 30**  
**Seventh Semester: 27**  
**Eight Semesters: 10**

**Total Credit Points: 216**

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## SEMESTER - I

### M-101: Mathematics-I

**Determinants:** Definition and properties, minors and cofactors. Product of two determinants. Adjoins and reciprocal determinants. Symmetric and skew-symmetric determinant. Cramer's rule. Consistency of equations.

**Matrices:** Definition, addition, subtraction and multiplication of matrices. Adjoin and reciprocal matrices. Inverse of a matrix. Rank of a matrix. Solution of system of linear equations by matrix method. Equivalence under row operations, Gaussian elimination, operational counts, row reduced echelon matrix, inverse by elementary row operations. Criteria for invertibility of a square matrix, eigen value and eigen vectors: characteristic polynomial. Cayley-Hamiltonian theorem Trace.

**Vector for Space:** Definitions and examples. Linear dependence and independence. Basis, subspaces, dimension of a linear space. Finite dimensional spaces. Inner product, length or norm, direction cosines, orthogonal bases and Gram-Schmidt orthogonalization process. Orthogonal expansions, Fourier rule.

Linear mappings kernel, image of a map, rank of a map, representation of a linear map by matrices. Algebra of linear mappings. Relation between linear mappings and systems of linear equations. Existence of solution of linear equations in terms of associated linear mapping.

**Quadratic forms:** Quadratic surfaces. Effect of linear transformation. Reduction to diagonal form. Invariance of index. Orthogonal reduction. Application to analytical geometry.

#### **Reference books:**

1. Higher Algebra (Abstract): S.K. Mapa
2. Engineering Mathematics: B.S. Grewal & Grewal

### PH-101: Physics-I

Overview of Classical Mechanics and wave phenomena. Vector Calculus.

Rigid Body Mechanics

Concept of wave function. Schrodinger's wave equation. Operators equations. Interpretation of wave function. Normalization of wave function. Expectation value. Concept of eigen values and Eigen functions of linear operators. Boundary Conditions. Continuous and discrete energy eigen values.

Statistical description of a system of particles. Statistical formulation of the mechanical problems. Specification of the states of a system. Phase space. Microstate statistical ensemble. Basic postulates. Probability calculations. Behaviour of the density of states. Statistical distribution functions. Quantum statistics: Maxwell Boltzmann, Fermi-Dirac distribution, Bose-Einstein distribution.

Band model of solids, electrons and holes, intrinsic and extrinsic semiconductors, Fermi-level, carrier concentration. Degenerate and non-degenerate semiconductors. Doping and compensation, traps recombination and life-time.

#### **Reference books:**

1. Introduction to Modern Physics: H.S. Mani and G.K. Mehta.
2. Concepts of Modern Physics: A. Beiser
3. Modern Engineering Physics: A. Vasudeva
4. Vector analysis: M. Spiegel

### EE-101: Fundamentals of Electrical Technology

Concept of single phase and three phase power supply. Concept of single phase and three phase windings.

Basic electromagnetic laws, Basic principles of motor and generator. Concept of torque and torque angle, generalized torque equation for rotating machines, voltage generated in electrical machines, common features of rotating electrical machines.

Brief description of different types of motors and generators, their characteristics and applications.

Working principle of transformer. Applications of single phase and three phase transformers. Use of CT and PT and constant voltage transformer.

Introduction to single phase motors including stepper motors.

Power Distribution System, Internal Wiring, Earthing, Electricity Rules. Illumination System, Electrical Tariff.

#### **Reference book:**

1. Principles of Electrical Technology: S.K. Bhattacharya

### EC-101: Electronics Fundamentals

Passive circuits – Passive component & models, power & signal sources, Passive circuit analysis – time-domain & frequency-domain analysis, transient and steady-state responses, one-port & two-port network, resonance. Use of Pspice for the analysis of passive circuits.

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Devices - Solid-state devices – PN-junction diodes, and their characteristics and models, BJT & FET and their characteristics, biasing models and equivalent circuit. MOS FET.

Active Circuits – Rectifier circuits and power supplies, signal stage amplifier, follower amplifiers, coupling & multistage amplifiers, frequency response of amplifiers, differential amplifiers, feedback, oscillators & filters. Use of Pspice for the analysis and design of active circuits.

Computer Usage

Homework requiring the uses of PSPICE/Circuit Analysis Software.

Homework requiring general use of computer applications, e.g. spreadsheets, MATLAB, etc. for the computer-aided analysis of active and passive circuits and to explore an amplifier design space.

### **Reference books:**

1. Network Analysis: M.E. Van Valkenberg
2. Integrate Electronics: J. Millman & C. Halkias
3. Electronics Principles: Malvino

### **CS-101: Introduction to Computer Programming**

Introduction to IT: Its components computer, communication, management.

Introduction to computers: architecture, compilers, operating systems, multi user environments, algorithms.

Types of programming languages

C programming language: data types, operators and expressions, data input and output, preparing and running a complete C programme, control statements, user defined functions, arrays, character strings, pointers, structures and unions, file handling.

### **Reference books:**

1. Programming in ANSI C: Balaguruswamy

### **HU-101: Humanities**

English : Comprehension. Formal letter and writing a curriculum vitae. Report writing. Paragraph (description and narration). Grammar and Vocabulary.

Text : (Any two of the following from “English for all” by Nilanjana Gupta Published by Macmillan India Ltd.)

- |  |   |                 |
|--|---|-----------------|
| i. “Dear as the Moon”                      | : | Verrier Eliwin  |
| ii. “Scientific Research for Amateurs”     | : | J.B.S. Haldane  |
| iii. “Government Checks Industrial Growth” | : | Jawharlal Nehru |
| iv. “Modem Improvement”                    | : | John Ruskin     |

Social Science and Development : Basic concepts of sociology perspectives, Process of social changes in modern India, Impact of science and technology on culture and civilization, Urban sociology and Industrial sociology, Social problems in India. Sociological problems of economic development and social changes.

Technology assessment and transfer, Problems of transfer of technology with special reference to India, Engineers’ positive and negative roles in value formulation and their effects on society.

Areas of application of IT in banking, health service, insurance, finance, rural, production, management, materials, concepts of e-business, e-governance.

### **EC-191: Basic Electronics Laboratory Lab**

Familiarization of electronic components: active and passive. Familiarization of electronic equipment: multimeter, oscilloscope, function generator, millivoltmeter. Studies on the characteristics of electronic devices: diode(PN junction, photo diode, LED), transistors, FETs, using curve tracer, Studies on rectifiers, amplifiers, follower circuits, difference amplifiers. Computer aided design of amplifier circuits and testing.

### **CS-191: PC Environment Lab**

MS – Office, MS-Word, Excel, Access, Power Point: usage & application.

Word: Document Preparation, Formatting and Printing.

Excel: Preparation of spreadsheet, Graph, and Printing.

Access: Preparation of database, simple query.

Power Point: Preparation of presentation material, use of colours and styles.

### **CS-192: Introduction to Programming Lab**

Windows, its operations, different issues of windows and its usage.

Formatting of a floppy, creation of folders, copying of files.

Installation of Windows 98 and Ms-Office.

Simple programming using C.

### **ME-191: Engineering Drawing**

Drawing Instruments & their specifications, Letter & Number Writing – Both double stroke and single stroke, italics following BIS, Drawing lines (BIS standard), Scales (Plane and Diagonal), Drawing regular polygons, conics and curves, Projection of points, lines,

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laminers (LAMINERS), Isometric views and orthographics views, Projection of solids (Simple problems), Sectional views of solids, Development of surfaces.

### **SEMESTER - II**

#### **MT-201: Mathematics – II**

Sets: Relations, equivalence relation, partial order relation Lattice.

Group: Definition of group, properties, examples Semigroup.

Subgroups, cyclic groups, permutation groups. Homomorphism and isomorphism.

Ring: Definition of ring, properties, examples, subrings, integral domains, fields.

Boolean Algebra and Propositional Calculus: Boolean Algebra, switching functions and simplification. Proposition, truth value of proposition, connectives (and, or, not), conditional and bi-conditional connectives. Tautology and Contradiction. Arguments – valid and invalid. Inference theory – Law of Modus-ponens and law of Syllogism

Predicate Calculus: Definition of terms and formulae. Predicate logic and normal forms.

Transforms: Fourier Transforms, Laplace Transforms and Z –transforms.

#### **Reference books:**

1. Boolean Algebra and Its Applications: Whitsitt
2. Engineering Mathematics: B.S. Grewal
3. Higher Algebra (Abstract): S.K. Mapa
4. Set Theory and Related Topics: Seymour LipSchutz

#### **PHT-201: Physics – II**

##### **Electric and Magnetic Fields**

Basic concepts, Electric potential and field strength, Gauss's law, Coulomb's law, Magnetic force on a current, Ampere's Law, Magnetic field for a solenoid, Biot – Savart's law, Faraday's law of induction, Lenz's law, Concept of displacement current.

##### **Maxwell's field equations**

Postulates and their derivation, Solution of Maxwell's field equations in free space and in isotropic medium, Propagation of electromagnetic wave in free space and in conducting medium, Poynting vector and Poynting theorem, Absorption in a conducting medium and skin effect, Potentials in an electromagnetic field, Solution of an in homogenous equation, retarded potential, Hertz vector and its simple applications.

##### **Optics**

Wave motion of light, reflection, refraction and interference, Young's experiment, Interference of light in thin films, Diffraction of light, Fresnel and Fraunhofer diffraction, Polarization of light, Interaction of light waves with electric and magnetic fields.

##### **Magnetic properties of matter**

Magnetization, Permeability and Susceptibility, Para, dia and ferromagnetism, Curie's law.

#### **Reference books:**

1. Modern Engineering Physics: A.C. Vasudeva
2. University Physics: M. Zemansky
3. Physics II : D. Halliday & R. Resnick

#### **CST-201: Network Theory & Transmission lines**

Passive circuit parameters and their equilibrium conditions – Kirchoff's law. Differential equation representation of passive circuits, solution of differential equation for simple circuits. Concept of impedance and reactance.

Frequency domain analysis of RLC Circuit, amplitude, phase, vector representation, resonance, circle diagram.

Network equation, Y-delta transformation, Network theorems - Superposition, Reciprocity, Thevenin, Norton, Maximum Power Transfer, Millman's theorem.

Fourier series and Fourier transform, Inverse Fourier transform, Laplace transform. Solution of differential equation using Laplace transform, transient and steady state response. Concept of Poles and Zero-frequency response.

Filters – Lowpass, Highpass, bandpass, band elimination and notch filters.

Circuit representation of transmission lines, Transients in a transmission line. Sinusoidal excitation of transmission line. Distinction between distributed and lumped constant system.

Discussion on line parameters – characteristics impedance, complex propagation constant, distortion in transmission lines, terminated transmission line.

Impedance transformation. Impedance matching and two port network analysis.

Elementary introduction of Computer aided circuit design.

#### **Reference books:**

1. Network Analysis: M.E. Van Valkenberg
2. Introductory Circuit Analysis: R. Boylestad



# School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)

## **EET-201: Logic Design and Digital Circuits**

Various number systems and codes. Algorithms for conversion between different number systems and between different codes. Representation of signed binary number in fixed and floating point

Boolean algebra – Postulates and fundamental theorems. Boolean functions and their representation using Venn diagrams, truth table and Karnaugh-maps. Fundamental Boolean operation – AND, OR, NOT, NAND, NOR, XOR.

Boolean expression minimization techniques through fundamental theorem, Karnaugh Map technique and Quine McCluskey's tabular method.

Error detection and correction techniques – minimum distance, parity and Hamming codes. Some combinational circuits like adder, subtractor, encoder, decoder, comparator, multiplexer, and parity generator.

Elementary sequential circuits. Various types of Flip-Flops like R-S, D-type, J-K etc. Race condition and state diagram.

Different type counters – asynchronous & synchronous counter, registers, shift registers etc.

Introduction to different logic families TTL, ECL, CMOS etc and their comparisons.

### **Reference books:**

1. Digital Logic and Computer Design: Morris Mano
2. Digital Principles & Application: Malvino & Leech

## **CST-202: Data Structure and Algorithms**

Algorithms: Definition and characteristics, pseudo-codes. Basic types: incremental, divide-and-conquer, greedy. Concept of dynamic programming.

Performance analysis and asymptotic notation: Space and time complexity with simple examples. Components of time complexity. Growth of functions: different notations and their usefulness; best, worst and average case behaviour.

Program design: Structured and modular programming. Non-recursive and recursive design-study and comparison with simple examples.

Data structure: Definition, fundamental data types, ADT.

Concept of storage allocation: Sequential and linked allocation.

Arrays: Definition, types, representation in memory and address functions. Application: representation and manipulation of matrices and polynomials.

Pointers and linked lists: Concept and representation; singly and doubly linked lists: non-circular and circular. Application: polynomial representation and addition, sparse matrix – representation and basic operations; operation with large integers.

Stacks: Sequential and linked representation; operations – push, pop.

Applications: Procedure calls and recursion, Towers of Hanoi, infix to postfix conversion and evaluation.

Queues: Representation with linear and circular arrays, linked representation; operations; application in a problem on simulation.

String: Representation, basic operations; pattern matching problem-brute-force and KMP algorithm.

Graphs: Representation of directed and undirected graphs; properties and manipulation methods. Applications- Kruskal's and Prim's algorithms, MST, DFS, BFS, topological sort.

Trees: General; binary trees: terminology (nodes and branches, height or depth, levels), types (complete, full, skewed); representation (array, linked), properties (nodes and branches, number of nodes in a level, maximum number of nodes, internal and external path length – minimum and maximum values). Binary tree traversal algorithms; threaded trees.

Applications: comparison tree, syntax tree and parsing, game tree, Huffman code.

Priority queues: Definition, heap data structure; max heap and min heap, basic operations.

Binary Search Trees: Definition and properties; search, insertion and deletion algorithms; height balanced trees – definition, rotations for restoring balance. 2-3 trees, B-trees.

Searching algorithms: Linear and binary search: algorithms, complexity.

Hashing: Definition; advantage and limitations; hash functions – design consideration, types and selection; collision resolution techniques – open addressing with linear probing, simple chaining, double hashing; load factors. Dynamic hashing, perfect hash functions.

Sorting algorithms: Classifications and basic parameters for analysis and design; comparison based – Bubble sort, Insertion sort, Selection sort, Tree sort, Heap sort, Quick sort, Merge sort; distribution based technique – Radix sort. Performance of sorting algorithms.

Dynamic storage management: Storage management: garbage collection; concept of dynamic memory management – first fit, best fit, worst fit, buddy system.

### **Reference books:**

1. Data Structure & Program Design: R. L. Kruse, B. Leung & C.L. Tondo
2. Data Structure using C: A. M. Tanenbaum, Y. Langsam & M.J. Augenstein.

## **EIT-202: Electrical Instrumentation & Measurements**

Introduction to Measurements - Electrical Measuring Instruments Their classification - Instrument Dynamics

Principle of Moving Coil Meter - Moving Iron Meter - Dynamometers - Hot Iron Instruments - Electrostatic Meters - Range Enhancements of Various Instruments

Measurement of Current/Voltage/Resistance/Power - Shunt & Multipliers for d.c. and a.c. instruments

## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

Measurement of resistance - Cross Coil Ohmmeter - Insulation Tester (Megger) - Various Bridges

Introduction to General Purpose Electronic Test & Measuring Instruments : Cathode Ray Oscilloscopes - Q Meter - Digital Voltmeters & Multimeters - Electronic Counters - AC Millivoltmeters - Spectrum Analyser - Signal Generators

Introduction to Industrial Instrumentation - Basic characteristics of Measuring Devices - Various definitions - Sensors & Transducers - Transducer Classification - Basic Requirements of a transducer - Displacement Measurement - Strain Gauge - Load Cell - Temperature Sensors - RTD - Thermocouple - Cold Junction Compensation - Pressure Transducers - Position Transducers - Flow Measurement - Level Measurement - Transducers - Level Measurement - Measurement of Humidity & Moisture - Basics of Optoelectronics

### **Reference book:**

1. Sensors & Transducers: D. Patranobis.

### **CST-291: Network & Circuit Laboratory**

(Laboratory work pertaining to CST-201)

### **EET-291: Digital Logic & Circuit Design**

(Laboratory work pertaining to EET-201)

### **CST-293: Programming in C**

(Laboratory work pertaining to CST-202)

Basics of a C Program

Use of data types, arithmetic, logic and relational operators, string and character handling.

Arrays and functions: 1D & 2D arrays, calling function by value.

Recursive functions, simple structures, switching operations. Use of pointers for calling function arguments by reference.

More on recursion binary search, stacks, structures and unions.

File management in C.

Command line arguments, dynamic memory allocation, linked lists.

### **ITT-291: Business Data Processing**

## **SYLLABUS - SEMESTER – III**

### **MT-301: Mathematics-III**

Review of limit and continuity and differentiability.

Successive differentiation, Leibnitz's theorem ( without proof but with problems of the type of recurrence relations in derivatives of different orders and also to find  $(y_n)_n$  ):

Rolle's theorem (statement only), Mean Value Theorem (Lagrange & Cauchy), Taylor's theorem (without proof and problems in respect of direct use and applications of the theorem only),Maclaurin's expansion in infinite series of the functions:  $\log(1+x)^n$  ,  $e^x$  ,  $\sin x/\cos x$ ,  $(a+x)^n$  , n being a negative integer or a fraction.

Elementary Reduction Formulae for Integrals.(Problems of the type  $\int_0^{\pi/2}$

$\int \sec^n x dx$ ,  $\int \tan^n x dx$ ,  $\int_0^{\pi/2} \cos^n x dx$  ,  $\int_0^{\pi/2} \sin^n x dx$  )

Ordinary Differential Equations:

Definition of order and degree; ODE of the first order: first order first degree (equation solvable by separation and variables, homogeneous equations, non-homogeneous equations that can be reduced to homogeneous equations, exact equations; definition and use of integrating factors; linear equation and Bernoulli's equation

Graph Theory:

Graphs, Digraphs, Isomorphism, Walks, Paths, Circuits, Shortest Path Problem, Dijkstra's Algorithm, Trees, Properties of Trees, Cotrees and Fundamental Circuits, Shortest Spanning Trees - Kruskal's Algorithm, Cut Sets, Fundamental Cut Sets and Cut Vertices, Planar and Dual Graphs, Metric Representation of Graphs, Networks, Flow Augmenting Path, Ford-Fulkerson Algorithm for Maximum Flow.

### **MT-303: Numerical Methods**

Interpolation-Newton's Forward, Backward, Sterling & Bessel's Interpolation formula, Lagrange's Interpolation

Integration- Trapezoidal, Simpson's 1/3 rd, Weddel's Rule, Romberg Integration, Gauss- Legendre two & three point formula, Newton Cotes Formula.

Gram-Schmidt orthogonalisation, Tchebycheff polynomial

Solution of transcendental equations- Method of Iteration, Method of Bisection, Newton -Raphson Method, Regula-Falsi method, Secant Method.

Solution of system of linear equations- Gauss Elimination Method, Gauss-Jacobi, Gauss-Seidel, LU factorisation, Tri-diagonalisation.

Inverse Interpolation.

Least Square Curve fitting- linear & non-linear

Solution of Differential Equations- Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.

### **Books:**

1 .Numerical Methods for Mathematics ,Science & Engg., Mathews, PHI

2 Numerical Analysis,G.S.Rao,New Age International

3 Programmed Statistics (Questions – Answers),G.S.Rao,New Age International

## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

4. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
5. Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
6. Numerical Methods, Arumugam, Scitech
7. Probability and Statistics for Engineers, Rao, Scitech
8. Numerical Methods in Computer Application, Wayse, EPH

### **CST-302: Computer Architecture**

Review of Pipelining, Examples of some pipeline in modern processors, pipeline hazards, data hazards, control hazards. Techniques to handle hazards, performance improvement with pipelines and effect of hazards on the performance.

Vector processors- Use and effectiveness, memory to memory vector architectures, vector register architecture, vector length and stride issues, compiler effectiveness in vector processors.

SISD, MISD, MIMD, Single instruction multiple data stream (SIMD) architectures. Array processors, comparison with vector processors, example of array processors such as MMX Technology.

Memory hierarchy, Cache Introduction, Techniques to reduce cache misses, techniques to reduce cache penalties, technique to reduce cache hit times. Effect of main memory bandwidth, effect of bus-width, memory access time, virtual memory, etc.

RISC architectures, addressing modes, instructions formats, effect of simplification on the performance, example processors such as MIPS, PA-RISC, SPARC, Power PC, etc.

MIMD Multiprocessors, Centralized shared architectures, distributed shared memory architectures, synchronization and memory consistency models, message passing architectures, comelier issues. Data flow architectures, Interconnection networks.

### **Text Books:**

1. Hwang, K. "Advanced Computer architecture with parallel programming", McGraw Hill, 1993
2. Carter—Computer Architecture ( Schaum Series), TMH
3. Patterson D.A. and Hennessy, J.L. "Computer architecture a quantitative approach", 2<sup>nd</sup> ed., Morgan Kaufman, 1996
4. Hwang & Briggs—Computer Architecture & Parallel Processing, TMH
5. Stone, H.S., "Advanced Computerat", Addison Wesley, 1989
6. Siegel, H.J., "Interconnection Network for Large Scale parallel Processing", 2<sup>nd</sup> Ed., McGraw Hill, 1990

### **CST-301: Microprocessor & Interfacing**

Introduction to Microprocessor Architecture & Organization & Microcomputer systems, concept of Assembly language Programming.

Detailed description of a 8085 Microprocessor its support chips including programmable peripherals interface (8255), Programmable timer/Counter (8253), Programmable UART(8251) Programmable interrupt controller (8259), DMA controller(8257) Programmable Keyboard, & display controller(8279), interference ADC & DAC, with interfacing techniques.

Programming the 8085A: addressing modes, Instruction set, Timing diagram, Stack subroutine, interrupt service routine, stack subroutine, interrupts service routines, program development, programming of Support Chips

INTEL 8086 : Intel 8086 l apx 86 family, Architecture, The execution Unit (EU), BUS Interface Unit (BIU), Register Structure, Registers : General, Pointer and Index, Segment, Control; Memory Addressing, Physical address generation, Dynamically Relocatable Code, Dedicated and Reserved Memory, Location, Pin configuration of Intel 8086, Addressing Modes, Instruction Set ; Arithmetic, BIT Manipulation, processor Control Instruction, The Assembly Language, Data Allocation.

Real Time Applications: Microprocessor applications & development of online real time systems.

Concept of single chip microcomputers (Micro controller): Introduction to 8051, Description of 8051 chip, pin configuration of the 8051, architecture & organization of the 8051, memory organization, programming concept.

### **Reference books:**

1. Microprocessor Architecture, Programming & Applications: R.S. Gaonkar
2. Microprocessor and Digital Systems: D.V. Hall
3. Digital Computer Applications – An Introduction to Microprocessors: A. P. Malvino.

### **CST-304: Object Oriented Methodology**

History of the development of Object-Oriented Programming Languages. Basic Concepts of OOP-Objects, Classes and Message Passing, Notions of abstraction, encapsulation information hiding and modularity, Instantiation and initialisation of Objects. Inheritance – Single, multilevel, multiple and repeated. Run-time polymorphism. Aggregation. Differences between conventional and Object-Oriented programming. Advantages and disadvantages of OOP. Class libraries.

Language Features of C++. Over-view of Java.

Introduction to Object-Oriented in Analysis, Modelling design and Implementation.

Universal Modelling Language (UML): Use case and other diagrams for static and dynamic modelling; UML Meta model; Software Architecture, Architectural Patterns, Design Patterns.

CORBA: Architecture overview and Interfaces, definition language Application development using CORBA.

### **Reference books:**

1. Object Oriented modelling & Design: Rumbaugh et. Al.

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2. Inside CORBA: Mowbray & Ruh
3. The Unified Modelling Language Reference Manual: Rumbaugh, Jacob & Booch

### **MT-302: Operations Research**

Introduction to OR modelling approach and various real life situations. Linear programming problems & Applications, Various components of LP problem formulation, Solving Linear Programming problem using simultaneous equations and Graphical Method, Simplex Method & extensions.

Sensitivity analysis – Duality theory – Revised Simplex – Dual Simplex Transportation and Assignment Problems.

Network Analysis including PERT-CPM.

Integer programming concepts, formulation, solution and applications.

Dynamic Programming Concepts, formulation, solution and applications.

Game Theory.

Queuing Theory & Applications.

Simulation.

### **Reference books:**

1. Operation Research: Taha
2. Introduction to Operation Research: F. Hiller & G. Liberman

### **CST-391: Microprocessors & Interfacing Lab**

- Programming Methods and Techniques: Assembly language programming using different programming techniques like looping, counting and indexing, subroutines parameter passing, time delay programs(Assembly Language Programming using 8085/8086)
- Interrupts:8085 Interrupts, restart as software instruction, Additional I/O concepts
- Parallel Input /Output and Interfacing Applications: Basic interfacing concepts, 8255 Programmable Peripheral Interface, Interfacing displays, keyboards, 8279 Programmable Keyboard/Display Interface, Interfacing memory, Memory, mapped I/O.
- General Purpose Programmable Peripheral Devices: 8253 Programmable Timer 8257 DMA controller, 8259 Interrupt controller.

### **CST-394: Object-Oriented Programming in C++**

(Laboratory work pertaining to IT-(T)-305)

Beginning with C++: Basic Syntax

Tokens, Expressions and Control Structures

Function in C++

Classes and Objects

Constructors and Destructors

Operator overloading and type conversions

Inheritance

Pointers, Virtual functions & Polymorphism

I/O operations and files

Optional programs/Projects

### **Text Book:**

Object – Oriented programming with C++: E. Balguruswamy (TMH)

### **MT-392: Optimisation Techniques Lab**

Problems solving Using C/C++:

- 1) Simplex method: Dual Simplex Transportation and Assignment Problem
- 2) Project Scheduling by PERT/CPM: Critical path calculations, construction of time chart and resource labeling, cost consideration in project scheduling
- 3) Integer Programming Problem (Branch & Bound Problem)
- 4) Dynamic Programming Problems

### **CST-395: Engineering Graphics Lab**

- Toolbars, F2, escape, command line, help
- Drawing Setup: limits, units, layers, grid, snap, new, open, save, save as, prototype
- Inquiry commands: list, distance, ID
- Drawing commands: line, circle, arc, , ellipse, rectangle, , hatch, polygon
- Editing commands: trim, copy, move, erase, rotate, extend, offset, fillet, chamfer, scale, change properties
- Dimensioning: dimensioning toolbar, dimension style dialog box (basics of format, annotation, and geometry)
- Isometric drawing: isometric axis angles (30, 150, 210, 330 )
- Introduction to 3D: solid primitives (box, wedge, cone, cylinder) union and subtract
- Printing: print dialog box basics
- Setup dimension variables for architectural drawing and dimensioning
- Draw a simple floor plan fully dimensioned and annotated

# School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)

## Semester IV

### ECT-401: Analog & Digital Communication

Introduction to communication systems, band width and noise limitations, Reviews of Fourier series and Fourier transforms, transfer functions, signal distortions, filters etc. Analog modulation techniques – AM, SSB, FM and PM, their bandwidth requirement and noise performance results.

Sampling theorem, FDM and TDM, important pulse modulation techniques like PAM, PCM and DM. Data communication systems (base band transmission, digital modulation system like) ASK, FSK, PSK, M-ary, FSK, M-ary, PSK, CPM, etc., Modems.

Elementary noise studies

Fundamental concepts of information theory-entropy information discrete noiseless channel, etc, Error control coding-linear block codes and cyclic codes.

#### **Reference books:**

1. Communication System: Bruce Karlson
2. Principles of Communication systems: Taub and Schilling
3. Information Transmission, Modulation and Noise

### CST-401: Operating Systems

Introduction – Functions and features of O/S-Different types like single-user, batch, multiprogramming, time-sharing, multiprogramming, Overall design principles. Concepts of virtual machine and message passing. Single-user systems-Basic I/O system, ROM resident and Disk-based I/O system, Command Interpreter with reference to any available O/S (like MS DOS).

Concurrent Processor-Issues related to concurrent processes, Functionality, Mutual exclusion, synchronization, deadlock, inter-process communication. Primitives like semaphores and the implementation using machine primitives.

Deadlock detection, recovery, prevention and avoidance.

Design of multi-user operating systems – (with reference to an available O/S like UNIX). Different resource managers-Processor management & algorithms-Memory management-partitioned, segmented-thrashing.

Device management-interrupt handlers, device drivers & controllers-device independent I/O and piping.

Management of secondary storage-device, disk allocation & scheduling-storage hierarchy. File system access methods, directory structures.

Advanced concepts-Data & program security & protection.

Distributed systems-Basic concepts & important results.

#### **Reference books:**

1. Operating Systems: Design & Implementation: Tanenbaum
2. Operating System Concepts (Alternate Edition): Silberschatz and Peterson
3. Operating System Principles: P. Brinch Hansen

### CST-402: Data Communication and Computer Networks

OSI 7 Layered architecture: Application Layer, Presentation Layer, Session Layer, Transport Layer, Network Layer, Data Link Layer, MAC Sub layer, Physical Layer.

Application Layer: Client/Server, HTTP, FTP, SMTP, Non-persistent and persistent connections, Network Security.

Transport Layer: Multiplexing and De-multiplexing, Connectionless and connection oriented protocol, UDP, TCP, Reliable data transfer service, Flow Control.

Network Layer and Routing: Routing Principles, Hierarchical Routing, Data Gram and Virtual Circuits, Congestion Control, IPv6, Internetworking.

Data Link Layer and LAN: Data link layer services, Error detection and correction Techniques, Sliding Window Protocol, LANs, Ethernet, Hubs, Bridges and Switches, ATM, X.25.

MAC Sub layer: Channel Allocation, CSMA, CSMA/CD, IEEE 802.3, IEEE 802.4, IEEE 802.5.

Physical Layer: Theoretical Basics, Transmission Media, ISDN, Cellular Radio Systems, RS-232, TDM, FDM, Switching Principles.

#### **Reference books:**

1. Computer Networks (2nd ed.) PHI (IEE): A.S. Tanenbaum
2. Data Networks PHI(IEE): D. Bertsekas and R. Gallager
3. Computer Networks and their Protocols: D.W. Davis et. al., John Wiley

### ITT-401: Systems Modelling, Analysis & Design

Information systems: System Development Life Cycle, Structured Systems Analysis and Design- Physical and Logical Data flow Diagrams, Requirement Analysis, Design of New System Data Modelling-Data Dictionary, Entity-Relationship Diagrams, Structure Charts – Transform and Transaction Analysis. Coupling and Cohesion, Process Specification Implementation – Chief Programmer Teams, Planning for coding and testing Verification and Validation, Changeover Phase, Project Review and Walk through. Alternate Life Cycles-Evolutionary Design and Proto-typing, Feasibility Study –Cost Estimation Cost Benefit Analysis, Input-Output Design-Forms, Design, Dialogue Design, File Design, Security and Control, Codification and Classification, Documentation.

#### **Reference books.**

1. NCC-Introduction to System Analysis and Design, Vol I & II : NCC (Galgotia)
2. Introduction to System and Design: Hawryszkiew YCZ (Prentice-Hall)
3. System Analysis and Design Methods: Whitten, Bentley and Barlow (Galgotia)

### CST-403: Database Management Systems



## **School of Information Technology ( formerly known as IIIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

**Data Network:** Data Transmission in PSTN, Switching Techniques in data transmission, Packet switching Principle, Routing congestion control, x.25

**Data communication Architecture:** link to link layer End to end layer. Satellite based data network Data Network standards, protocol stacks, Internet works.

**Integrates services Digital Networks:** Motivation of ISDN, New services, Networks and protocol architecture. ISDN standards, Expert system in ISDN, Broadband ISDN, Voice data integration, VOIP etc.

**Reference:** T. Viswanathan: Telecommunication Switching System and Network, Prentice Hall India

1. W. Stallings: Data and Computer Communication, Prentice-Hall India
2. D. Talley: Basic Telephone Switching System, Hayden Inc.

### **ITT-502 : Formal Language & Automata Theory**

#### **Finite State Machines [4L]**

Definition, concept of sequential circuits, state table & state assignments, concept of synchronous, asynchronous and linear sequential machines

#### **Finite State Models [10L]**

Basic definition, mathematical representation, Moore versus Mealy m/c, capability & limitations of FSM, state equivalence & minimization, machine equivalence, incompletely specified machines, merger graph & compatibility graph, merger table, Finite memory, definite, information lossless & inverse machines : testing table & testing graph.

#### **Finite Automata [9L]**

Preliminaries (strings, alphabets & languages, graphs & trees, set & relations), definition, recognition of a language by an automata - idea of grammar, DFA, NFA, equivalence of DFA and NFA, NFA with  $\epsilon$ -moves, regular sets & regular expressions : equivalence with finite automata, NFA from regular expressions, regular expressions from DFA, two way finite automata equivalence with one way, equivalence of Moore & Mealy machines, applications of finite automata.

#### **Closure Properties of Regular Sets [4L]**

Pumping lemma & its application, closure properties minimization of finite automata : minimization by distinguishable pair, myhill-nerode theorem.

#### **Context Free Grammars [4L]**

Introduction, definition, derivation trees, simplification, CNF & GNF.

#### **Pushdown Automata [5L]**

Definition, moves, instantaneous descriptions, language recognised by PDA, deterministic PDA, acceptance by final state & empty stack, equivalence of PDA and CFL.

#### **Closure Properties of CFLs [4L]**

Pumping lemma & its applications, ogden's lemma, closure properties, decision algorithms.

#### **Introduction to ZRL & CSL [2L]**

Introduction to Z. Regular language properties and their grammars, Context sensitive languages.

#### **Text Books :**

1. Hopcroft JE. and Ullman JD., "Introduction to Automata Theory, Languages & Computation", Narosa.
2. K.L.P. Mishra & N. Chandrasekharan – "Theory of Computer Science", PHI
3. Ash & Ash – "Discrete Mathematics", TMH
4. Lewis H. R. and Papadimitrou C. H., "Elements of the theory of Computation", P.H.I.
5. Martin: Introduction to Languages and Theory of Computation", McGraw Hill.

#### **References :**

1. Kohavi ZVI, "Switching & Finite Automata", 2nd Edn., Tata McGraw Hill.
2. Linz Peter, "An Introduction to Formal Languages and Automata", Narosa
3. "Introduction to Formal Languages", Tata McGraw Hill, 1983.

### **CST-502 : Parallel & Distributed Computing**

Introduction to parallel computing: Problems of sequential computing \vectorization of algorithms.

Overviews of distributed and parallel systems and Applications (e.g. Physics, Many body systems modelling, weather forecasting, computational geometry, neural networks etc.)

Parallel processing architectures and inter-connection networks (Mesh, hypercube, fully connected) Architectural classification schemes (SISD, MISD, SIMD, MIMD) Client/Server computing: Multi threaded client-server architecture.

Types of Parallelism: Data Parallelism; Processor Parallelism and master slave concept; Geometric Parallelism: nearest neighbour dependency, data domain partitioning, boundary overlap; shared memory.

MPI: Basic message, synchronization, scatter/gather, broadcast messages, groups/contexts, I/O; Performance evaluation on parallel machines.

Basic parallel programming techniques: Vector dot product, matrix multiplication. Some examples of implementation of parallel processing (e.g., Cellular automata, neural networks)

#### **References:**

## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

- 1.Parallel Processing: Theory and Practice: M.J. Quinn (TMH)
- 2.Parallel processing Architectures: K. Hwang & F. Biggs.
- 3.Introduction to Parallel Processing and Distributed Computing: Joel Crichlow.

### **ITT-501: Compiler Design**

Overview of different phases of a compiler : front-end; back-end.  
Lexical analysis : finite automata; DFA construction and minimization; automatic tools.  
Syntax analysis : context free grammars; top down and bottom up parsing techniques;  
construction of efficient parsers; syntax-directed translation; automatic tools.  
Semantic analysis : declaration processing; type checking; symbol tables; error recovery.  
Intermediate code generation : run-time environments; translation of language constructs.  
Code generation : Flow-graphs; register allocation; code-generation algorithms.  
Introduction to code optimization techniques.

#### **Text Books:**

1. Aho A., Sethi R., Ullman J.D., Compilers : Principles, Techniques and Tools, Addison Wesley, 1995.

#### **Reference Books:**

1. Holub, A.I., Compiler Design in C, Prentice-Hall of India, 1993.
2. Tremblay, A.S., and Sorenson, P.G., The Theory and Practice of Compiler Writing, McGraw-Hill Int. Edition, 1985.
3. Fischer, C.N., Le Blanc, R.J., Crafting a Compiler. Benjamin/Cummings California

### **CST-503 : Software Engineering**

Software development life cycles.  
Software project management : Planning, scheduling, monitoring, control etc.  
Requirements specification : Informal requirements, formal requirements.  
Software Design : Function-oriented, object-oriented approaches, User-Interfaces.  
Structured programming and implementation.  
Software testing, verification and validation.  
Software maintenance, reliability, metrics.  
Introduction to CASE tools.

#### **Text Books:**

1. Jalote, P., An Integrated Approach to Software Engineering. Narosa Publishing House, 1991.

#### **Reference Books:**

1. Pressman, R.S., Software Engineering: A Practioner's Approach, McGraw Hill, 1997.
2. W S Humphrey. Managing the Software Process, Addison-Wesley. 1989.
3. J J Marciniak. Ed. Encyclopaedia of Software Engineering, Vols. 1 & 2. John Wiley. 1994.
4. Ghezzi, C. et. al., Fundamentals of Software Engineering, Prentice Hall of India, 1991

### **MBT-501 : Management Principles & Practices**

Course objective: To help student the Principles of Management and application of these principles to business.,

Schools of Management thought: Scientific process, human behavior and social system school; decision theory school; quantitative and systems school; contingency theory of management; functions of a manager.

Social responsibility of business: Objectives of business; social responsibility; stakeholders and managerial ethics; Functions of Management: Planning Concept, Significance and types.

Organising: concept, principles, theories, types of organizations, authority, responsibility, power, delegation, decentralization; staffing; Directing; Coordinating; Control: nature, process and techniques.

Management by objectives (MBO) and managerial decision-makin.

Motivation: Process of motivation; Theories of motivation need hierarchy theory, theory of x and theory of y, two factor theory, Mc Cleland's learned need theory, Victor Vroom's expectancy theory, Stacy Adams equity theory

Leadership: Concept, leadership styles; Theories; Trait theory, behavioural theory, Fielder's contingency theory, Harsey and Blachard's situational theory, Managerial grid; Likert's four systems of Leadership.

Communication: Meaning; Process; communication network; formal and informal communication; Barriers to communication and principles of effective communication;

Controlling: Nature, importance and techniques; steps; feedback; concurrent and feed forward control; prerequisites of an effective control system; behavioral implications.

#### **References:**

1. Koontz, O' Dounell and Weirich, Essential of Management, Tata McGraw- Hill
2. Benjmin, Shyamal, Principles and Principles of Management
3. Stephen & Coulter, Management: Concepts and Principle, Prentice-Hill

### **CST-591: Network Components lab**

The state-of-the-art in high speed networking, LANs (e.g. Ethernet, FDDI), WANs (e.g. IPng, ATM), optical networks (e.g. WDM), and wireless networks. In addition, performance analysis topics include multimedia traffic modelling, policing and congestion control, fast switching, IP multicast and multicast routing protocols and quality of service (QoS) support.

In addition, topics relating to IP mobility support, including Mobile IP, and multicast-based mobility architectures will be discussed.

### **CST-592: Parallel Processing Lab**

#### **Syllabus**

- Review of relevant concepts from OS, concurrent programming and architectures.



## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

- Shared memory programming, process-based shared memory programming abstraction in Unix, thread-based programming, POSIX threads, Java threads, etc.
- Dependency analysis for identifying parallelism.
- Distributed memory parallel programming, message passing and remote procedure call paradigms, PVM and DCE environments.
- MIMD Algorithms - design and analysis
- Distributed Operating Systems and Distributed Databases.
- Debugging parallel programs
- Cluster/grid computing

### **CST-595 : Case tools**

- To describe and compare models of the Software Development Process.
- To teach Structured Analysis and Object Modeling techniques.
- To introduce the use of CASE tools as an aid to modeling.
- To introduce software testing and to teach module testing techniques

### **HUT-581 : Language & Communication Skills Development**

Topics to be covered and number of hours required for it:

1. Introductory lecture is to be given to the students so that they get a clear idea of the syllabus and understand the need for having such a practice lab in the first place(3 hours)
2. Conversion practice is done on given situation topics. The students are also made to listen to pre-recorded cassettes produced by British Council and also by the Universities of Oxford and Cambridge (6 hours)
3. Group Discussions:- The students are made to understand the difference between the language of conversion and group discussion. Strategies of such discussions are to teach to them. It is also helpful to use videocassettes produced by the U.G.C. on topics like group-discussion. After wards the class is divided into groups and the students have to discuss on given topics on current socio-economic-political-educational importance(12 hours)
4. Interview sessions-students are taught the do's and don'ts of facing a successful interview. They then have to face rigorous practices of mock-interviews. There simulations of real life interview sessions where students have to face an interview panel(12 hours)
5. Presentations: The secrets of an effective presentation are taught to the students. Then each and every student has to make lab presentations with the help of the Overhead projector/ using power point presentation and other audio-visual aids in the laboratory. They also have to face the question answer sessions at the end of their presentation (12 hours)
6. Classes are also allotted to prepare the students for competitive examinations like the T.O.E.F.L. by making the students listen to specially produced C.D. cassettes of such examinations (3 hours)

The overall aim of this course is to inculcate a sense of confidence in the students and help them to become good communicators in their social as well as professional lives.

# School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)

## Seventh Semester

### CST-701 : Artificial Intelligence

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

Problems, Problem Space & search.

Heuristic Search Techniques,

Knowledge representation issues.

Representing knowledge using rules.

Symbolic reasoning under uncertainty.

Statistical reasoning.

Weak slot & filler structures.

Strong slot & filler structures.

Game planning –Minimax search procedure, adding alpha beta cut-off's, iterative deepening,

Planning.

Natural language processing, Understanding.

Learning – induction & explanation based learning.

Expert systems- expert system shells, knowledge acquisition.

Basic knowledge of programming language like Prolog & Lisp.

#### **Books:**

- 1.Artificial Intelligence, Ritch & Knight, TMH
- 2.Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
- 3.Logic & Prolog Programming, Saroj Kaushik, New Age International
- 4.Expert Systems, Giarranto, VIKAS

### ECT-701 : Digital Signal processing

#### **Introduction :**

Definition of continuous time (analogue), discrete time and digital signals. Sampling and quantisation in general terms. Introduction to analogue and digital signal processing.

#### **Brief review of analogue and digital signal processing systems:**

Transfer function and frequency-response of an analogue filter. Low-pass and band-pass analogue filters. Butterworth low-pass gain response approximation.

#### **Discrete time linear time-invariant (LTI) signal processing systems :**

Recursive and non-recursive difference equations. Signal flow-graphs and their implementation by simple computer programs. Linearity, time invariance and impulse-response for discrete time systems. Definition of finite impulse response (FIR) and infinite impulse response (IIR) type digital filters. Stability and causality. Time-domain convolution. Frequency response as discrete time Fourier transform (DTFT) of impulse response. Gain and phase responses. Linear phase and group delay. Inverse DTFT. Use of MATLAB for analysing the frequency response of digital filters.

#### **Design of FIR digital filters :**

Design of FIR digital filters by the Fourier series approximation method. Implementation on personal computers and in real time on dsp chips. Effect of increasing order and use of non-rectangular windows. Alternative methods.

#### **Introduction to z-transforms and IIR type discrete time filters :**

System function,  $H(z)$ , as z-transform of impulse response. Relationship between system function, difference equation, signal flow-graph and software implementation of FIR and IIR type digital filters. Poles and zeros. Distance rule for estimating the gain response of a digital filter from an Argand diagram (z-plane) of poles and zeros. Design of a digital IIR "notch" filter by pole/zero placement.

#### **Design of IIR type digital filters using analogue filter approximations :**

Derivative approximation technique. Bilinear transformation method .Survey of alternative techniques.

#### **Digital processing of analogue signals :**

Sampling theory, aliasing, effect of quantisation and, sample and hold reconstruction. Oversampling to simplify analogue filters. Overall design of a digital system for processing analogue signals.

## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

### **Introduction to the discrete Fourier transform (DFT) :**

Derivation of DFT from DTFT. Inverse DFT. Effects of windowing and frequency domain sampling. Non-rectangular windows. Implementation of the DFT by the 'fast Fourier transform' algorithm (FFT) and speed comparison of direct DFT with FFT. Use of DFT and FFT for spectral estimation

### **CST-702 : Network Security**

Information theory Fundamentals:

Error Correcting Codes:

Mathematical Preliminaries; Linear Block Codes; Cyclic Codes; BCH Codes; Arithmetic Codes; Convolutional Codes; Unidirectional Error Correcting Codes; Applications of Error Correcting Codes.

Cryptography:

Cryptographic techniques; Mathematical Preliminaries; Symmetric Key cryptography; Block Cipher and Stream Cipher; Public Key

Cryptography; Attacks;

Message Authentication: Digital signatures, MD5, SHA etc.; Key Exchange Schemes; E-cash/Money.

Data Compression:

Compression Techniques; Mathematical Preliminaries; Hoffman Coding; Arithmetic Coding; Dictionary Techniques; Static Dictionary, Adaptive Dictionary; Lossless Image Compression; Scalar and Vector Quantization; Differential Encoding; MPEG; JPEG; Video Compression.

#### **Text Books:**

1. Rao, T.R. N. and Fujiwara, E., Error Control Coding for Computer Systems, Englewood Cliffs, NJ: Prentice Hall, 1989.
2. Schneier, B., Applied Cryptography, 2nd Edition, John Willey and Sons, 1996
3. Sayood, K. Introduction to Data Compression, Morgan Kaufmann Publishers Inc., San Francisco, 1996.

#### **Reference Books:**

1. Rhee, M. Y., Cryptography and Secure Communication, McGrawHill, 1994,
2. Lin, S. and Costello, D. J., Error Control Coding: Fundamentals and Applications,
3. Wicker, S. B., Error- Control system for Digital Communication System and Storage,
4. Bell, T. C., Cleary, J. G. and I H Witten, Text Compression, Advanced Reference Series, Englewood Cliffs, NJ: Prentice Hall, 1990,
5. Gray, R. M., Entropy and Information Theory, New York: Springer-V

### **HUT-701 : Values & Ethics of Profession**

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 nations. 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:**

Value 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 judgments; canons of ethics;  
Ethics of virtue; ethics of duty; ethics of responsibility

#### **Books:**

1. Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL
2. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
3. Business Ethics, Pherwani, EPH
4. Ethics, Indian Ethos & Mgmt., Balachandran, Raja, Nair, Shroff Publishers

**School of Information Technology ( formerly known as IIT-C)  
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**Elective I**

**ITT-701 A: Neural Networks**

**What Are Neural Networks**

- History
- Artificial and biological neural networks
- Artificial intelligence and neural networks

**Neurons and Neural Networks**

- Biological neurons
- Models of single neurons
- Different neural network models

**Single Layer Perceptrons**

- Least mean square algorithm
- Learning curves
- Learning rates
- Perceptron

**Multilayer Perceptrons**

- The XOR problem
- Back-propagation algorithm
- Heuristic for improving the back-propagation algorithm
- Some examples

**Radial-Basis Function Networks**

- Interpolation
- Regularisation
- Learning strategies

**Kohonen Self-Organising Maps**

- Self-organising map
- The SOM algorithm

**Learning vector quantisation**

**ITT-701 B: Distributed Database**

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design – fragmentation, allocation criteria.

Storage mechanisms. Translation of global queries. / Global query optimisation. Query execution and access plan. Concurrency control – 2 phases locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase unit protocols. Architectural aspects. Node and link failure recoveries.

Distributed data dictionary management. Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled.

Alternative architecture. Development tasks, Operation- global task management. Client server databases-SQL server, open database connectivity. Constructing an application.

**Books:**

1. Database System Concepts, Silberschatz Korth, Sudarshan, MH
2. Database Management Systems, Ramakrishnan, MH
3. Beginning SQL Server 2000 programming, Dewson, SPD/WROX
4. Database Management Systems, Leon, VIKAS
5. My SQL :Enterprise Solutions, Alexander Pachev, Wiley Dreamtech

**ITT-701 C : Principles of Robotics**

Introduction to robot manipulation.

Forward and inverse kinematics of robots and some case studies.

Manipulator dynamics. Basics of robot control.

Task planning with emphasis on computational geometry methods for robot path finding, robot arm reachability, grasp planning etc.

Overview of robot vision.

**Text Books:**

1. Schilling, R. J., Fundamentals of Robotics: Analysis and Control, Prentice-Hall India 1996.

**Reference Books:**

1. Fu, K.S., Gonzalez, R.C., and Lee, C. S. G., Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill Int. Edition, 1987.
2. Paul, R.P., Robot Manipulators: Mathematics, Programming and Control, MIT Press, 1981.
3. Latombe, J. C., Robot Motion Planning, Kluwer Academic Publishers, 1991.

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## **ITT-701 D : Soft Computing**

- 1.Introduction to soft computing and mathematical preparations :
- 2.Fuzzy sets
- 3.Fuzzy reasoning
- 4.Fuzzy logic
- 5.Fuzzy measure and fuzzy integral
- 6.Genetic algorithms
- 7.Neural networks
- 8.Chaos and fractal
- 9.Clustering
- 10.Artificial life

## **Elective II**

### **ITT-702 A: VLSI Systems Design**

Overview of VLSI system design, MOS devices and circuits: physics of MOS transistors, nMOS, CMOS. MOS fabrication and scaling. Delay and power consumption: driving high capacitive loads, superbuffers. Inverters, logic gates: design rules and layouts, stick diagrams, transistor sizing. Logic design: static nMOS and CMOS combinational networks, steering logic. Dynamic CMOS and clocking: static versus dynamic CMOS designs, domino CMOS structures, charge sharing, clock generation and distribution. MOS memory devices. Special circuit layouts: multiplexers, general-purpose functional blocks, barrel shifter, etc. Regular arrays of logic: PLA (generation and folding), Wienberger array, gate array, etc. Layout representation: CIF, symbolic layouts. corner stitching, etc. VLSI design tools: placement, floorplanning, routing, design-rule checking, circuit extraction and simulation. Modeling and simulation of MOS circuit modules using SPICE.

#### **Text Books:**

1. Pucknell D A, Eshraghian K, Basic VLSI Design, 3/e, PHI, 1995
2. Fabricius E D, Introduction to VLSI Design, IE, McGraw-Hill, 1990

#### **Reference Books:**

1. Weste N H E, Eshraghian K, Principles of CMOS VLSI Design, A Systems Perspective, 2/e, Addison-Wesley Publishing Company, 1992.
2. Wolf W, Modern VLSI Design: A Systems Approach, Prentice

### **ITT-702 B : Windows Programming with VB**

Introduction to Visual Basic & difference with BASIC. Concept about form Project, Application, Tools, Toolbox Windows concepts and terminology, key elements

Creating the look, communication via messages, windows resources and functions, adding multimedia and sound resources

Writing windows applications, taking control of windows, adding menus, dialog boxes,

Special controls.

, Controls & Properties. Idea about Labels, Buttons, Text Boxes.

Data basics, Different type variables & their use in VB, sub-functions & Procedure details, Input box () & MsgBox (). Making decisions, looping

List boxes & Data lists, List Box control, Combo Boxes, data Arrays.

Frames, buttons, check boxes, timer control, Programming with data, built in functions, database basics, file concepts, ODBC data base connectivity. Data form Wizard, query, and menus in VB Applications, Graphics.

#### **Books:**

1. Win32 API Programming With VB , Roman,SPD/O'REILLY
- 2.Learn Microsoft VB 6.0 Now,Halvorson, PHI/MSP
- 3.Visual Basic 6 from the Ground Up, Cornell,TMH
- 4.Visual Basic 6, CDG, TMH
- 5.Visual basic 6.0 in 30 days, Krishnan, Scitech
- 6.Beginning VB 6 ,Wright,SPD/WROX

### **ITT-702 C : Embedded Systems & Applications**

In this course, we will study what real-time systems are, the characteristics of certain devices that require real-time event response, and the development of systems to manage real-time applications. Topics to be covered in lectures include:

1. Introduction to Real-Time Systems
  - a. Definitions of Real-time systems
  - b. Embedded systems
2. Designing and Developing Real-time Systems
3. Interrupts and Exceptions
4. Timers and Real-time Facilities
5. Real-Time Devices
  - a. Event driven activities
6. I/O Devices and Buses
  - a. Serial devices and parallel devices
  - b. Peripheral serial buses
7. Multitasking in Real-Time Systems
  - a. Scheduling
  - b. Synchronization
  - c. Inter-task communication
8. Networking
  - a. Embedded devices and networks

# School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)

## **ITT-702 D : Natural Language Processing**

1. Introduction - What is language and Natural Language Processing?
  - What does it mean to know a language?
  - What do we know when we know a natural language?
  - What is meant by Natural Language Understanding
2. Word-level descriptions
  - Morphology and morphological processing
  - The lexicon
3. Syntax and Syntactic Processors
4. Lexical and syntactic categories
  - Introduction to the terminology of syntax and context-free grammars
  - Part-of-Speech Tagging
  - From Finite State Automata to Context-Free Grammars
  - Definite Clause Grammar and the Very Simple Parser
  - Active Chart Parsers
  - Unification-based grammars and parsing
5. Semantics and pragmatics
  - Introduction to semantics and semantic processing
  - Building semantic structures
  - Building more complex structures and semantic interpretation
  - Discourse structure and reasoning
6. Application of Natural Language Processing)
  - Machine translation

## **ITT-781: Image Processing Lab**

- Hadamard-ordered Walsh transform on 16x16 blocks for compression
- FFT for frequency domain digital filtering
- Fast walsh transform for compression compared to 0,1st,2nd order-hold
- Zooming algorithm using Lagrange method of interpolation
- Huffman encoding for compression
- 2-D to 3-D gray-level intensity mapping
- 3-D rotation and translation
- Removal of blur from uniform linear motion
- High frequency enhancement techniques on UFO/JFK photos:
- Local- based on statistics, - based on neighborhood histogram EQ
- Histogram stretch
- Global histogram EQ
- Unsharp masking
- Convolutions, high-pass filters
- Sharpen, roberts, sobel colored edge, bitplane
- Histogram equalization and image coloring enhancement for X-ray images
- Histogram EQ and direct histogram specification using VGA/mouse drivers
- Global vs. Local Histogram EQ
- FFT and FWT on 16x16 blocks for filtering
- Arithmetic coding for compression
- Differential coding 1-D and 2-D
- Homomorphic filtering
- DCT for compression - JPEG algorithm

## **ITT-782: DB2 Lab**

Design the schema using ER model :

Map it to the relational model -Look at whether there would be anomalies-If there are, then perform a decomposition that satisfies lossless join property .

Is it in BCNF? Is it in 3NF?

Send 10% of cheque to Databases lecturer in gratitude for learning important Transferable skill

- be able to design entity-relationship diagrams to represent simple database application scenarios
- know how to convert entity-relationship diagrams to relational database schemas in the standard Normal Forms
- be able to program simple database applications in SQL
- understand the basic theory of the relational model and both its strengths and the weaknesses
- be familiar with various extensions and alternatives to the relational model

## **ECT-791: Digital Signal Processing**

1. Introduction to DSP
2. The DFT and Z Transforms
3. Digital Hearing Aids
4. Digital Filters
5. Multi-rate Signal Processing
6. Random Signal Processing-review of Discrete-Time Signals and Systems

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Sampling and Digital Processing of Continuous-Time Signals  
The Z-Transform  
Transform Analysis of Linear Time-Invariant Systems  
Structures for Discrete-Time Systems  
Filter Design Techniques  
The Discrete Fourier Transform  
The Fast Fourier Transform  
Analysis of Signals Using the DFT

## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

### **ITT-601: Multimedia And Web Technology**

Overview of Multimedia system - Various type of Multimedia Information System, Characteristics of Multimedia Platform & Multimedia Application.

Multimedia Building Blocks – Text , Audio , Video Graphics , Animation , Simulation , Morphing and Hypermedia.

Information Handling – Representation , Storage , Retrieval and Processing, Digitization of Audio and Video , Audio and Video Compression Techniques , Data Encryption & Data Communication.

Multimedia Production – Life Cycle, Production Process, Script Story Board, Flowcharts, Interactivity & Authoring Metaphor.

Interface Design – Interactivity , Navigation & Control, Cognitive Principles & Learning Styles.

Web page Design issues , Different Technologies – HTML, DHTML, XML, CGI, ASP, JSP, Java Script, VB Script, Voice over IP, WAP.

Working with Databases , ODBC, Connection Methods.

Cyber laws – Governance, Digital Signature, Penalties and Adjudication

Search Engines.

### **CST – 601: Satellite and Mobile and Optical Communication**

Satellite Communication: Evolution and Growth of Communication Satellites, Orbital Mechanics , Doppler Shift, International Regulation & Frequency co-Ordination, Satellite frequencies allocation & Band Spectrum, Earth Station Technology, Multi Access Techniques, Satellite Link Design, Down Link and Up Link, Advantages of Satellite Communication, active and Passive Satellites, Applications of GEO, MEO, LEO.

Mobile Communication : Introduction to mobile communication, Cellular Radio, Principles of Cellular Mobile Communication System, Cell Structure, Cell Splitting Base Station, Mobile Receiver, Frequency Range Hand off, multi access techniques FDMA, CDMA, TDMA.  
Cellular Radio System : Cordless Telephones, Analog Cellular Telephones, Digital Cellular Telephones, GSM, Personal Communication Service.

Optical Communication:  
Principles of Fibre Optic Communication, Introduction and Historical Background, Advantage of optical Fibre communication.

Fibre Optic Theory : Wave Propagation in the modes in the optical fibre, numerical Aperture refractive index, optical Fibre Properties, Splicing & joining of Fibres , Fibres, Single mode, multi mode Fibres, Step index, Graded index dispersion Fibre.

Fibre Optical Devices : Optical sources, LED & Lasers, Gas Lasers, Semi Conductor Distributed feed – back laser, Noise in the laser Diode, Avalanche Diode (APD) , Avalanche multiplication process, Photo multiplier tubes.  
Fibre Optic Communication : Optical Transmitter, Opt. Receiver, Link Design, Power Budget analysis, Line codes for OFC, OFC modulation – intensity Modulation, Local Area Network System, FDDI, SONET, SDH Network, ISDN, BISDN & High Speed Networks , Comparison with Satellite Communication.



## **School of Information Technology ( formerly known as IIT-C) New Course Structure of B.E. in IT(in-house course of WBUT)**

### **ITT – 602: Design And Analysis Of Algorithm**

Concept of Dynamic Programming – longest common subsequence.  
Amortized analysis – aggregate method, accounting method and potential method  
Graph Algorithms  
BSF, DSF, Topological Sort, Strongly Connected Components  
MST – Kruskal’s and Prim’s algorithm  
Single – Source Shortest path problem – Dijkstra’s algo, Bellman – Ford algorithm  
All pair Shortest paths – Floyd Warshall algorithm  
Max Flow – Ford Fulkerson algorithm, Max flow mincut theorem (without proof)  
Matrix multiplication – Strassen’s algorithm  
String Matching – Rabin Karp Algorithm , KMP algorithm  
Medians and Order Statistics  
Concept of NP Completeness – Illustration with TSP.

### **CST – 602: Software Architecture & Software Testing**

Design Pattern : History , Principles and Expectation, ways of using patterns  
Software Architecture : Why is architecture is important ? Emerging concepts and Models of Software architecture, Linguistic Issues – architecture description Language (ALDs), Classical architectural styles such as pipe and filter, data Abstraction or OO based, event based etc. Formal models and the importance of Reasoning about architectures, architecture description languages.  
Frameworks : Frameworks as reusable chunks of architecture, the framework Lifecycle, development using framework , some well-known frameworks  
Components : development using components, composition, components as units Of development, different approaches to components ( e.g., OMG, Microsoft, Sun ), Developing components , tool support for architectural design, Formal approaches To architectural specification and analysis, Case studies of reference architectures And domain – specific architectures.  
  
Principles of Testing : Fundamental Test Process. The Psychology of Testing, Retesting and Regression Testing, Fault-Fixing and retesting, Prioritization of Tests , Testing throughout the lifecycle : Economics of Testing, High level Test Planning, Acceptance Testing, Integration Testing, Non-Functional System Testing, Functional System Testing, Dynamic Testing Techniques, Static Testing, Test Management, Tool Support for Testing (CAST)

### **CST – 603: Image Processing and Pattern Recognition**

Digital image fundamentals: image digitisation, sampling and quantization, image Resolution, Processing of image: pixel based transformation, geometric Transformation, image enhancement, image filtering – spatial domain approach, Mask processing, histogram modification, linear and non-linear filter, image Restoration, frequency domain analysis, Fourier Transformation, Wiener Filter, Image segmentation, local processing edge detection, gradient based operators, Laplacian of Gaussian, Gaussian edge detector, contour, digital curve, curve Representation, Haugh transform, Region Segmentation, Texture analysis, Statistical method, Concept of Image Compression.

Introduction to Pattern Recognition, Machine perceptions, pattern representation, Feature extraction, shape determinations, object Recognition and Matching, Bayes’ Decision theory – minimum error rate classification, discriminant function Bayes’ Theory for discrete features, error probability and error bounds, hidden Markov Model, parameter estimation, non-parametric techniques – Parzen windows, K-Nearest neighbour rule, Supervised and unsupervised Learning, Clustering

**School of Information Technology ( formerly known as IIT-C)  
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**MBT – 601: Managerial Economics**

Course Objective:

To help students to enrich the conceptual and technical skills of a manager facing business Decision problems.

Course Contents:

Concepts & Techniques

Business Decisions: The Circular flow of economic activity; The Nature of the firm: The Rationale, the objective, Maximizing Vs. Satisfying, Constrained decision Making; Profit: Scarcity, Total, Average & Marginal Costs, Marginalisation, Equi-Marginalisation, Opportunity, probability & probability distribution, Time value of Money, Money Building.

Demand Concepts & Analysis:

Demand Concepts: Demand function, Demand schedule, Demand curve, Laws of Demand, Types of Demand, Market Demand vs Firm Demand, Total, Average and Marginal Revenue, Price Elasticity, Income Elasticity, Cross Elasticity and Decision Making; Regression Techniques and Demand Estimation; Demand Forecasting: Needs For forecasting: simple survey method, Complex statistical methods, Accuracy of Forecasting.

Production Concepts & Analysis

Production Function: Concepts, Joint Production, Iso-quant, the production Iso-cost, Optimal Employment of two inputs, profit Maximization, change in input, profit Maximization, Change in Input prices, The expansion Pattern;

Cost Concept & Analysis

Types of cost, Relationship between production & costs, short-run cost functions, Long-Run cost Functions, Economics of Scale, Economics of Scope, Cost Elasticity and output Elasticity, Forms of cost function, Application of cost analysis.

Market Structure

Market structure, Perfect Competition, Monopoly, Oligopoly, Market Structure and Barriers to entry.

Pricing Strategies and Tactics

Multiproduct Pricing, situation requiring major pricing decision, Various pricing Strategies: Main Approaches; Demand Capacity & Pricing Behaviour, Pricing objectives And corporate goals, pricing of services, Bureau of Industrial costs and prices.

Investment Decisions:

Capital Budgeting, Public Investment Decisions, The economics of Risk & uncertainty.