MODEL CURRICULUM

FOR

UNDERGRADUATE PROGRAMME
B.E./B.TECH

IN

COMPUTER SCIENCE & ENGINEERING

ALL INDIA COUNCIL FOR TECHNICAL EDUCATION
(A Statutory Body of Government of India)
New Delhi
2000
The need to ensure minimum acceptable standards and quality in curricula of Engineering Colleges spread across the country and recent technological advances have necessitated development of Model Curriculum for various disciplines of first degree course in Engineering by All India Council for Technical Education. The planning of engineering curricula is a complex exercise since it involves integration of not only the current educational needs of the profession but also the anticipated needs arising out of the fast changing national and international technological scene. To make the curricula both dynamic, to meet the evolving needs of the profession and flexible to adjust to unforeseen developments, the first step is to identify the core part of the curriculum which embodies scientific and engineering knowledge basic to the profession. To this core is added, in different proportions, the other ingredients of professional knowledge of both current and emerging technological processes and systems. With proper balancing of the core, specialized and elective subjects and suitable integration of meaningful practical and field exercises and challenging project activity, the curriculum can, not only provide the students with relevant professional knowledge, but also develop in them the capacity to tackle unknown engineering problems and help them acquire sound professional ethics and an awareness of their obligations to society.

In 1996 the AICTE initiated program to upgrade the syllabi for undergraduate education in technical institutions in India. An exercise to develop detailed curricula which will serve as a model for the institutions was taken up. The emergence, on the national scene, of several new engineering colleges added a sense of urgency to this effort. Since QIP Centres were already intimately involved with the curriculum development activities sponsored by AICTE, they were requested to undertake this important task.

I am glad that Model Curricula for various disciplines which are both dynamic and flexible and provide a proper balance in the teaching of basic sciences, social sciences and management, engineering sciences, technologies and their applications have been finalized. I am sure that this work will serve as a useful guide to the universities and institutions in framing their curricula.

I take this opportunity to express my deep appreciation for the valuable work done by the various members of the Expert Committees and the persons entrusted with the responsibility of co-coordinating the work in the respective disciplines.

Chairman
All India Council for Technical Education
INTRODUCTION

All India Council for Technical Education (AICTE) has been entrusted with the responsibility of coordinated development of technical education system throughout the country. Uniform growth of technical education requires continuous up-gradation of Curricula for courses at all levels in Technical Education. This need is further accentuated by the emergence of a large number of self-financing institutions in technical education where faculty does not have sufficient expertise. In pursuance of clause 10(1) of AICTE Act and with an objective of bringing about uniformity in the curriculum of Engineering, AICTE has initiated a programme to come up with the syllabi for undergraduate education in technical institutions.

The broad strategies for framing the curricula included the study and analysis of the existing curricula followed in various institutions within the country and also the feedback received in various workshops involving faculty from different institutions. The draft Model Curriculum was discussed in a wide forum before coming up with the present version.

Based on the interaction and discussion with a number of experts the following recommendations were finalised.

- The duration of a degree level course should be limited to 4 years! 8 semesters of about 90 working days each.
- A common first year syllabus with sufficient emphasis on Hum. & Science and Management subjects shall be adopted for all branches of engineering.
- The contact hours per week should normally be kept at about 30 hours.
- Weightage of 15-20% shall be given to non-professional (Basic Sciences and Humanities) subjects and about 10% to Management subjects.
- Normally the curriculum should include a Major Project of minimum 8 credits in Final Year (2 credits in 7th semester and 6 credits in 8th semester). Emphasis should be given to industry sponsored projects.
- Wherever possible the students in 3rd & 4th year should be involved in group discussion on topics of current trends in Engineering & Technology. (No credit)
- There should be a continuous evaluation system. Various components of evaluation suggested are Teachers Assessment (TA), Class Tests (CT) also called minors 111 some of the institutions and End Semester Examination (ESE).
To make the evaluation more objective, teachers' assessment could be broken into various components like assignments, quizzes, attendance, group discussions.

- tutorials etc. Similarly marks of class Tests can be awarded by having at least two to three tests. These two components i.e. TA & CT put together would form the sessional components. End Semester Examination will have to be conducted by the Institute through concerned affiliating University, as per its regulations.

- On the basis of total marks (TA+CT+ESE) in each subject obtained, a letter grade should be awarded where A = 10, B = 8, C = 6, D = 4, F = 0. Normally top 5 – 10% should be awarded ‘A’ Grade and last 5-10% ‘F’ Grade.

In order to evaluate grade point average for a semester the same could be done using the following illustration:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit = (L + (T + P)/2)</th>
<th>Grade Awarded</th>
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<tbody>
<tr>
<td>I</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
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</tr>
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<td>3</td>
<td>2</td>
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Semester Grade Point Average = \[
\frac{3A + 5B + 4A + 4B + 2C}{3+5+4+4+2}
\]

= \[
\frac{(30+40+40+32+12)}{18} = 8.55
\]

L : Lecture
T : Tutorial
P : Practical

- In order to meet the demand of changing trends and emerging areas a student be given a choice to choose subjects offered as electives which consist of a professional elective (PE) of 2 Credits and an open elective (non departmental elective) of 8 Credits.

Based on the recommendations a Model Curriculum has been framed. A model structure of the total courses to be undertaken by a student during his undergraduate programme in Computer Science & Engineering is shown in the subsequent tables. The institute may assign the course numbers depending upon the guidelines of the respective affiliating university.

This developmental exercise is underpinned by the philosophy that curriculum should transcend traditional instructional modes, embrace novel methods of teaching and
enhance and embellish the learning process to produce quality engineers for the future. The success of the curriculum lies in its implementation. It is suggested that advantage be taken of modern technology by augmenting the role of a teacher with innovative audio-visual and digital teaching and learning aids. This curriculum is only a base line and institutions should aspire to develop over and above this. The development of this model curriculum has been possible only through the sustained and dedicated efforts of a large number of faculty members from various institutions. The AICTE expresses its gratitude to them for contributing their time and expertise in this important national task. Suggestions to improve the quality of contents of this curriculum will be highly appreciated.

(Prof. R.S. Nirjar)
Member Secretary
All India Council for
Technical Education
COURSE STRUCTURE
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<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>SUBJECT (THEORY)</th>
<th>PERIODS</th>
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<tr>
<td>6</td>
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<td>Basic Electrical Engineering</td>
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(PRACTICAL/DRAWING/DESIGN)

|         |            | Chemistry/Physics Lab. (To be taken in alternate weeks) |         | 3  | -   | 25  | -   | 25   | 50   | 2     |
|         |            | Engineering Mechanics/ Electrical Laboratory |         | 3  | -   | 25  | -   | 25   | 50   | 2     |
|         |            | Engineering Graphic I |         | 3  | -   | 25  | -   | 25   | 50   | 2     |
| 10      |            | Workshop Practice – I |         | 3  | -   | 25  | -   | 25   | 50   | 2     |

GP-I GENERAL PROFICIENCY

|         |            |                         |         | 50  | -   | 50   | 2     |

**Total**

|         |            |                         | 16  | 6   | 12  | 1000 | 32   |

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks: 1000, Total Periods: 34, Total Credits: 32
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GP-II GENERAL PROFICIENCY

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<td></td>
<td>System Administration Lab</td>
<td>3  25  -</td>
<td>25</td>
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<td>8.</td>
<td></td>
<td>Internet Lab</td>
<td>3  25  -</td>
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<tr>
<td>10.</td>
<td></td>
<td>Language Processor Lab</td>
<td>3  25  -</td>
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</tbody>
</table>

GP-VI GENERAL PROFICIENCY

|                  | 50 | - | 50 | 2 |

Total

|                  | 16 | 6 | 12 | 1000 | 32 |

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks: 1000,
Total Periods: 34, Total Credits: 32
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>SUBJECT</th>
<th>PERIODS</th>
<th>EVALUATION SCHEME</th>
<th>Credits</th>
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<tr>
<td></td>
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<td>(THEORY)</td>
<td>L T P</td>
<td>SESSIONAL EXAM</td>
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<tr>
<td>1</td>
<td></td>
<td>Software Engg.</td>
<td>2 1 -</td>
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<td>Object Oriented Prog &amp; Methodology</td>
<td>3 1 -</td>
<td></td>
<td>30</td>
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<tr>
<td>3</td>
<td></td>
<td>Data Base Application Design</td>
<td>3 1 -</td>
<td></td>
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<td>4</td>
<td></td>
<td>Open Elective I</td>
<td>3 1 -</td>
<td></td>
<td>30</td>
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<td>5</td>
<td></td>
<td>Professional Elective - I</td>
<td>3 1 -</td>
<td></td>
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</table>

|        |            | (PRACTICAL/DRAWING/DESIGN)| L T P | SESSIONAL EXAM | ESE | SUB TOTAL | Credits |
|        |            |                         |         | TA | CT | TOT |         |         |
| 7      |            | Software Engg. Lab | - - 3 | 25 | - | - | 25 | 50 | 2 |
| 8      |            | Data base Application Lab | - - 3 | 25 | - | - | 25 | 50 | 2 |
| 9      |            | Object Oriented prog. Lab | - - 3 | 25 | - | - | 25 | 50 | 2 |
| 10     |            | Project - I | - - 3 | 25 | - | - | 25 | 50 | 2 |

| GP-VII | GENERAL PROFICIENCY | 50 | - | 50 | 2 |

| Total |               | 16 | 6 | 12 | 1000 | 32 |

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks: 1000, Total Periods: 31, Total Credits: 29
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<th>Sl. No.</th>
<th>Course No.</th>
<th>SUBJECT</th>
<th>PERIODS</th>
<th>EVALUATION SCHEME</th>
<th>Credits</th>
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<td></td>
<td>Web Technology</td>
<td>3 1 -</td>
<td>30 20 50</td>
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<td></td>
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<td>30 20 50</td>
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<td>30 20 50</td>
<td>100</td>
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</table>

(PRACTICAL/DRAWING/DESIGN)

|        |            | Project – II-colloquim | - - 12 | 100 - | 100 | 100 | 200 | 6 |

GP- VIII

|        |            | GENERAL PROFICIENCY | 50 | - | 50 | 2 |

Total | 15 5 12 | 400 600 1000 | 28 |

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks: 1000, Total Periods: 32, Total Credits: 28
COURSE CONTENT
<table>
<thead>
<tr>
<th>Course</th>
<th>Page No.</th>
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<tbody>
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<tr>
<td>Engineering Chemistry</td>
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<tr>
<td>Engineering Physics-I</td>
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<tr>
<td>Mathematics-I</td>
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<td>Engineering Mechanics</td>
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<td>Basic Electrical Engineering</td>
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<td>Engineering Graphics-I</td>
<td>10</td>
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<tr>
<td>Workshop Practice I &amp; II</td>
<td>11</td>
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<tr>
<td>Introduction to Computing</td>
<td>13</td>
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<tr>
<td>Environment and Ecology</td>
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<tr>
<td>Engineering Physics - II</td>
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<td>Mathematics - II</td>
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<td>Engineering Thermodynamics</td>
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<td>Basic Electronics</td>
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<td>Computer Programming</td>
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<td>Engineering Economics</td>
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<td>Computer Organisation</td>
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<td>Electronics - II</td>
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<td>Mathematics - III</td>
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<td>Strength of Materials</td>
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<td>Discrete Mathematics</td>
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<tr>
<td>System Analysis &amp; Design</td>
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<tr>
<td>Digital Circuit Design</td>
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<td>Data Communication</td>
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<td>Data Structure &amp; Proa. Methodology</td>
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<tr>
<td>System Software</td>
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<tr>
<td>Management Science</td>
<td>28</td>
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<tr>
<td>Formal Language and Automata Theory</td>
<td>29</td>
</tr>
<tr>
<td>Computer Networking</td>
<td>29</td>
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</tbody>
</table>
Relational Data Base System 30
Operating System-I 31
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Software Engineering 37
Object Oriented Programming & Methodology 38
Data Base Application Design 39
Web Technology 39
Visual Programming 40

OPEN ELECTIVES

Human Values 42
Science Technology and Society 43
ENGLISH FOR PROFESSIONAL COMMUNICATION

Objective of the Course

To impart basic skills of communication in English through intensive practice to the first year UG students of engineering so as to enable them to function confidently and effectively in that language in the professional sphere of their life.

Desired Entry Behaviour

The student must have some basic command of English that is must be able to:

- write reasonably grammatically
- understand (if not use) at least some 2500 general purpose words of English
- use some 2000 (at least 1500) general purpose words of English to express himself in writing and 1500 such words to talk about day-to-day events and experiences of life.
- understand slowly-delivered spoken material in Standard Indian English, and
- speak reasonably clearly (if not fluently) on routine matters with his fellow students.

Teaching Method

- The topics must be covered essentially through plenty of examples. Lecture classes must be conducted as lecture-cum-tutorial classes.
- It is a course that aims to develop skills. It is therefore "practical" in orientation. Plenty of exercises of various kinds must be done by the students both inside and outside the class-room.
- The teacher must not depend on a single or a set of two or three text books. He must choose his materials from diverse sources.
- Keeping in view the requirements of his students, the teacher may have to prepare some teaching and exercise materials.
- For practice in listening, good tape recorders can be used if the more advanced facilities (for example, language laboratory) are not available. In fact they can be used very fruitfully.
- The teacher must function as a creative monitor in the class-room.
- Minimum time should be spent in teaching phonetic symbols, stress, intonation, etc.
  The aim should be to enable the student to find out for himself the correct pronunciation of a word from a learner's dictionary. In teaching speaking, emphasis should be on clarity, intelligibility and reasonable fluency rather than no "correct" pronunciation of words. Classroom presentation and group discussion sessions should be used to teach speaking.

Some Key Concepts

Communication as sharing; context of communication; the speaker/writer and the listener/reader; medium of communication; barriers to communication: accuracy, brevity, clarity and appropriateness in communication.
Writing
Selecting material for expository, descriptive, and argumentative pieces; business letters; formal report; summarizing and abstracting; expressing ideas within a restricted word limit; pant graph division; the introduction and the conclusion; listing reference material; use of charts, graphs and tables; punctuation and spelling; semantics of connectives, modifiers and modals: variety in sentences and paragraphs.

Reading Comprehension
Reading at various speeds (slow, fast, very fast); reading different kinds of texts for different purposes (for example, for relaxation, for information, for discussion at a later stage, etc.); reading between the lines.

Speaking
Achieving desired clarity and fluency; manipulating paralinguistic features of speaking (voice – quality, pitch, tone, etc.); pausing for effectiveness while speaking; task-oriented, interpersonal, informal and semiformal speaking; making a short, classroom presentation.

Group Discussion
Use of persuasive strategies including some rhetorical devices (for emphasizing, for instance; being polite and firm; handling questions and taking in criticism of self; turn-taking strategies and effective intervention; use of body language.

Telephonic Conversation

Listening Comprehension
Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English and American English; intelligent listening in situations such as an interview in which one is a candidate.

Suggested Text Books & References

ENGINEERING CHEMISTRY

Atoms and Molecules
Particle in a box illustrating energy quantization, angular momentum quantization, radial and angular parts of H atom wave functions/orbitals, probability and charge distribution. Many electron atoms.

Homonuclear and heteronuclear diatomic, covalent bonds, ionic bonds and electro negativity concepts, hybridization and shapes of molecules. Non-covalent interaction (Van.Der Waals and hydrogen bonding).

Solid State
Idea of spatial periodicity of lattices; elements of bond theory. Conductors, semiconductors and insulators.

Experimental methods of structure determination using spectroscopic techniques such as IR, UV-Vis, NMR and Mass Spectrometry.

Reaction Dynamics
Rate laws, mechanisms and theories of reaction rates (collision and transition state theory). Lasers in Chemistry.

Electrochemistry
Application of electrode potentials to predict redox reactions in solution with special reference to Lattimer and Frost diagrams.

Transition Metal Chemistry
Structures of coordination compounds corresponding to coordination numbers up to 6. Types of ligands. Isomerism (geometrical, optical, ionization, linkage and coordination). Theories of bonding in coordination compounds, viz. crystal field theory, valence bond theory. Chelation. Brief application in organic synthesis and medicines etc.

Organ metallic Chemistry and Catalysis
Structure and bonding in organ metallic complexes, the sixteen and eighteen electron rules. Homogeneous catalysis, the role of metals in catalytic cycles during some chemical reactions (e.g. hydroformylation, hydrogenation etc.). Role of metals in biology; oxygen carrier, electron transfer.

Structure and Reactivity of Organic Molecules
Inductive effect, resonance, hyper conjugation, electrometric effect. Carbonation, carbanion and free radicals. Brief study of some addition, elimination and substitution reactions. Conformational analysis (a cyclic and cyclic molecules), geometrical and optical isomerism; E, Z and R, S nomenclature.

Polymerization
Basic concepts, classification and industrial application.
Photochemistry
Photo excitation of carbon substrates (Norrish type I and type II reactions), selected examples of the application of photolysis. Photosynthesis (Z-diagram). Chemistry of vision.

List of Experiments
- Acid-base titration (estimation of commercial caustic soda).
- Redox titration (estimation of iron using per manganometry).
- Complex metric titration (estimation of hardness of water using EDTA titration).
- Preparation and analysis of a metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).
- Chemical kinetics (determination of relative rates of reaction of iodide with \( \text{H}_2\text{O}_2 \) at room temperature (clock reaction).
- Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
- Photochemical oxidation-reduction (study of photochemical reduction of ferric salt).
- Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).
- Synthesis of aspirin.
- Synthesis of p-nitro aniline from acetanilide.
- Detection of functional groups in organic compounds.
- Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds.
- Radical polymerization of vinyl monomers such as styrene, acrylonitrile etc.
- Conductometric titration (determination of the strength of a given HCl solution by titration against a standard NaOH solution).

Suggested Text Books & References
- "Blocks 1-5 of Chemistry Course", Indira Gandhi Open University, IGNOU, New Delhi, 1996.

ENGINEERING PHYSICS - I

Theory of Relativity

Inertial frame of reference, Noninertial frames and fictious forces, Outline of relativity, Michelson-Morley experiment, Lorentz transformation of space and time, length contraction, variation of mass with velocity, equivalence of mass and energy.

Geometrical Optics

Combination of thin lenses, cardinal points of coaxial system of thin lenses, thick lenses, location and properties of cardinal points, graphical construction of images.

Physical Optics

Interference- analytical treatment of interference, intensity distribution of fringe system, coherent and non-coherent sources, fundamental conditions of interference, Fresnel's biprism, displacement of fringes, wedge shaped films, Newton's rings

Diffraction- single slit and double slit diffraction, diffraction grating, Limit of resolution, resolving power of grating and image forming systems.

Polarisation- Brewster's law, double refraction, geometry of calcite crystal, optic axis, nicol prism, circularly and elliptically polarised light, retardation plates, production and analysis of planes, polarimeter

Thermal Physics

Kinetic theory of gases, maxwellian distribution, mean free path, transport phenomena in gases, Imperfect gases and vander Waal's equation of state.
Acoustics
Production and applications of Ultrasonics, Acoustics of buildings.

**Dynamics of fluids**
Continuity equation, Bernoulli's theorem and its applications, Torcelli's theorem, Viscosity, flow of liquid through a capillary tube, capillaries in series and parallel, Stoke's formula, rotation viscometer.

**List of Experiments**
- To determine the coefficient of viscosity of water by capillary flow.
- To determine the thermal conductivity of a bad and good conductor by Lee's method and Searl's method, respectively.
- To determine the wave length of light by Newton's ring method.
- To determine the wave length of light by Fresnel's biprism.
- To determine the dispersive power of the given material of the prism.
- To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
- Determination of e/m by J. J. Thomson's method.
- Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
- Use of Can)' Foster Bridge.
- Study of electromagnetic induction.
- Study of electromagnetic damping and determination of terminal velocity reached by a magnet falling in a metallic tube.
- Study of LCR circuits with AC current.
- Determination of Plank's Constant using photocells.

**Suggested Text Books & References**
- Mathur, D.S. "Mechanics"
- Saha and Srivastava "A treatise on heat"
- Singh R.B. "Physics of Oscillations and Waves"
- Ghatak A.K. "Optics"

**MATHEMATICS - I**

**Calculus of Functions of One Variable**
Successive differentiation, Libnitz's theorem (without proof). Rolle's theorem mean value theorems and Taylor's theorem. Fundamental theorems of integral calculus, elementary reduction formulae for integrals. Applications to length, area, volume, surface area of revolution, moments and centers of gravity.

Infinite Series: Convergence, divergence, comparison test, ratio test, Cauchy Leibnitz's theorem, absolute and conditional convergence. Expansions of functions into Taylor and Maclaurin series.
Calculus of Functions of Several Variables

Vector Calculus
Scalar and vector fields. Line and surface integrals. Gradient, divergence and curl. Line integrals independent of path. Green's theorem, divergence theorem and Stoke's theorem (without proofs) and their simple applications.

Suggested Text Books & References

ENGINEERING MECHANICS

Fundamental of Mechanics- Basic concepts

Force Systems and Equilibrium-
Force, Moment and couple, Principle of Transmissibility, Varignons theorem, Resultant of force systems-Concurrent and non-concurrent coplanar forces, Free body diagram, Equilibrium equations and their uses in solving elementary engineering problems.

Plane Trusses

Friction
Introduction, laws of coulomb friction, simple contact friction problems, belt friction, the square screw thread, rolling resistance.

Properties of Surfaces
First moment of an area and centroid, second moment and product of area of a plane area, transfer theorems, relation between second moment and product of area, polar moment of inertia, principal axes, mass moment of inertia

Virtual Work
Work of a force, Principle of Virtual work and its application.

Kinematics of Rigid bodies
Plane motion, Absolute motion, Relative motion, Translating axes and rotating axes.
Kinetics of Rigid bodies
Plane motion, Work and energy, Impulse and momentum.

List of Experiments
- To determine the Newton's second law of motion by Fletcher's trolley apparatus.
- To determine the moment of inertia of a flywheel about its axis of rotation.
- To verify: (a) the conditions of equilibrium of forces by parallel force apparatus.
- (b) The principal of moments by crank lever.
- To find the compression in the rafters and tension in ties of simple roof truss models and to verify graphically.
- To determine the dry friction between inclined plane and slide boxes of different materials.
- To determine the coefficient of friction between the belt and rope and the fixed pulley.
- To determine the velocity ratio of a simple screw jack and to plot graph between (a) Effort-Load. (b) Friction-Load. (c) Efficiency-Load.
- To measure the area of a figure with the help of a Polar Planimeter.

Suggested Text Books & References

BASIC ELECTRICAL ENGINEERING

DC Networks
Kirchoff s laws, node voltage and mesh current methods; Delta-star and star-delta conversion; Classification of Network Elements, Superposition principle, Thevenin's and Norton's theorems.

Single Phase AC Circuits
Single phase EMF generation, average and effective values of sinusoids; Solution of R, L, C series circuits, the j operator, complex representation of impedances; Phasor diagram, power factor, power in complex notation; Solution of parallel and series-parallel circuits; Resonance.

Three phase AC Circuits
Three phase EMF generation, delta and V-connection, line and phase quantities; Solution of three phase circuits, balanced supply voltage and balanced load; Phasor diagram, measurement of power in three phase circuits; Three phase four wire circuit; Unbalanced circuits.'

Magnetic Circuits
Ampere's circuital law, B-H curve, solution of magnetic circuits; Hysteresis and eddy current losses; Relays, an application of magnetic force.
Transformers
Construction, EMF equation, ratings; Phasor diagram on no load and full load; Equivalent circuit, regulation and efficiency calculations; Open and short circuit tests; Auto-transformers and three phase transformers.

Induction Motors
The revolving magnetic field, principle of operation, ratings: Equivalent circuit; Torques and speed characteristics; Starters for squirrel cage and wound rotor type induction motors; Single phase induction motors,

DC Machines
Construction, EMF and torque equations; Characteristics of DC generators and motors; Speed control of DC motors and DC motor starters; Armature reaction and commutation.

Electrical Measuring Instruments
DC PMMC instruments, shunts and multipliers, multi-meters; Moving iron ammeters and voltmeters; Dynamometer wattmeters; AC watt-hour meters, Extension of instrument ranges.

Power Supply Systems
General structure of electrical power systems; Power transmission and distribution via overhead lines and underground cables, Steam, hydro, gas and nuclear power generation.

List of Experiments
- To measure the armature and field resistance of a DC machine.
- To calibrate a test (moving iron) ammeter and a (dynamometer) wattmeter with respect to standard (DC PMMC) ammeter and voltmeters.
- Verification of circuit theorems, Thevenin's and Superposition theorems (with DC sources only).
- Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
- Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC supply.
- Open circuit and short circuit tests on a single-phase transformer.
- Connection and starting of a three-phase induction motor using direct on line (DOL), or star-delta starter.
- Connection and measurement of power consumption of a fluorescent lamp.
- Determination of open circuit characteristics (OCC) of a DC machine.
- Starting and speed control of a DC shunt motor.
- Connection and testing of a single-phase energy meter (unity power factor load only).
- Two-wattmeter method of measuring power in three-phase circuit (resistive load only).
- Measurement of thenno emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
Design and use of potentiometer.
Study of LCR circuits with AC current.

Suggested Text Books & References


ENGINEERING GRAPHICS-I

General
Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic projections, B.I.S. Specifications.

Projections of Points and Lines
Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance intersecting and non-intersecting lines.

Planes Other than the Reference Planes
Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.

Projections of Plane Figures
Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.

Projection of Solids
Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles.
Development of Surface
Development of simple objects with and without sectioning.

Isometric Projection

Nomography

Basic concepts and use.

Suggested Text Books & References


WORKSHOP PRACTICE 1&11

Carpentry
Timber, definition, engineering applications, seasoning and preservation, plywood and plywoodboards.

Foundry
Moulding sands, constituents and characteristics. Pattern, definition, materials, types, core prints. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.

Metal Joining
Definitions of welding, brazing and soldering processes, and their applications. Oxy-acetylene gas welding process, equipment and techniques, type of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrode coating. Welding positions. Type of weld joint. Common welding defects such as cracks, undercutting, slag inclusions, porosity.

Metal Cutting
Introduction to machining and common machining operations. Cutting tool materials. Definition of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Common lathe operations such as turning, parting, chamfering and facing. Quick return machianism of shaper. Difference between drilling and boring. Files material and classification.
Forging

Forging principle, materials, operations, like drawing, upsetting bending and forge welding, use of forged parts

List of jobs to be Made in the workshop

Group A

1. T-Lap joint and Bridle joint (Carpentry shop) 4hrs
2. Mould of any pattern (Fondry shop) 2hrs
3. Casting of nay simple pattern (Foundry shop) 2 hrs

Group B

1 (a) Gas welding practice by students 2hrs
   Mild steel flat
   (b) Lap joint by Gas welding 2hrs
2 (a) MMA Welding practice by students
   (b) Square butt joint by MMA Welding
3.(a) Lap joint by MMA Welding 1hrs
   (b) Demonstration of brazing 1hrs
4 Tin smithy for making mechanical joint and
   Soldering of joints 2hrs

Group C

1. Job on lathe with one step turning and
   Chamfering operations 2hrs
2. Job on shaper for finishing two sides of a job 2hrs
3.(a) Drilling two holes of size 5 and 12mm diameter on job used/to be used for shaping 2hrs
   (b) Grinding a corner of above job on bench grinder 2hrs
1. finishing of two sides of a square piece by filing 2hrs

Suggested Text Books & References

• Chaudhary, Hajra “Elements of Workshop Technolgoy”, Media Promotors & publishers, 1998

INTRODUCTION TO COMPUTING

Introduction

Introduction to the computer devices such a keyboard, mouse, printers, disk, files, floppies etc.

Concept of computing, contempory. OSs such as DOS, Windows95, MAC-OS, UNIX etc. (Only brief level description)

Introduction to the e-mail, ftp, rlogin and other network services world wide wbe,

Introduction to the type setting software such as Microsoft office

Introduction to Programming

Concept of algorithms. Example of Algorithms such as how to add ten numbers, roots of a quadratic equation. Concept of sequentially following up the steps of the algorithm,

Notion of program. Program, programmability and programming languages, structure of programs, object codes, compilers.

Introduction to the Editing tools such as vi, or MS-VC editor

Concepts of the finite storage. bits. Bytes, kilo. mega and gigabytes. Concepts of character representation, languages for system programming; study of Basics, Fortran, Pascal, Cobol etc.

COMPLTER PROGRAMMING LAB

Concepts of flow charts and decision tables, Examples and practice problems.

Introduction to Digital Computers and its Components,. Introduction to DOS and
UNIX operating system

Development of computer program for example

- Roots of quadratic and Cubic equations
- Summation of N natural numbers
- Arranging numbers in ascending and descending order
- Separation of odd and even numbers. etc,

**Suggested Text Books & References**

- Yourdon, E., "Techniques of program structures and design", Prentice-Hall.

**ENVIRONMENT AND ECOLOGY**

**General**
Introduction, components of the environment, environmental degradation.

**Ecology**

**Air Pollution and Control**
Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures

**Water Pollution and Control**
Hydrosphere, natural water, pollutants their origin and effects, river/lake/ground water pollution, standards and control.

**Land Pollution**
Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes): their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

**Noise Pollution**
Sources, effects, standards and control.
Suggested Text Books & References


ENGINEERING PHYSICS-II

**Vector analysis**
Scalar and vector fields, gradient of a scalar field, Divergence and curl of a vector fields, Line integral of a vector field, Gauss- divergence theorem, Stoke's theorem

**Electromagnetism**
Quantization & conservation of charge, Coulomb's law (vectorial form) and superposition principle,
Concept of electric field lines, flux of E-field, Gauss' law, Electric Potential energy and potential,
Conductors, capacitors and dielectric materials, Magnetic field, Force on a moving charge in a magnetic field, Force on current element, Torque on current loop, Biot Savart law, Ampere's law,

**Thermoelectricity**
Seebeck effect, law of successive temperatures, law of intermediate metals, peltier effect. Thomson effect, Thermoelectric power, application of thermodynamics on thermocouple.

**Modern Physics**
Elements of wave properties of particles and particle properties of waves, Nuclear Energy. Lasers- spontaneous and stimulated emission of radiation, Einstein coefficient, Parts of laser, types of lasers and their application.

**Solid State Devices**
Energy band diagram; covalent bonds; bound and free electrons, holes; electron and hole mobilities: intrinsic and extrinsic semiconductors; Fermi and impurity levels; impurity compensation, charge neutrality equation and semiconductor conductivity; Einstein relation; drift and diffusion current; photo conductivity and Hall effect.

Suggested Text Books & References

**MATHEMATICS – II**

**Linear Algebra**

**Ordinary Differential Equations**
Formation of ODE's, definition of order, degree and solutions. ODE's of first order: separable variables, homogeneous and nonhomogeneous equations; exactness and integrating factors, linear equations and Bernoulli equations. General linear ODE's of nth order: solutions of homogenous and nonhomogenous equations, operator method, methods of undetermined coefficients and of variation of parameters. Solutions of simple simultaneous ODE's.

**Laplace Transforms**
Transforms of elementary functions, transforms of derivatives and derivatives of transforms, inverse transforms, transforms of periodic functions, unit step function, shifting theorems, solutions of ODE's using Laplace transforms.

**Numerical Methods**
Difference operators - forward, backward, central, shift and average operators and relations between them. Newton's forward and backward interpolation. Lagrange interpolation and the error formula for interpolation. Numerical differentiation and integration - Trapezioal rule and Simpson's one-third rule including error formulas.

**Suggested Text Books & References**

**ENGINEERING THERMODYNAMICS**

**Fundamentals and Definitions**
System, Control Volume, properties, state, state change, and diagram, Dimensions and units.

**Work**
Mechanics and Thermodynamics definitions, Displacement work at part of a system boundary, Engine Indicator, Displacement work in various quasi-static processes, shaft work, electrical work.
Heat
Temperature, thermal equilibrium, zeroth law of thermodynamics, sign convention for heat transfer.

First Law of Thermodynamics
Statement, Application to non-cyclic process, Energy, modes of energy, Pure substance, Specific heats, First Law for Control Volumes.

Second Law of Thermodynamics
Direct and reversed heat engines, Kelvin-Planck and Clausius Statements and their equality, reversible and irreversible processes, Carnot cycle, Thermodynamic temperature scale.

Entropy
Definition, calculation through Tds relations, T-s diagrams, entropy as a measure of irreversibility Properties of pure substances - Use of steam Tables and Mollier Diagram.

Ideal gas
Properties of ideal gas and ideal gas mixtures with and without a condensable vapour- psychrometry.

Real gas
Equations of state, generalised charts for compressibility, enthaly changes and fugacity.

Second Law Analysis of Engineering Processes
Availability and irreversibility and their application in Thermal Engineering.

Suggested Text Books & References

BASIC ELECTRONICS

Semiconductor Diodes
Introduction, Ideal diode, PN semiconductor diode, Diode equivalent circuits, Zener diode, Light diodes.

Bipolar Junction Transistor
Introduction, Transistor construction, Transistor operation, Common-base
configuration, common emitter and common collector configuration.

**Semiconductor Devices**
Introduction of silicon controlled rectifier, GTO, TRIAC, DIAC, injunction transistors, IGBT.

**Field Effect Transistor**
Introduction, Construction and characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, Enhancement type MOSFET.

**Operational Amplifier**
Introduction, Differential and common mode operation, Constant gain multiplier, voltage summing, voltage buffer.

**Cathode Ray Oscilloscope**
Introduction, Cathode ray tube- theory & construction.

**Electronic Instruments**

**Transducers**
Introduction, classification and types of electrical transducers.

**Display Devices and Recorders**
Introduction, Digital instruments, Digital Vs Analog instruments, Recorders- Analog recorders, graphic recorders, strip-chart recorders.

**Data Acquisition Systems** Introduction, Components and uses.

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**COMPUTER PROGRAMMING**

Overview of computer components and their function, computer languages, problem analysis, flow charts, decision tables, pseudocodes algorithms, stepwise refinement.

**Algorithmic Programming Language**
Representation of integers, reals, characters, constants and variables, arithmetic expression and their evaluation using rules of hierarchy. Assignment Statements, Logical constants variables and expression. Control Structures-sequencing alternation, iteration. Arrays Procedures and functions manipulating vectors and matrices. Subroutines and linkages, Data Management. Sample I/O statements, Documentation, debugging. Storage and execution time estimation. Example from numerical methods like solutions of linear algebraic equations; integration and solutions of differential equations. Also from non-numerical methods like searching, simple string pattern, machining etc.

**Suggested Text Books & References**
- Sastry SS. "Introductory method of Numerical Analysis", Prentice Hall ofIndia.
Microeconomics
Demand Theory & Demand Forecasting, Production Theory, Cost Theory, X-Inefficiency.

Market Dynamics
Forms of Market, Elements of Competition, Perfect Competition, Monopoly & Prince Discrimination, Imperfect Competition Oligopoly.

Pricing Policies

Firm as an Organization
Objectives of the Firm, Types of the Firm, Firm versus markets, Uncertainty and Finn, Vertical and Horizontal Integration, Diversification, Merges and Takeovers.

Macroeconomics

Suggested Text Books & References
- Gupta G.S. "Managerial Economics"
- Davis, H. "Managerial Economics", ELBS - Pitman.
- Joel Dean, "Managerial Economics", Prentice hall.

COMPUTER ORGANISATION

Representation of information
Number systems, integer and floating point representation, character codes (ASCII, EBCDIC), En-or detection & correction codes.

Basic Building Block
Boolean Algebra, Combination logic design, flip-flops, registers, counters, ALU, Arithmetic and Logic Operations, Faster algorithms and their implementation. Organisation of Central Units (Hardwired and Microprogrammed), Microprogramming organisation. Memory types and Organisation. Address decoding and selecting.


Suggested Text Books & References
- Assembler "Manual for the Chosen Machine".

ELECTRONICS – II

Review of d.c. analysis biasing and bias stability for BJTS: small signal equivalent circuit; linear analysis, multiple stage circuits, biasing of FETS, FET equivalent circuit and amplifiers.

Feedback And Amplifier Classification
Effect of feedback on again and impedance; emitter and source follower; step response of amplifiers; low frequency response; high frequency equivalent circuit; high frequency response, gain-BW product; effect of feedback on frequency response single and double pole representation; high impedance circuits.

Differential Amplifiers
CMRR; operational amplifiers; applications-summer, integrator, current converter; instrumentation amplifiers, active filters; compactors, Schmidt trigger, square and triangular wave generation. Monostable; wien bridge and tuned oscillators, OP-amp bias currents and offset voltages, frequency response, measurement of OP-amp parameters, coupled amplifier.

Voltage regulators; regulators in a regulator design; protection circuits; fixed and adjustable regulators; switching regulators.

Class A and Class B power amplifiers; push-pull amplifiers; audio power amplifier
Ics like LM 380, distortion in Class AB push-pull amplifiers; Class C amplifiers; power OP-amps and MOSFETS.

Voltage controlled oscillators; IC timer 555; applications.

**Suggested Text Books & References**

**MATHEMATICS - III**

**Complex Variable**
Complex number, Arc and diagram, complex functions, limit, continuity and differentiability Cauchy-Reimann equations, harmonic functions, construction of analytic functions, by mile-Thomson method, conformal mapping, transformations \( W=Z^n \), \( \sqrt{Z} \), \( (az + b)/cz=d \).

**Fourier Series**
Periodic functions, Fourier series off unctions with period 2 change of interval, Half range sine and cosine series.

**Laplace Transform**
Laplace transform, existence theorem, first shifting theorem, multiplication and division by T, Laplace transform of deviated Inverse Laplace transform, Application to solve Linear differential equations.
Unit step function, Dirac delta function - their Laplace transforms, second shifting theorem.

Laplace transform of periodic function, Applications.

**Series Solution of Differential Equation**
Serious solution. Frobenious method, Legendre and Bessels equations.

**Partial Differential Equation**
Linear and non-linear partial differential equations of first order. four standard forms.

**Suggested Text Books & References**
- Kreyszig E. "Advanced Engineering Mathematics".
- Prasad C. "Advanced Engineering Mathematics".
- Pati T. "Functions of Complex Variable".

**STRENGTH OF MATERIALS**

**Analysis of Stress:** Plane Stress, Stress components associated with arbitrary oriented
Faces in plane stress, principal stresses, Maximum shearing stress, Mohr's circle representation of plane stress.

**Analysis Strain**: Strain components. Strain-displacement relation. Strain components associated with arbitrary sets of axes, Principal strains, Maximum shearing strain, Mohr's circle representation of plane strain, Strain rosettes.

**Stress-Strain relations**: The tensile test, Elastic stress-strain relations, Thermal Strain, Strain energy in an elastic body, stress-strain relations for composite materials, Poisson's ratio, Relations between various elastic constants, Yield criteria.

**Statically indeterminate Problems**: Composite bars and thermal stresses.

**Thin-walled Pressure Vessels**: Stresses and deformations in thin cylindrical and spherical vessels.

**Torsion**: Geometry of deformation of a twisted circular shaft Stress and deformation in twisted circular solid and hollow shafts, Strain Energy due to torsion, Power transmitted by circular shaft.

**Shear Force and Bending Moment Diagrams**

**Stresses due to Bending**: Geometry of deformation of asymmetrical beam subjected to pure bending. Bending stress and deformation in symmetrical elastic beams subjected to pure bending, Shear stress in Symmetrical elastic beams transmitting both shear and bending moment, Combined stresses, Short columns.

**Deflections due to bending**: The moment curvature relation, Integration of the moment curvature relation, Superposition, The load deflection differential equation, Moment-area method, Castigliano's theorem.

**Stability of Columns**: Elastic stability of flexible columns, Eluer's formula, Instability as a mode of failure, Rankine's formula.

**Springs**: Types of springs. Close-coiled and open-coiled springs.

**Suggested Text Books & References**
- Sharmes, L.H. "Introduction to Solid Mechanics", Prentice Hali of India Ltd.
- Popova, E. "Engineering Mechanics of Solids".
- Singer, "Strength of Materials".
DISCRETE MATHEMATICS

Formal Logic
Introduction to formal logic, formulas of prepositional logic, boolean valuations and truth sets, predicate calculus, quantification, Notion of interpretation, validity, consistency and completeness.

Sets
Sets, operations on sets.

Functions
Ordered pairs, functions and sequences, recursive definitions.

Relations
Relations, partially ordered sets, equivalence relations, composition of relations, colosures.

Algebraic Structures
Lattices, semigroups, groups, rings, fields, etc.

Graph Theory
Incidence, degrees, walks, paths, circuits, Euler graphs, hamiltonian paths, trees, spanning tree, network flow, cut-sets, planar graphs, etc.

Combinatorics
Counting techniques -pigeon-hole principle, infinite sets, mathematical induction. Permutations (with repetitions, etc.). Generating functions. Recurrence relations and their solutions.

Suggested Text Books & References
- Deo, N. "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall of India, 1980.

SYSTEM ANALYSIS & DESIGN

Overview
Overview of system analysis and design, Business systems concepts, systems development life cycle, project selection, feasibility analysis, design implementation, testing and evaluation.
**Project Selection**
Sources of project requests, managing project review and selection, preliminary investigation.

**Feasibility Studies**
Technical and Economical feasibility, cost and benefit analysis.
System requirement specification and analysis, fact finding techniques, Data flow diagrams, data dictionaries, process organization and interaction, decision trees and tables structural English advanced Modelling methods, ER Diagram & DFDS, Entity relationship model.

**Detailed Design**
Modularization, module specification, file design, system development involving database. Program Design, Practical Design.
System control and quality assurance, system administration and training, conversion and operation plans, Hardware and Software selection.

**Suggested Text Books & References**
- Thomas, R. & Prince "Information systems for Planning & Control".
- Hawrys Zbiwyes LT. "Introduction to System Analysis & Design", Prentice Hall of India

**DIGITAL CIRCUITS DESIGN**
Mixed logic representation, design of machine on ROMs and PLANS, interactive networks Digital System structure, pipe lined and serial structure, Process interface design such as numerical control, PLCs, control sequencing use sequencers.

Hardware description languages, programming using HPLs. Firmware based design, design of control units, microprogram design.
Algorithm implementation with digital systems.

**Suggested Text Books & References**
- J.P. Hayes, "Digital System Design and Microprocessor".
- W.I. Fletcher, "Engineering Approach to Digital Design".
DATA COMMUNICATION


Baseband data transmission, Baseband puleshaping, Inter Symbol Interface (ISI), Dubinary Baseband PAM, System Many signalling schemes, Equalisation, Synchronisation Scrambler and Unscramble.

Band-pass data transmission system ASK, PSK, F AK, DPSK & PSK, MSK, Modulation schemes coherent and Non Coherent detector, Probability of Error, (PE), Performance Analysis and Comparison.

Error detection and correction codes, Linear Block Encoding, Algebraic Codes, Cyclic Codes, Convolution codes, Best Error, Correcting Codes performance of Codes.

Synchronous and Asynchronous transmission, Modem, serial interface Circuit switching packet, switching, Hybrid switching, Architecture of computer network, OSI model, data communication protocols.

Suggested Text Books & References

- Roden, M.S. "Analog and Digital Communication System", P.H.I.
- Scheber, W.L. "Data Communication", MGH.
- Tanebaum, "Computer Networks".

DATA STRUCTURE & PROG. METHODOLOGY

Programming in C.

Elementary data structures
Arrays and strings; packing; space arrays; algorithm development; complexity; simple example of algorithm development; recursion.

Sequential Search
Divide and conquer binary search; selection and insertion sort; merge-sort; quicksort; complexity of sorting.

Linear lists - stacks; stack use-postfix notation recursion removal. queues-circular
queues.

Linked list-definition on Pascal and C; creation and deletion of nodes; circular and deletion of nodes; circular and doubly linked lists; applications of list.

Graphs and representation sets-UNION and FIND operations; graph algorithms; optimisation and greedy method; minimum spanning tree, shortest path.

Trees, A VL trees; threaded trees; heapsort; tries and B-trees; external search.

Tables and information retrieval; hashing; depth first and breadth first search; examples of backtracking.

String algorithms-pattern search and text editing.

Structured approach to programming step wise refinement approach.

Reasoning about programs, program specification, pre-and post condition, weakest pre-conditions, program assertions, loop invariants.

Programming style-documentation, basic concepts of program testing.

**Suggested Text Books & References**


**SYSTEM SOFTWARE**

Machine architecture, instruction set, addressing modes of the chosen machine, arithmetic & logic operations, floating point operations.
C Programming: Review of syntax of C with emphasis on features like pointers. Bit operations, Pre-processors, files.
Assemblers, Cross Assemblers: Two pass assembler design, data structures and algorithms.
Macro Processors: Definitions, nested macro-definitions, macro expansion,
conditional macro-expansions.
Linking, Loading, and Relocation, Static and Dynamic linking. Loading and Relocations.
Editors, debuggers, interactive programming environments.
DOS: Introduction to interrupts, structure of the interrupt vector table, interrupt types,
software interrupts, Hardware interrupts, interrupts, at a glance, interrupt calls from C,
internal structure of DOS, Booting DOS, COM & EXE Programs, BIOS, Memory resident programs. Running Batch files.
Programming Examples of text handling, file management, interface and device driver, programming in C.

Suggested Text Books & References
- Michael Tischer "PC System Programming", Abacus.
- Dhamdhare, "System Programming and operating system", Tata McGraw Hill.

MANAGEMENT SCIENCE

Principles of Management

Functions of Management

Organisation Theory
- Group Dynamics: Defining and classifying groups, Group Processes. Group task. Group Cohesiveness.
- Conflict Management: Discovery of conflicts, Processing of grievances, conflicts resolution, conflict and intergroup relations.

Suggested Text Books & References
- Koontz, H. and Weihrich, H., "Essential of Management".
- Mathur, S. S., "Principles of Management".
- Agarwal, R.D., "Organisation and Management".
- Robbin, S.P., "Organisational Behaviour".
- Hicks & Gullet, "Organisations: Theory and Behaviour".
- Allen, "Management and Organisation".

**FORMAL LANGUAGE AND AUTOMAT A THEORY**

**Finite Automata and Regular Expressions**
Deterministic and non-deterministic finite automata Regular expression, Two-way finite Automata, Finite automata with output, Properties of Regular sets, Pumping lemma, closure properties, My-hill-Nerode theorem.
Push Down Automata (PDA) : Definitions, Relationship between PDA and Context free Languages (CFL) properties of CFLs properties of CFLs, Decision Algorithms.
Turing Machines: The Turing machine model, Computable languages and functions.

Modification of Turing machines, Church's Hypothesis, Undesirability. Properties of recursive and recursively enumerable languages, Universal Turing machines, Post correspondence problem, introduction to recursive function theory.

Chomsky Hierarchy: Regular grammars, Unrestricted grammars, Context sensitive languages, Relation between classes of languages.

**Suggested Text Books & References**
- Hopcroft and Ullman, "Introduction to Automata theory Languages and Computation", Narosa,
- Kohan, "Theory of Computer Science".
- Korral, "Theory of Computer Science".

**COMPUTER NETWORKING**
Overview of OS I reference model, topology design, Media Access Control Level, Services, Problems and protocols, Practical local area network design and implementation. IEEE LAN Standards, Logical Link Control protocols, HDLC, ALOHA, Slotted ALOHA, FDDI, Client Server model and related software's.

Network Layer level services, problems and protocols. WAN, MAN, interconnection networks related software's TCP/IP, Novel NetWare, Routers, Bridges and Gateways their Practical implementation aspects. X.25, Internet and related software's NETSCAPE and MOSAIC.

Transport layer, services, problems and their protocol. Brief functioning of upper layers E-mail and other application.
Suggested Text Books & References
- Black, "Computer Networks".
- Schwartz, "Communication Networks".
- Stevens, "UNIX Network Programming".
- Dugglas, "TCP/IP and internetworking".

RELATIONAL DATA BASE SYSTEM

Introduction
Data Base System Concepts and architecture, Data models, scheme and instances, Data independence Data base language and Interface.

Data Modelling Using the Entity-Relationship Model
ER model concepts, Notations for ER diagram, Extended E.R. model, Relation-ships of higher degree.

Relational Data Model and Languages
Relational data Model concepts, constraints, relational algebra. Relational Caculus, Tuple and Domain calculus. SQL, data definations queries and up-dates in SQL, QBE, Data definations, queries and up-dates in QBE.

Example DBMS System (ORACLE/INGRESS/SYBASE)
Basic architecture. Data definitions Data Manipulation.

Database Design

Query Processing and Optimisation
Algorithms for executing query operations, Heuristics for query optimisations.

Transaction Processing Concepts
Transaction and system concepts, schedules and Recoverability seriazability of schedules.

Concurrency Control Techniques
Locking Techniques for concurrency control Time stamping and concurrency control.

Suggested Text Books & References
- Elmasri, Ramex Shamkant B. Navathe, "Fundamentals of Data base Systems".
- Date, C.J. "An Introduction to Database System", Vol. I, II & IIIrd, Addison-
OPERATING SYSTEM - I

Introduction

Operating System Structure
System components, operating system service, System structure.

Concurrent Processes

CPU Scheduling
Scheduling concepts, Performance criteria, Scheduling algorithms. Algorithm evaluation, Multiprocessor scheduling.

Dead locks
System model. Dead lock characterization. Prevention, avoidance and detection. Recovery from dead lock Combined approach.

Memory Management

I/O management & Disk Scheduling

File System

Suggested Text Books & References
- Tanenbaum, A.S., "Operating System Design & Imlementation", Prectice Hall NJ.
- Dietel, R.N. "An Introduction to Operating Systems", Addison Wesley.

**MICRO COMPUTER BASED SYSTEM DESIGN**

Architecture of 16 and 32 bit microprocessors such as Intel 8086/ 1861186/ 386/ 486 Motorola 68600/68010/68020 etc.

Comparative studies of the architectures, instruction types, addressing modes, interrupt structure.

Assembly language Programming on available 16/32 bit machine.

Hardware and software interrupt management.

Controllers such as key board, diskette and DMA.

Serial communication controller.

Dynamic RAM and its controller, Back up power for semiconductor memories.

Multiprocessor configurations, Numeric Processor I/O processor.

I/O standards RS 232C, centronics, SCSI, VIME, Ethernet LAN etc.

**Suggested Text Books & References**

- Lin and Gibson, "Microprocessor System", The 8086/8088 family, Prentice-Hall India.
- Rajalu Govind, IBM PC 4 Clones, "Hardware, Trouble shooting and Maintenance", Tata McGraw Hill.
- Norton, "Assembly Language Programming on on PC", BPB Publication.
- Miller, "Assembly Language Programming on PC", BPB Publication.

**INTERNET FUNDAMENTAL & APPLICATION**

Overview of OSI reference model, topology design, Media access control level, Services, Problems and Protocols, Practical local area network design and implementation, IEEE LAN Standards, Logical link control protocols, HDLC, ALOHA, Slotted ALOHA, FDDI, Clint Server model and related software's.

Network layer level services, problems and protocols, WAN, MAN, Interconnection networks and related software's TCP/IP protocol suite, Novel NETWARE, Routers, Bridges and Gateways their practical implementation aspects. X.25, Internet and related software's NETSCAPE and MOSAIC.
Transport layer, services, problems and their protocol.

Brief functioning of upper layers E-mail and other applications.

**Suggested Text Books & References**
- Black, "Computer Networks".

**INTERACTIVE COMPUTER GRAPHICS**

**Line Generation**
Points, lines, Planes, Vectors, Pixels and frame buffers, Vector and character generation.

**Graphics Primitives**

**Polygons**
Polygons representation, Entering polygons, Filling Polygons.

**Transformations**
Matrics Transformations, transformation routines. Display procedures.

**Segments**
Segments table. Creating, Deleting and Renaming a segment Visibility, Image transformation.

**Windowing and Clipping**

**Interaction**
Hardware Input device handling algorithms. Eventhandling Echoing. Interactive techniques.

**Three Dimensions**
3-D Geometry Primitives, Transformations, Projection, Clipping.

**Hidden line and surfaces**

**Rendering and Illumination**
Introduction to curve generation. Bezier. Hermite and B-spline algorithms and their comparisons.
**Suggested Text Books & References**
- Henary Baper, "Computer Graphics".

**LANGUAGE PROCESSORS**

**Compiler Structure**
Analysis - Synthesis model of complication, various phases of a compiler, Tool based approach to compiler construction.

**Lexical Analysis**
Interface with input, parser and symbol table, Token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition. Transistion diagrams, LEX.

**Syntax Analysis**
CFGs, Ambiguity, associativity, precedence, Top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operaor precedence grammars, LR parses (SLR,LALR,LR), Y ACe.

**Syntax Directed Definitions**
Inherited and synthesised attributes, dependency graph, Evaluation order, bottom up and top down evaluation of attributes, I-and S-attributed definitions.

**Type Checking**
Type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.

**Run Time System**
Storage organisation, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

**Intermediate Code Generation**
Intermediate representations, translation of declarations, assignments, control flow, boolean expressions and procedure calls. Implementation issues.

**Code Generation and Instruction Selection**
Issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimisation.
Suggested Text Boo~& References


COMPUTER ARCHITECTURE

Prerequisites: Computer Organisation

Review of Piping, 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.

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

Advanced pipeline techniques, interaction level parallelism, basic instruction scheduling to avoid conflicts, dynamic scheduling, effect of loop unrolling, branch prediction and their effectiveness in instruction level parallelism, issues of cache design.

Memory hierarchy. Cache Introduction, Techniques to reduce cache misses, techniques to reduce cache penalties, techniques 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, SP ARC, Power PC etc.

MIMD Multiprocessors, Centralised shared architectures, distributed shared memory architectures, synchronisation and memory consistency models, message passing architectures, comelier issues. Dataflow architectures. Interconnection networks.

World - wide parallel processing projects; Architecture of multiprocessor and multi-computer machines like hypercube, MMS, mesh, CM*, CMP Illiac IV, Monsoon machine;

Dataflow architecture; CM machine; Teraflop computers.
Suggested Text Books & References


OPERATING SYSTEM II

(System Administration)

Understand configuration of Hardware, Configuration of Kernel, Setting up of serial Hardware, Configuration of TCP/IP Networking, Name service & Resolve Configuration, Understanding of various Network Application, Management of NIS, Understanding NFS and AFS, Configuration of Mail, Configuration of NNTP/TIN, File System & Quota Management

Reference
LINUX Administration
HPUX Administration Manual
DELALPHA Administration Manual
Tanbaum : Modem Operating System.

ANALYSIS & DESIGN OF ALGORITHMS

Divide and Conquer:

Binary search, Merge sort, Quick sort. Selection-sort.

Greedy Method:
Knapsack Problem, Job sequencing, Optimal merge patterns, Minimum Spanning trees.

Dynamic Programming:
All pairs shortest paths, optimal binary search trees. 0/1 Knapsack Problem, Travelling Sales person problem, Flow shop scheduling.

Search Techniques:
Code optimisation, Depth-first search, Breadth-first-searching.

Backtracking:
The 8-queen problem, Graph Colouring, Hamiltonian cycles.
Branch and Bound:
0/1 Knapsack Problem, travelling Sales person, problem, efficiency.

NP Hard and NP-Complete Problems:
Basic concepts, Cook's theorem, Simple NP-Hard problems.

Suggested Text Books & References
- Sedgewick, "Algorithms in C".

SOFTWARE ENGINEERING

Introduction
What is Software Engineering.

Software Development Life-cycle
Requirements analysis, software design, coding, testing, maintenance, etc.

Software Requirements Specification
Waterfall model, prototyping, interactive enhancement, spiral model. Role of Management in software development. Role of metrics and measurement.

Software Requirements Specification'
Problem analysis, requirement specification, validation, metrics, monitoring and control.

System Design
Problem partitioning, abstraction, top-down and bottom-up design, Structured approach. Functional versus object-oriented approach, design specification and verification metrics, monitoring and control.

Coding
Top-down and bottom-up, structured programming, information hiding, programming style, internal documentation. Verification. Metrics, monitoring and control.

Testing
Levels of testing functional testing, structural testing, test plane, test cases, etc. Certification, reliability assessment.

Software Project Management
Cost estimation, Project scheduling, Staffing, Software configuration management, Quality assurance, Project Monitoring, Risk management, etc.

Suggested Text Books & References
OBJECT ORIENTED PROGRAMMING & METHODOLOGY

Object Modelling: Objects, class, Links and associations, Generalisation and inheritance, aggregation, abstract class, multiple inheritance, meta data.

Dynamic Modelling: Events and stages operations, Nest and state diagram currency.

Functional Modelling: Data flow diagrams, specifying functions and constraints.

OMT (Object Modelling Technique) Methodology, examples and case studies to demonstrate methodology.

Object Oriented Language C++ (or any other available language such as SIMULA SMALL TALK etc.

Translating object oriented Design into an implementation, examples.

Comparison of Methodologies SAISD, JSD, etc.

Suggested Text Books & References


DATA BASE APPLICATION DESIGN

Design Theory for Relational Database

Functional Dependencies, Decomposition of Relation Schemes, Normal for Relations Schemes, Normal Forms for Relations Scheme, Multi valued and other kinds of Dependencies.

Query Optimization

Basic Optimization strategies, Algebraic Manipulation, Optimization of Selections in System, Exact optimization under weak equivalence.
Database Protection

Concurrent Operations on the Database
Basic concepts, A simple transaction model, A model with Read -and Write-only model, Concurrency for Hierarchiall structured items, protecting against crashes, optimistic concurrency control.

Distributed Database Systems
Fragments of relations, Optimization transmission cost by semi joins, Distributed concurrency control, The Optimistic approach, Management of Deadlocks and crashes.

Suggested Text Books & References
- Rishe, "Database Design Fundamentals", Prentice Hall Inc.

WEB TECHNOLOGY

History of the web, growth of the web in past decade, protocols governing the web, web applications, security aspects on the web, computational features, encompassing the web. Development of web in India, creating web sites for individuals and corporate world.

VISUAL PROGRAMMING
Creating window, menus, file handling in window, dialogue boxes, scroll bars, list boxes, mouse techniques, reading key strokes in windows, windows messages, debugging in visual C++, multi document interface (MDI), object linking and embedding (OLE), writing X applications, constructing geographical user interface with X.

Suggested Text Books & References
- Barkakati, N." X window system programming", Prentice-Hall.
- Holzener, Steven "Visual C++ programming", Prentice-Hall.
- Murray and Pappas, "The visual C++ handbook".

Foundations of Information Technology Information concept & Processing
Definition of Information, Need for Information, Quality of Information, Value of Information, Categories and Levels of Information in Business Organization. Data concepts and Data Processing, data Representation-Number System.
Computer Appreciation

Definition of an Electronic Digital Computer, History, Generations, Characteristics and applications of computers, Classification of computers.

Elements of Computers Processing System

Hardware CPU, Peripherals, Storage Media, Software Definition, Role and Categories, Firmware and Human ware.

Computer & Communication

Need for Data Transmission Over Distances, Types of Data Transmission, Media for Data Transmission, Networking of Computers-Introduction of LAN ~ WAN, Client-Server Architecture.

Programming Language Classification

Computer Languages, Generation of Languages, Translators-Interpreters, Compilers, Assembles, Introduction to 4GLS.

Information Technology Applications in India

Scientific, Business, Educational and Entertainment Applications, Industry Automation, Weather Forecasting, Awareness of Ongoing IT Projects in India NICNET ERNET etc.

Suggested Text Books & References

- Rajaraman, V. "Introduction to Computer".
- Morris, "Computer Organization".
- Hamacher, "Computer Organization".
- Kanter, "Managing Information System".

LIST OF OPEN ELECTIVES & PROFESSIONAL ELECTIVES

Open Elective I

2. E-Commerce, Strategic IT Management.
3. Technology Management.
4. Decision Support and Executive Information system.
5. Software Technology.
6. Knowledge Management.
7. IT in Marketing Management.
8. IT in HR Management.
9. IT in Finance Management.
10. Project Management and Software

Professional Elective I

1. Network Management.
2. Enterprise Network Management.
3. Distributed Computing.
5. Relational Data Base System.
6. JAVA Programming.
7. RISC architecture.
8. Object Oriented Data Base Systems.
10. Data ware housing & meaning.
11. Image Processing.
Tools.

11. Human Values.
13. High Speed Network, Client Server
16. Fuzzy and Neural Network.

Note: The Institutions Can Frame Syllabi of Professional Electives and Open electives to be offered by them in the particular area.

Open Electives

HUMAN VALUES

The objective of the course is an exploration of human values which go into making a 'good' human being, a 'good' human society and a 'good life. The context is the work life and the personal life of modern Indian professionals. The proposed Course Structure is as follows:

1. The value-crisis in the contemporary Indian Society.
2. The nature of values: the value spectrum for a 'good' life
3. The Indian system of values.
4. Material development and its values: the challenge of science and technology
5. Psychological values: integrated personality; mental health
6. Societal values: the modern search for a 'good' society; justice, democracy, rule of law; values in the Indian constitution
7. Aesthetic values: perception and enjoyment of beauty
8. Moral and ethical values; nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.
9. Work ethics; professional ethics.
10. Spiritual values; different concepts; secular spirituality.
11. Relative and absolute values.
12. Human values: humanism and human values; human rights; human values as freedom, creativity, love and wisdom.
13. Management by values: professional excellence; inter-personal relationships at work place; leadership and team building; conflict resolution and stress management; management of power.

SCIENCE TECHNOLOGY AND SOCIETY

It will be innovative course dealing with social, human and ethical implications of engineering and technology, with special reference to the Indian situation. Its three main components are:
(i) Social and Cultural history of technology, (ii) Social and Human critiques of technology, (iii) Engineering Ethics and Professional Ethics.
The proposed course structure is as follows:

**TOPIC**

1. Science, Technology and Engineering, as knowledge and as social and professional activities.
2. Inter-relationship of technology growth and social, economic and cultural growth; historical perspective.
5. Rapid technological growth and depletion of resources. Reports of the club of Rome. Limits to growth; sustainable development.
6. Energy crisis; renewable energy resources.
8. Technology and the arms race. The nuclear threat.
9. Appropriate technology movement Schumacher; later developments.