### NATIONAL INSTITUTE OF TECHNOLOGY, ARUNACHAL PRADESH
(Established by Ministry of Human Resource Development, Govt. of India)

### Course Structure & Syllabus
**For Computer Science and Engineering**

<table>
<thead>
<tr>
<th>Education</th>
<th>Research</th>
<th>Service to Society</th>
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</table>
| In God's own land, a fusion of scholastic students, innovative & motivated researchers & teachers and fast moving visionary leaders. | PO- Yupia, Dist. – Papum Pare, Arunachal Pradesh, Pin – 791112  
Ph No : 0360-2284801/2001582  
Fax No : 0360-2284972  
Email – nitarunachal@gmail.com | Stepping Stone and Sky reaching ladder to success |

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# Faculty

**E. d. u. c. a. t. i. o. n.**

- **Aru**n **A. c. h. A. l. P. r. a. d. e. s** (Estd. by E. d. b. y M. i. n. i. s. t. r. y o. f. h. u. M. a. n. r. E. s. o. u. r. c. E. D. e. v. e. l. o. p. m. e. n. t, G. o. v. t. of I. n. D.)

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**Course Structure & Syllabus**

- **COMPUTER SCIENCE AND ENGINEERING**
To achieve the target of being a global leader in the field of Technical Education, there is some sort of time bound urgency to work quickly, massively and strongly, in respect of National Institute of Technology, Arunachal Pradesh being an “Institute of National Importance” (by an Act of Parliament) and being established only in five years back in 2010. I have therefore adopted a “B” plan as stated below to achieve the primary goal of producing world class visionary engineers and exceptionally brilliant Researchers and Innovators:

<table>
<thead>
<tr>
<th>B- Plan</th>
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<tbody>
<tr>
<td>➢ Best Teaching</td>
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<tr>
<td>➢ Best Research</td>
</tr>
<tr>
<td>➢ Best Entrepreneurship &amp; Innovation practices</td>
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<td>➢ Best Services to Society</td>
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In implementing the ‘B’ plan in letter and spirit, the framing of syllabi has been taken as an important legitimate parameter. Therefore, extraordinary efforts and dedications were directed for the last few years to frame a syllabi in a framework which is perhaps not available in the country as of today, with an Indian perspective in a Global context.

Besides attention on ‘B’ plan institute has given considerable importance to the major faults of current Technical Education while framing the syllabus. The major stumbling blocks in Technical Education today are:

I. The present system is producing “Academic Engineers” rather than “Practical Engineers”.
II. The present system of education makes the students to run after jobs rather than making them competent to create jobs.
III. There is lack of initiative to implement the reality of “Imagination is more important than knowledge”.

Taking due consideration of the findings made above, to my mind credible syllabi has been framed in the institute in which the major innovations are introduction of:

I. I-Course (Industrial Course) one in each semester at least one, which is targeted to be taught by the Industrial Expert at least up to 50% of its component.
II. Man making and service to society oriented compulsory credit courses of NCC/NSS, values & ethics.
III. Compulsory audit course on Entrepreneurship for all branches.

IV. Many add-on courses that are (non-credit courses) to be offered in vacation to enhance the employability of the students.

V. Many audit courses like French, German, and Chinese to enhance the communication skill in global scale for the students.

VI. Research and imagination building courses such as Research Paper Communication.

VII. Design Course as “Creative Design”.

Further, the syllabi are framed not to fit in a given structure as we believe structure is for syllabus and syllabus is not for structure. Therefore, as per requirement of the courses, the structure, the credit and the contact hours have been made available in case to case.

The syllabus is also innovative as it includes:

I. In addition to the list of text and reference books, a list of journals and magazines for giving students a flexibility of open learning.

II. System of examination in each course is conventional examination, open book examination and online examination.

Each course has been framed with definite objectives and learning outcomes. The Syllabus has also identified the courses to be taught either of two models of teaching:

I. J.C.Bose model of teaching where practice is the first theory.

II. S.N.Bose model of teaching where theory is the first practice.

Besides the National Institute of Technology, Arunachal Pradesh has initiated a scheme of simple and best teaching in which for example:

I. Instead of teaching RL, RC and RLC circuit separately, only RLC circuit will be taught and with given conditions on RLC circuits, RL and RC circuits will be derived and left to the students as interest building exercise.

II. Instead of teaching separately High Pass Filter, Band Pass Filter and Low Pass Filter etc.; one circuit will be taught to derive out other circuits, on conditions by the students.

I am firmly confident that the framed syllabus will result in incredible achievements, accelerated growth and pretty emphatic win over any other systems and therefore my students will not run after jobs rather jobs will run after them.

For the framing of this excellent piece of syllabus, I like to congratulate all members of faculty, Deans and HODs in no other terms but “Sabash!”.

Prof. Dr. C.T. Bhunia
Director, NIT, (A.P.)

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### First Semester:

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Teaching Methodology:

All subject papers in each of the semester require to be divided into two groups; one group will be taught in a model named “JC Bose model” where practice is first theory. The other model will be “SN Bose model” which is the conventional mode of teaching with theory as the first practice.

<table>
<thead>
<tr>
<th>Semester</th>
<th>J C Bose Model</th>
<th>S N Bose Model</th>
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<tr>
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<td>Workshop Practice-I</td>
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<td>Engineering Mathematics- II.</td>
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<td>Workshop Practice-II</td>
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<td>Digital Electronics &amp; Logic Design</td>
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<td>Historiography of Science &amp; Technology</td>
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<tr>
<td>3rd</td>
<td>Computer Organization &amp; Architecture</td>
<td>Discrete Mathematics</td>
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<td>Data Structure &amp; Algorithm Optimization Methods</td>
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<td>Entrepreneurship &amp; Innovation</td>
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<td>Engineering Ethics &amp; IPR.</td>
<td>Creative Design</td>
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<td></td>
<td>Disaster Management.</td>
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<td>Software Engineering</td>
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<td>7th</td>
<td>Internet &amp; Web Technology</td>
<td>Mass Communication for Technology.</td>
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<td>Research Paper Communication.</td>
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<td>Elective – I</td>
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<td>Elective – II</td>
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<td>Cryptography &amp; Network Security</td>
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<td>AI &amp; Neural Network</td>
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### Summery Table of Different Courses:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Credit Course</th>
<th>I- Course</th>
<th>Audit Course</th>
<th>Add-on course</th>
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Computational Numerical Methods.

<table>
<thead>
<tr>
<th>Semester</th>
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<tr>
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<td>Disaster Management. Creative Design.</td>
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<td>8th</td>
<td>Industrial Training</td>
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<td></td>
<td>Project Works</td>
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<td></td>
<td>Seminar</td>
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<td></td>
<td>Grand Viva</td>
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**Examination System:**

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<td>Semester</td>
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</table>
| 4th      | Optimization Methods  
          | Behavioural Science  
          | Stochastic Process  
          | Control System Engineering  
          | Advanced Computer Architecture.  
          | Entrepreneurship & Innovation Design & Analysis of Algorithm.  
          | Formal Languages & Automata Theory.  
          | System Software and Administration  |
| 5th      | Microprocessors, Microcontrollers & Embedded System.  
          | Operating System  
          | Industrial Management.  
          | Graph Theory & Combinatorics.  
          | Computational Numerical Methods.  
          | Database Management system.  
          | Principle of Communication Engineering.  |
| 6th      | Engineering Ethics & IPR.  
          | Disaster Management.  
          | Creative Design.  
          | Compiler Design  
          | Computer Networking.  
          | Computer Networking.  |
| 7th      | Internet & Web Technology.  
          | Mass Communication for Technology.  
          | Research Paper Communication.  
          | Elective – I  
          | Elective – II  
          | AI & Neural Network  
          | Cryptography & Network Security  
          | Internet & Web Technology.  |
| 8th      | Industrial Training  
          | Project Works  
          | Seminar  
          | Grand Viva  |
First Semester (Common to all)

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<tr>
<th>Subject Code</th>
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<td>CHY – 101</td>
<td>Engineering Chemistry</td>
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<td>0</td>
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<td>PHY – 101</td>
<td>Engineering Physics - I</td>
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<td>BIO – 101</td>
<td>Life Science</td>
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<td>ME-101</td>
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<td>EE – 101</td>
<td>Basic Electrical &amp; Electronics Engineering</td>
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<td>HSS – 101</td>
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<tr>
<td>HSS – 103</td>
<td>Foreign Language (French / Korean) (Audit)</td>
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Name of the Module: Engineering Mathematics-I  
Module Code: MAS 101  
Semester: 1st  
Credit Value: 4 [P=0, T=1, L=3]  
Module Leader:

A. Objectives:
The course is designed to meet with the objectives of:
1. providing high quality education in pure and applied mathematics in order to prepare students for graduate studies or professional careers in mathematical sciences and related fields,
2. imparting theoretical knowledge and to develop computing skill to the students in the area of Science and Technology,
3. providing teaching and learning to make the students competent to their calculating ability, logical ability and decision making ability,
4. giving students theoretical knowledge of Calculus, Algebra and their practical applications in the various fields of Science and Engineering,
5. apply their knowledge in modern industry or teaching, or secure acceptance in high-quality graduate programs in Mathematics and other fields such as the field of quantitative/Mathematical finance, Mathematical computing, statistics and actuarial science.

B. Learning Outcomes:
Students successfully completing this module will be able to:
1. students will become more confident about their computing skill, logical skill and decision making skill,
2. students will find various applications of calculus and algebra in the practical fields science and engineering,
3. students will become more competent to analyze mathematical and statistical problems, precisely
define the key terms, and draw clear and reasonable conclusions,
4. student will be able to use mathematical and statistical techniques to solve well defined problems and present their mathematical work, both in oral and written format, to various audiences (students, mathematicians, and non-mathematicians),
5. student will be able to understand, and construct correct mathematical and statistical proofs and use the library and electronic data-bases to locate information on mathematical problems,
6. student will be able to explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of the results,
7. student will be able to propose new mathematical and statistical questions and suggest possible software packages and/or computer programming to find solutions to these questions.

C. Subject Matter:

Unit I:
Matrices: Introduction to Matrices and their basic properties, Transpose of a matrix, verification of the properties of transpose, Symmetric and Skew symmetric matrices and their properties. Determinant of a square matrix, Minors and Cofactors, Laplace’s method of expansion of a determinant, Product of determinants, Adjoint of a determinant, Jacoby’s theorem on adjoint determinant. Singular and non-Singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, Orthogonal matrix and its properties, Trace of a matrix, Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and non homogeneous linear simultaneous equations, Eigen values and Eigen vectors of a square matrix (of order 2 or 3), Eigen values, Calye-Hamilton theorem and its applications, Diagonalisation of a square matrix with real and distinct eigen values (up to 3rd order).

Unit II:
Successive Differentiation: Higher order derivatives of a function of single variable, Leibnitz’s theorem (statement only) and its application, problems of the type of recurrence relations in derivatives of different orders.

Mean Value Theorems & Expansion of Functions: Rolle’s theorem (statement only) and its application, Mean Value theorems – Lagrange & Cauchy (statement only) and their application, Taylor’s theorem with Lagrange’s and Cauchy’s form of remainders (statement only) and its application, Expansions of functions by Taylor’s and Maclaurin’s theorem, Maclaurin’s infinite series expansion of the functions.

Unit III:
Integrals: Double and triple integrals and evaluation of area and volume. Change of order of integration.
Reduction formula: Reduction formulae both for indefinite and definite integrals.

Unit IV
Complex variables: complex numbers, De-Moivre’s Theorem and its applications, Inverse circular and Hyperbolic functions, functions, continuity, Differentiability, analyticity - Cauchy Riemann equations and properties of analytic functions, Cauchy's integral and Cauchy's integral formula, derivatives of analytic functions.
D. Teaching/ Learning/ Practice Pattern:
   Teaching: 70%
   Learning: 30%
   Practice: 0%

E. Examination Pattern:
   Theoretical Examination: Written

F. Books:

G. Magazines:
   1. Current Science (Indian Academy of Science).
   2. The Mathematics Student (Math Student) (Indian Mathematical Society).
   3. Mathematical Spectrum (The University of Sheffield).
   5. +Plus magazine (University of Cambridge).

H. Journals:
   3. The Journal of Indian academy of Sciences.

Name of the Module: Engineering Chemistry
Module Code: CHY 101
Semester: 1st
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:
A. Objectives:
The course is designed to meet the following objectives:
1. imparting theoretical and practical knowledge to the students in the area of Chemistry.
2. providing teaching and learning to make students acquainting with advanced science and technology in Chemistry.
3. injecting the future scope and the research direction in the discipline of Chemistry.
4. making students competent to the research and development in advanced science and technology in Chemistry.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. adequately trained to become Chemists, Scientist and Chemical Engineers.
2. skilled both theoretically and practically to do operation, control and maintenance works in Chemistry and Chemical Engineering.
3. substantially prepared to take up prospective research assignments.

C. Subject matter:
Unit I:
Chemical Thermodynamics: Concept of Thermodynamic System: diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property, Introduction to first law of thermodynamics: different statements, mathematical form; internal energy: physical significance, mathematical expression (ideal and real gas), Enthalpy: physical significance, mathematical expression. Cp and CV definition and relation; adiabatic changes; reversible and irreversible processes; application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lovoisier and Laplace, Hess’s law of constant heat summation, Kirchoff’s law. Second law thermodynamics; Joule Thomson and throttling processes; inversion temperature; evaluation of entropy: characteristics and expression, entropy change in irreversible process, entropy change for irreversible isothermal expression of an ideal gas, entropy change of a mixture of gases.
Work function and free energy: physical significance, mathematical expression for ideal and real gases obeying Vander Waals' equation, Gibbs Helmoltz equation. Condition of spontaneity and equilibrium

Unit II:
Electrochemistry Conductance: Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration. Kohlrausch’s law of independent migration of ions, transport numbers and hydration of ions. Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs AgNO3.


Unit III:
Structure and reactivity of Organic molecule: Electronegativity, electron affinity, hybridization, Inductive effect, resonance, hyperconjugation, electromeric effect, carboxylation, carbanion and free
radicals. Brief study of substitution, eliminations and addition reactions. **Instrumental Methods of Analysis**: Introduction to instrumental methods such as IR, UV, VIS, NMR and Mass spectrometry.

**Unit IV:**

**Polymerization**: Concepts, classifications and industrial applications. Polymerization processes (addition and condensation polymerization), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity and amorphicity of polymer. Preparation, structure and use of some common polymers: plastic (PE, PP, PVC, bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6.6, polyester). Conducting and semi-conducting polymers.


**D. List of practical’s**: (Minimum eight experiments should be conducted by students)
1. Acid –base titration : (Estimation of commercial caustic soda)
2. Red-ox titration: (Estimation of iron using permanganometry)
3. Complexometric titration: (Estimation of hardness of water using EDTA titration)
4. Chemical Kinetics : (Determination of relative rates of reaction of iodide with hydrogen peroxide at room temperature (clock reaction).)
5. Heterogeneous equilibrium (Determination of partition coefficient of acetic acid between n-butanol and water)
6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
7. Conductometric titration for 
   (a) Determination of the strength of a given HCl solution by titration against a standard NaOH solution.
   (b) Analysis of a mixture of strong and weak acid by strong base.
8. Preparation of a homo-polymer by free radical initiated chain polymerization and determination of its molecular weight by viscosity average molecular weight method.
9. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH.

**E. Teaching/ Learning/ Practice pattern:**
Teaching: 40%
Learning: 10%
Practice: 50%

**F. Examination pattern:**
1. Theoretical Examination: Written.
2. Practical Examination: Conduct Practical Examination and viva-voce.

**G. Reading lists:**
Books:
3. Levine ” Physical Chemistry” McGraw-Hill Education.

Magazines:
1. Chemical science
2. chemistry Today
3. chemistry For You

Journals:
2. Journal of Physical Chemistry, ACS

Name of the Module: Engineering Physics - I
Module Code: PHY 101
Semester: 1st
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the following objectives:
1. imparting theoretical & practical knowledge to the students in the area of Engineering Physics.
2. providing teaching and learning to make students acquainting with modern state-of-art of Engineering.
3. injecting the future scope and the research direction in the field of Physics with specific specialization.
4. making students competent to design & development of Engineering Physics.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. adequately trained to become Engineers.
2. substantially prepared to take up prospective research assignments.

C. Subject matter:
Unit I:
Scalar and vector: Scalar and vector, dot and cross product, Scalar and vector fields, concept of Gradient, Divergence and Curl.
General Properties of Matter: Elasticity, Viscosity, Surface tension.
Unit II:
Acoustics: Simple Harmonic Motion, Damped Vibration, Forced Vibration
Thermal Physics: Kinetic Theory of Gas, conductivity & Radiation

Unit III:
Physical Optics: Introduction to Interference, Diffraction, Polarization
Elementary Solid State Physics: Elementary ideas of crystal structure: lattice, basis, UNIT cell, fundamental types of lattices: Bravis lattice, simple cubic, f.c.c and b.c.c lattices, Miller indices and miller planes, Co-ordination number and atomic packing factor, X-rays: Origin of characteristics and continuous X-ray, Bragg’s law (no derivation), determination of lattice constant

Unit IV:
Fundamental of Quantum Physics: Wave particle duality, Compton effect, Photo electric effect, Heisenberg’s uncertainty relation, concept of wave packet.

D. List of practical’s: (Minimum five experiments should be conducted by students)
1. Determination of thermal conductivity of a good conductor by Searle’s method
2. Determination of thermal conductivity of a bad conductor by Lees and Charlton’s method
3. Determination the dispersive power of the material of a given prism
4. Use of carry Foster’s bridge to determine unknown resistance
5. Determination of Young Modulus by flexure method and calculation of bending moment and shear force at a point on the beam
6. Determination of coefficient of Viscosity by Poiseulle’s capillary flow method
8. Determination of Surface tension of a liquid.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Written.
2. Practical Examination: Conduct Practical Examination and viva-voce.

G. Reading lists:
Books:
9. Richard P. Feynman, Robert B. Leighton and Matthew Sands, “The FEYNMAN Lectures on
Name of the Module: Life Science  
Module Code: BIO 101  
Semester: 1st  
Credit Value: 3 [P=0, T=0, L=3]  
Module Leader:

A. Objectives:
The course is designed to meet the following objectives:
1. imparting knowledge on the origin of Earth and life forms on Earth, appreciating importance of biological diversity and understanding biomolecules being the main component of life.
2. understanding “Cell” – the basic UNIT in different life forms, and structure and function of different tissue systems in plants and animals.
3. imparting knowledge on water relations, nutrient uptake and assimilation, and metabolism in plants.
4. providing knowledge on Bioenergetics of plant and animal cells, different organelles involved in electron transport systems, nervous, digestive and immune systems in animals.

B. Learning Outcomes:
Upon completion of the subjects:
1. students will understand the characteristics of living organisms; appreciate the importance of diversity of life and their interaction with the environment.
2. students will be able to explain the interrelationship between biomolecules and the living system,
and influences of biomolecules upon the structure and function of intracellular components.

3. students will have a broad knowledge on Bioenergetics of plant and animal cells; and a brief on important biological systems of animal.

C. Subject matter:

Unit I:

**Origin of Life:** History of earth, theories of origin of life and nature of the earliest organisms.

**Varieties of life:** Classification, Five kingdoms, viruses (TMV, HIV, Bacteriophage), Prokaryote (Bacteria-cellstructure, nutrition, reproduction), Protista, Fungi, Plantae and Animalia.

**Chemicals of life:** (Biomolecules) - Carbohydrates lipids, amino acids, proteins, nucleic acids and identification of biomolecules in tissues.

Unit II:

**Cell:** Cell concept, structure of prokaryotic and eukaryotic cells, plant cells and animal cells, cell membranes, cellorganelles and their function, Structure and use of compound microscope.

**Histology:** Maritimes (apical, intercalary, lateral) and their function; simple tissue (parenchyma, collenchymas,sclerenchyma); Complex tissue (xylem and phloem); Tissue systems (epidermal, ground, vascular); primary body and growth (root, stem, leaf); Secondary growth (root, stem). Animal tissues (Epithelial, connective, muscle and nervous tissues) and their functions in the body.

Unit III:

**Transport:** Plant water relationships, properties of water, diffusion, osmosis, imbibition, uptake of water by roots andtheories of transport of water through xylem (ascent of water in xylem, cohesion-tension theory), apoplast and symplast theory; Transpiration-structure of leaf, opening and closing mechanisms of stomata, factors affecting transpiration and significance of transpiration.

**Nutrition:** Mineral Nutrition in plants, Heterotrophic nutrition in plants; Photosynthesis (Autotrophic-forms ofnutrition), Chloroplast structure, two pigment systems, photosynthetic UNIT, light absorption by chlorophyll and transfer of energy, phosphorylation and electron transport system, Calvin-Benson Cycle (C₃), Hatch Slack Pathway (C₄), Crassulacan Acid Metabolism (CAM), factors affecting photosynthesis.

Unit IV:

**Energy Utilization:** (Respiration) - Structure of mitochondria, cellular respiration, relationship of carbohydrate metabolism to other compounds, Glycolysis, fermentation, formation of acetyl co-A, Kreb cycle, Electron Transport System and Oxidative Phosphorylation, ATP, factors affecting respiration;

Elementary canal in humans, nervous and hormonal control of digestive systems, fate of absorbed food materials; Nutrition in humans, Reference values; General characteristics of blood vascular system, development of blood systems in animals, Composition of blood, circulation in blood vessels, formation of tissue fluids, the heart, functions of mammalian blood, the immune system.

D. Teaching/ Learning/ Practice pattern:

Teaching: 70%
Learning: 30%
Practice: 0%

E. Examination pattern:

Theoretical Examination: Written

F. Reading Lists:
Books:

Magazines:
1. National Geographic Channel, http://science.nationalgeographic.co.in/science/earth

Journals:
3. Plant and Cell Physiology, Oxford journals, USA.

Name of the Module: Engineering Mechanics
Module Code: ME 101
Semester: 1st
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet with the following objectives:
1. Ability to utilise scalar and vector analytical techniques for analysing forces in statically determinate structures.
2. Ability to apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
3. Student gets a basic idea of Centre of gravity, moment of inertia, mass moment of inertia, friction.

B. Learning Outcome:
Upon completion of the subject, students should have the knowledge of:
1. Different type of forces and how to resolve forces.
2. Centre of gravity of different size, shape, and solid.
3. Centre of gravity, moment of inertia, mass moment of inertia, friction.

C. Subject Matter:
Unit I:
Forces and Moments: Force, Moment and Couple, Resultant of forces, Forces in space Equilibrium, FBD, General equations of equilibrium, Analysis of forces in perfect frames, Brief
introduction to vector approach.

Unit II:
Friction: Introduction to dry friction, laws of friction, friction of simple machines, inclined planes, Screw jacks.

Unit III:
Centre of gravity and moment of inertia: Centre of gravity of axes, volume and composite bodies, Area moment of inertia and mass moment of inertia for plane figures and bodies.

Unit IV:
Dynamics: Kinematics and Kinetics, Rectilinear motion of particles, determination of position velocity and acceleration under uniform rectilinear motion (uniform and non-uniform accelerated rectilinear motion), Relative motion, construction of x-t, v-t and a-t graphs (simple problems), Projectile motion, Normal and Tangential components, Radial and Transverse components, simple problems, Equation of motion, D. Alembert’s principle.

D. List of Practical’s: No Practical’s

E. Teaching/ Learning/ Practice pattern:
Teaching: 60%
Learning: 40%
Practice: 0%

F. Examination pattern:
1. Theoretical Examination.

G. Reading lists:
Books:
3. Timoshenko,” Engineering Mechanics”, MGH.

Magazines:
2. Engineering Magazine.

Journals:
2. Journal of Applied Mechanics, ASME.

Name of the Module: Engineering Drawing
Module Code: CE 101
Semester: 1st
Credit Value: 2 \( [P=3, \; T=0, \; L=0] \)

Module Leader:

A. Objectives:

The course is designed to meet the following objectives:

1. increase the ability to understand Engineering Drawing.
2. learn to sketch and take field dimensions.
3. learn to take data and transform it into graphic drawings.
4. learn basic Auto Cad skills.
5. learn basic engineering drawing formats.
6. prepare the student for future Engineering positions.

B. Learning Outcome:

Upon completion of the subject student’s ability to:

1. hand letter will improve.
2. perform basic sketching techniques will improve.
3. draw orthographic projections and sections will improve.
4. use architectural and engineering scales will increase.
5. produce engineered drawings will improve.
6. convert sketches to engineered drawings will increase.
7. cope up and become familiar with office practice and standards will increase.
8. handle and become familiar with Auto Cad two dimensional drawings will improve.
9. develop good communication skills and team work will improve.

C. Subject Matter:

Unit I:
- **Indian Standards:** Line symbols and line groups, sheet layout of rules of printing, preferred scales.

Unit II:
- **Orthographic Projection:** Theory of Orthographic Projection.

Unit III:
- **First and third angle system of projection:** Technical sketching, Multi-planar representation.

Unit IV:
- **Glass box concept:** Sketching of orthographic views and line.

D. List of Practical's:

1. Technical writing of various type of letters.
2. Technical sketching of Scales- Plain, Diagonal, Vanier, Comparative and chord.
3. Technical sketching of Projection of points.
4. Technical sketching of Projection of lines.
5. Technical sketching of Projection of plains.

D. Teaching/ Learning/ Practice Pattern:

- Teaching: 70%
- Learning: 30%
- Practice: 0%

E. Examination pattern:

1. Practical Drawing.
2. Assignment.

F. Reading lists:

Books:

Magazines:
1. Machine Design
2. Design to Part Magazine.

Journals:
1. International Journal of Design Engineering

Name of the Module: Workshop Practice-I
Module Code: ME 102
Semester: 1st
Credit Value: 2 [P=3, T=0, L=0]
Module Leader:

A. Objectives:
The course is designed to meet the following objectives:
1. acquire skills in basic engineering practice.
2. identify the hand tools and instruments.
3. acquire measuring skills.
4. acquire practical skills in the trades.
5. acquire practical skills in welding, carpentry, fitting.

B. Learning outcomes:
Upon completion of the subject, students should have the knowledge of:
1. workshop safety.
2. handling workshop tools, machines.
3. different welding types.
4. different carpentry joints.
5. working principle of different tools.

C. Subject matter:
Unit I:

Unit II: 
Metal Joining: Definitions of welding, brazing and soldering processes and their applications, Oxy acetylene gas welding process, equipment and techniques, types of flames and their applications, Manual metal arc welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrodes, welding positions, types of weld joint, common welding defects such as cracks, slag inclusion and porosity.

Unit III: 
Bench work and Fitting: Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses.

Unit IV: 
Laying out (bench work): Sawing and finishing by filing.

D. List of Practicals:
1. T-Lap joints and Bridle joint (Carpentry Shop).
2. Gas Welding practice on mild steel flat(sheet) upto 3 mm thick.
3. Lap joint by Gas Welding (upto 3mm thick).
5. Pattern Making. (Carpentry Shop)
6. Laying out (bench work); Sawing and Finishing by Filing.

E. Teaching/Learning/Practice pattern:
Teaching: 20%
Learning: 20%
Practice: 60%

F. Examination pattern:
1. Job making.
2. Viva-voce.

G. Reading lists:
Books:
4. Hazra and choudhary “Workshop Technology” Vol. 1, 2, Media Promoters
5. VirenderNarula “Workshop Technology”, S.K.Kataria& Sons

Magazines:
1. International Metal Working News.
2. Industrial Distribution

Journals:
1. International Journal of Machine Tools and Manufacture
2. Journal of Manufacturing Science and Engineering, Transactions of the ASME
3. Journal of Manufacturing Technology and Research
Name of the Module: Basic Electrical & Electronics Engineering  
Module Code: EE 101  
Semester: 1st  
Credit Value: 4 [P=2, T=0, L=3]  
Module Leader:

A. Objectives:  
The course is designed to meet the objectives of:  
1. To make the students familiar with the course and its importance.  
2. Introduction to Basic Electrical & Electronics Engineering.  
3. Basic knowledge of DC circuits, Electromagnetism, AC fundamental.  
4. Introduction to DC, AC single and three phase machine, their construction and working principles.  
5. Introduction to measurement of electrical quantities. 
7. Briefing to Semiconductor devices and their applications.

B. Learning outcomes:  
Students successfully completing this module will be able to:  
1. Students will develop interest in learning the subject and be adequately trained to solve network problems.  
2. Students will be skilled both theoretically and practically to utilize conventional circuit solving procedures.  
3. Students will be substantially prepared to take up prospective design assignments.

C. Subject matter:  
Unit I:  
DC circuits: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff’s law, Principle of superposition. Source equivalence and conversion, Thevenin’s theorem, Norton Theorem, nodal analysis, mesh analysis, star-delta conversion. Maximum power transfer theorem with proof.  

Unit II:  
Decision making: Simple If statement, if-else statement, nested if else statement, Switch statement, nested switch, the operator, goto statement.  
Decision making & branching: while statement, do-while statement, for statement. Array

Unit III:  
Transformers: Construction, Types, emf equation, voltage, current, impedance and turns ratio;
auto-transformer. DC machines (motor and generator)–Construction, types, emf equation, equivalent circuit, starting, speed control, braking, applications. Single phase motors, types; need of rotating field, starting, running, speed control and applications.

Unit IV:

**Introduction to Semiconductors:** Band gap, Conductivity, intrinsic and extrinsic types, Doping: donors and acceptors, n-type and p-type.

**P-N Junction:** Energy band diagram, Formation of P-N junction, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics, junction capacitance and varactor diode. Simple diode circuits, load line, linear piecewise model; rectifiers: half wave, full wave, its PIV, DC voltage and current, ripple factor, efficiency, Clipper & Clamper Circuits.

**Introduction to Transistors:** Formation of PNP/ NPN junctions, energy band diagram; transistor mechanism and principle of transistors, Biasing: CE, CB, CC configuration, transistor characteristics: cut-off, active and saturation mode, Early effect. Introduction to Field Effect Transistor: Structure and characteristics of JFET and MOSFET, depletion and enhancement types, CS, CG, CD configurations.

D. List of practicals: (Minimum eight experiments should be conducted by students)
1. To construct a series-parallel circuits and verify:
   - Ohms law, Kirchhoff’s laws
   - Verify Thevenin’s theorem.
   - Verify Norton’s theorem.
   - Verify Maximum Power Transfer theorem.
2. Construct an R-L-C circuit and verify
   - Voltage across R, L and C
   - Verify the phasor sum of the voltages across the combination of R-L-C.
3. Measurement of power in the circuit made in 2 above and verify:
   - The power consumed by Resistance, Inductance and Capacitance and the total power consumed by the circuit.
4. How does the power factor varies in the circuit of 2 above if Resistance, Inductance and Capacitance are varied.
5. Study of VI Characteristics of Silicon Diode.
7. Design and Analysis of a Half wave Rectifier using Diode.
8. Design and Analysis of a center-tap Full wave Rectifier using Diodes
9. Design and Analysis of a Bridge Rectifier Circuit.
10. Design and Analysis of a Clipping Circuit with one voltage source. (Different possible configurations)
11. Design and Analysis of a Clipping Circuit with two voltage source. (Different possible configurations)
12. Design and Analysis of a Clamper Circuit.
13. Analysis of the characteristics of BJT (CE and CB mode)
14. Design and Analysis of fixed bias circuit using NPN transistor (DC)
15. Design and Analysis of emitter bias circuit using NPN transistor (DC)
16. Determination of the characteristics of JFET.
17. Determination of the characteristics of MOSFET.
18. Verification of truth tables of logic gates.
E. Teaching/ Learning/ Practice pattern:
   Teaching: 40%
   Learning: 10%
   Practice: 50%

F. Examination pattern:
   1. Theoretical Examination: Written.
   2. Practical Examination: Conduct Practical Examination and viva-voce.

G. Reading lists:
   Books:

   Magazines:
   1. IEEE Industrial Electronics
   2. Electrical Line, Canada.

   Journals:
   1. Electrical Engineering, Springer.

Name of the Module: Communication Skill
Module Code: HSS 101
Semester: 1st
Credit Value: 1 [P=2, T=0, L=0]
Module Leader:

A. Objectives:
The course is designed to meet the following objectives:
   1. to increase the Students ability to improve and utilize the skills necessary to be competent interpersonal communicator.
   2. to Increase the students’ understanding of his or her own communication behaviour.
   3. to Increase the students’ understanding of others communication behaviours.
   4. to improve the students’ communication skills in both social and professional contexts.
   5. to improve the students ability to demonstrate effective complete resolution skills.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. develop their communication skills on the specific subject.
2. direct effectively in their work place.

C. Subject matter:

**Unit I:**

*General Principles of Communication and Oral Communication*: The Process of Communication, Principles of Communication (communication barriers, levels of Communication, Communication network, verbal, non-verbal) and Professional Communication. The Speech Mechanism, IPA symbols (vowel and consonant sounds), minimal pairs, word transcription, stress and intonation, types of listening, traits of a good listener, active versus passive listening.

**Unit II:**

*Constituents of Effective Writing and Vocabulary*: The sentence and its parts, articles, the verb phrase, tense and aspect, the active and passive, the adjective, interrogative and negative sentences, concord, preposition. Paragraph development, summary writing and reading comprehension. Word formation processes: affixation, compounding, converting, use of words in different parts of speech, idioms and phrases.

**Unit III:**


D. List of practicals:

1. Issue Writing
2. Writing Resumes and Applications
3. Writing Memos
4. Reading Comprehension
5. Vocabulary
6. Presentation Skills
7. Group Discussion
8. Extempore
9. Debates

E. Teaching/ Learning/ Practice pattern:

Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:

1. Theoretical Examination

G. Reading lists:

**Books:**

1. NiraKonar, “English Language Laboratory”, Prentice Hall India
5. Rajeevan, Dutt, Sasikumar, A course in Listening and Speaking I & II with CD, CUP, New Delhi, 2007.
Name of the Module: Foreign Language (French) (Audit)
Module Code: HSS 103
Semester: 1st
Credit Value: 0\{P=2, T=0, L=0\}

Module Leader:

A. Objectives:
The course is designed to meet the objectives of:

1. the French Language course accords to a method created for Indian students who are complete beginners in French and who wish to acquire verbal communication skills in current scenario.

B. Learning outcomes:
Students successfully completing this module will be able to:

1. develop four skills in French i.e. Reading, Writing, Speaking, Comprehension.

C. Subject matter:
Unit-I:
Preliminaries of Grammar: Articles, Gender and Number of Nouns and Adjectives. Personal and Tonique Pronouns, Demonstrative and Possessive Adjectives, Preposition and Adverbs.

Unit-II:
Conjugation: Present, Past and Future Tense; Types of Sentences. Pronominal Verbs Conjugation of Verbs of all the Groups in present Tense and Introduction to past and Future tense, Interrogation, Negation and Imperatives.

Unit-III:
Names of days, seasons. Months, colours, garments body parts and numbers. Computer, Commerce & Marketing related Vocabulary & Terminology.
D. List of practicals:
1. Issue Writing
2. Writing Resumes and Applications
3. Writing Memos
4. Reading Comprehension
5. Vocabulary
6. Presentation Skills
7. Group Discussion
8. Extempore

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination

G. Reading lists:
Books:

Name of the Module: NSS/ NCC
Module Code: HSS 102
Semester: 1st
Credit Value: 1 [P=2, T=0, L=0]
Module Leader:
Second Semester

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Name of the Module: Engineering Mathematics-II  
Module Code: MAS 201  
Semester: 2\textsuperscript{nd}  
Credit Value: 4 \( [P=0, \ T=1, \ L=3] \)  
Module Leader:

A. Objectives:  
The course is designed to meet the following objectives:  
1. imparting theoretical knowledge to the students about three and more dimensional objects in space and to improve their capability of visualising of objects in space.  
2. making student competent enough to construct a differential equation/ mathematical modelling for every real life situation with its solution.  
3. giving students theoretical knowledge of vectors with the flavour of Calculus.  
4. introduce the concepts of Laplace and Fourier transforms and its application to the solution of differential equations (ODE & PDE) to the students.

B. Learning Outcomes:  
Upon completion of the subject:  
1. students will have strong visualising capability in their mind about any object.  
2. students are so trained that they will recognize various real life situation/ problem and able to solve them by constructing a differential equation/ mathematical model.  
3. students will be able to find the Laplace and Fourier representation as well as transforms of functions of one variable.

C. Subject matter:  
Unit I:  
Coordinate Geometry Of Three Dimensions: Equation of a sphere, plane section of a sphere, tangent plane, orthogonality of spheres, definition and equation of right circular cone and right circular cylinder.
Unit II:
**Vector Calculus:** Differentiation and integration of vector functions, scalar and vector fields, Gradient, Directional derivative, Divergence, Curl. Line integral, Surface integral and Volume integral, Green’s, Gauss’ and Stokes’ theorems (without proofs) and their simple applications.

Unit III:
**Ordinary Differential Equations:** Formulation of Differential equations, Linear Differential Equations and reducible to linear form, Exact Equations, Reducible to exact form, Linear differential equations with constant coefficients, Second order ordinary differential equations with variable coefficients, Homogeneous form, Change of dependent variable, Change of independent variable, Normal form, Variation of Parameters, Solution in series of second order LDE with variable coefficient (C.F. only), Bessel’s and Legendre differential equations with their series solutions, Orthogonal properties, recurrence relations and generating function of Bessel functions and Legendre polynomials.

**Partial Differential Equation:** Linear and non-linear Partial Differential Equation of order one, Linear Partial Differential Equation with constant coefficient, Partial Differential Equation of order two with variable coefficients.

Unit IV:
**Basic Transform:** Laplace & Fourier.

D. Teaching/ Learning/ Practice Pattern:
- Teaching: 70%
- Learning: 30%
- Practice: 0%

E. Examination Pattern:
Theoretical Examination and open book examination.

F. Reading Lists:
**Books:**
Magazines:
1. Current Science (Indian Academy of Science).
2. The Mathematics Student (Math Student) (Indian Mathematical Society).
3. Mathematical Spectrum (The University of Sheffield).
5. +Plus magazine (University of Cambridge).

Journals:
3. The Journal of Indian academy of Sciences.

Name of the Module: Basic Mechanical Engineering
Module Code: ME 201
Semester: 2nd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is design to meet with the following objectives:
1. Ability to utilise scalar and vector analytical techniques for analysing forces in statically
determinate structures.
2. Ability to apply fundamental concepts of kinematics and kinetics of particles to the analysis of
simple, practical problems.
3. Student gets a basic idea of Engineering Mechanics, Fluid Mechanics, Strength of Material and
Thermodynamics.

B. Learning Outcome:
Upon completion of the subject, students will have the:
1. Knowledge of different type of force resolving.
2. Knowledge of centre of gravity of different size, shape, and solid.
3. Knowledge of basic idea of Engineering Mechanics, Fluid Mechanics, Strength of Material and
Thermodynamics.

C. Subject Matter:
Unit I:
Thermodynamics: Introduction to Thermodynamics, Concepts of system control volume, state,
properties, equilibrium, quasi-static process, reversible & irreversible process, cycle. Zeroth Law
and Temperature, Heat and Work transfer Definition, Sign convention, various P-dV work done
(Isobaric, Isochoric, Polytrophic, adiabatic and isothermal processes) and related problems.

Unit II:
1st Laws of Thermodynamics for closed & open systems (ii) Non Flow Energy Equation (iii)

Unit III:
Fluid Mechanics: Properties & Classification of Fluids – ideal & real fluids, Newton’s law of viscosity, Newtonian & Non Newtonian Fluids, Compressible & Incompressible fluids Pressure at a point, Pascal’s law, Measurement of Pressure, Continuity equation, Bernoulli’s equation and its application

Unit IV:
Strength Of Materials: Concept of simple stresses and strains. Yield strength, Normal stress Shear stress, Bearing stress, Normal strain, Shearing strain, Hooke’s law, poisson’s ratio, Examples.

D. List of Practical: No practicals.

E. Teaching/Learning/Practice Pattern:
Teaching: 60 %
Learning: 40 %
Practice: 0%

F. Examination Pattern:
1. Theoretical Examination.

G. Reading List:
Books:
3. Timoshanko & Young, “Elements of Strength of Materials” D Van Nostrand Company

Magazine:
1. PopularMechanics Everyday
2. Engineering Magazine

Journals:
1. International Journal of Applied Mechanics and Engineering
2. Journal of Applied Mechanics, ASME

Name of the Module: Programming in C
Module Code: CSE 201
Semester: 2nd
Credit Value: 4 [P=8, T=0, L=0]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. introducing art, science and engineering of C programming language to the students of all UG programs,
2. teaching and training of different problems in data structures,
3. guiding and training students to write efficient coding,
4. guiding & training students to fragment problems into different functions or units.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand the basic terminology used in computer programming
2. write, compile and debug programs in C language in different operating systems.
3. design programs involving decision structures, loops and functions.
4. use and apply the dynamics of memory by the use of pointers in engineering applications.
5. use and apply the differences between structure oriented and function oriented programming in programming applications.

C. Subject matter:

Unit I:
Basic Idea: Algorithm, Flowchart, Program, Top down approach, Procedure oriented etc..
Keyword & Identifiers: History & Importance of C, Basic structure of C programs, C fundamentals: The C character set identifier, Constants and keywords, data types & size, variable names, declaration, statement, C token, symbolic constant.
Managing Input & output operations: using of printf( ) & scanf( ).

Unit II:
Decision making: Simple If statement, if-else statement, nested if else statement, Switch statement, nested switch, the operator, goto statement.
Decision making & branching: while statement, do-while statement, for statement. Array

Unit III:
Array: Declaration, Initialization and processing One-dimension array, Two-dimension array and multi dimension array and their operations.
String & pointer: String: Operation on String without using library function and using library function. Pointer: Declaration of pointer variables, accessing the variable by using pointer, pointer increment and decrement operator, pointer and array.
Functions: Basic functions, function type, function with no argument & no return value, function with no argument but return value, function with argument & return value, Storage class identifier, Call by reference, Recursive function. Pointer to function.

Unit IV:
File management system: Advantage of using file, Open, close, read, write in the files, Operation on files.
Dynamic memory Allocation: use of Malloc, calloc, realloc, free. Library functions, Implementation of Linked list and their various operations.
The pre-processor: macro statements.

D. List of practicals: (Minimum eight experiments should be conducted by students)

1. Write a program to find the two’s complement of a given binary sequence.
2. Write a program to find the addition of two integer numbers by using 2’s complement arithmetic.
3. Write a program to perform subtraction using 2’s complement method.
4. Write a program to find the n-bits even/odd parity hamming code for the given binary sequences of r-bits.
5. Write a program to design the full adder logic and display the sum and carry of the provided binary inputs.
6. Write a program to design the truth table for any given function.
7. Write a program to find the shortest paths between each nodes of the given graph.
8. Write a program to design the traffic rules of a Junction Railway station consist with finite number of platforms.
9. Write a program to find the optimal weighted spanning tree from a graph.
10. Write a program to create a circular linked list and traverse the all the nodes.
11. Calculate the value of power factor, using two wattmeter methods, the first reading of wattmeter is X W and that of second wattmeter is Z W, when the both the reading is positive.
12. From the experimental data of OCC (Open Circuit Characteristics) and SCC (Short Circuit Characteristics) of a 1-Φ transformer, write a program for determining the parameters for the equivalent circuit.
13. Write a program to implement the Bernoulli’s Equation.
14. Write a program to determination of Cantilever Beam – Concentrated load P at any point.
15. Write a program to determine the shear strength of soil by Triaxial and direct shear method.
16. Write a mini project to store all records of students and search by their name, roll number or registration number.
17. Write a program to create, edit, open, delete a file and perform different operations accordingly.
18. Write a program to backup one file to another file.
19. Write a program to merge two files.
20. Write a mini project to control mouse cursor and display whether left, right or scroll happens.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Open book and online.
2. Practical Examination: Conduct Programming test and viva voice.

G. Reading lists:

Books

Magazines:
1. C/C++ Users, CMP Media LLC publication, United States.
2. EPS Software Corp/CODE Magazine, 6605 Cypresswood Drive, Suite 300 Spring, TX 77379.

Journals:
3. Dr. Dobb’s Journal, United Business Media publication, United State, ISSN: 1044-789X
4. Journal of C Language, CMP Media LLC publication, United States
5. C vu Journal, ACCU, UK.

Name of the Module: Environmental Science
Module Code: CHY 201
Semester: 2nd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the following objectives:
1. imparting the knowledge to the students in the area of Environmental Engineering.
2. providing teaching and learning to make students acquainting with advanced science and technology in Environmental Science.
3. injecting the future scope and the research direction in the discipline of Environmental Engineering.
4. making students competent to the research and development in Environmental Engineering.

B. Learning outcomes:
Students successfully completing this module will be able to:

1. adequately trained to become Scientist, trainers and Chemical Engineers.
2. skilled both to control and maintenance in Environmental pollution, waste water treatment and other related activities in Environmental Engineering.
3. be substantially prepared to take up prospective research assignments.

C. Subjects matter:

Unit – I

Unit – II
Water resources, characteristics of water, water pollutants, oxygen demanding wastes, surface water quality, groundwater quality, water treatment systems, biomedical wastes treatment technologies and disposal options.

Unit – III

Unit-IV
Air quality standards, emission standards, criteria pollutants, air pollution and meteology, atmospheric dispersion, emission controls. Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –greenhouse gases, non-criteria pollutants, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NOx removal, Fugitive emissions.

D. Teaching/ Learning/ Practice pattern:
Teaching : 50%
Learning : 50%
(Teacher is to divide components for T/R/P)
E. Examination pattern:
   1. Theoretical Examination: Open book and on line.

F. Reading lists:
Books:
2. Arcadio P. Sincero & Gregoria A. Sincero, “Environmental Engineering”, PHI
8. M.L. Davis and D.A. cornwell, “Introduction to Environmental Engineering”.

Magazines:
1. Applied Environmental Research Foundation
2. Environmental Science and Engineering
3. Climate Wire
4. Down to Earth
5. The Green Economist
6. Green Wire

Journals:
1. Journal of Environmental Science, Elsevier Publication
2. Environmental Science and Technology, ACS Publication
3. Energy and Environmental Science, RSC Publication
4. Environmental International, Elsevier Publication

Name of the Module: Engineering Physics - II
Module Code: PHY 201
Semester: 2nd
Credit Value: 4 \( [P=2, T=0, L=3] \)
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. imparting theoretical & practical knowledge to the students in the area of Engineering Physics.
2. providing teaching and learning to make students acquainting with modern state-of-art of Engineering
3. injecting the future scope and the research direction in the field of Physics with specific specialization.
4. making students competent to design & development of Engineering Physics.
B. Learning outcomes:
Students successfully completing this module will be able to:
1. adequately trained to become Engineers.
2. substantially prepared to take up prospective research assignments and will be substantially prepared to take up prospective research assignments.

C. Subject matter:
Unit I:
Electricity: Coulombs law in vector form, Electrostatic field and its curl, Gauss's law in integral form and conversion to differential form, Electrostatic potential and field, Poisson’s Eqn. Laplace's Eqn. (Application to Cartesian, Spherically and Cylindrically symmetric systems-effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady state current Dielectrics-concept of polarization.

Unit II:
Magnetostatics& time varying Field: Lorentz force, force on a small current element placed in a magnetic field, Biot-Savart law and its applications, divergence of a magnetic field, vector potential, amperes's law in integral form and conversion to differential form, Faraday's law of electromagnetic induction in integral form and conversion to differential form.

Electromagnetic theory: conception of displacement current, Maxwell's field equations, Maxwell's wave equation and its solution for fee space, E.M wave in a charge free conducting media, skin depth, physical significance of skin depth, E.M. energy flow &poynting vector.

Unit III:
Quantum Mechanics: Wave particle duality, Compton effect, Photo electric effect, Black body radiation, Heisenberg’s uncertainty relation, concept of wave packet. Conception of probability and probability density, operators, commutator, Formulation of quantum mechanics and basic postulates, Time dependent Schrodinger's equation, Formulation of Time independent Schrodinger's equation, physical interpretation of wave function, Free particle and particle in a box.

Unit IV:
Statistical Mechanics: Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Bose-Einstein statistics – Planck’s law of blackbody radiation.

D. List of practicals: (Minimum six experiments are required to be performed)
1. Determination of dielectric constant of a given dielectric material.
2. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
3. Determination of specific charge (e/m) of electron by J.J. Thomson’s method.
4. Determination of Planck’s constant using photocell.
5. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum.
6. Determination of Stefan’s radiation constant.
7. Verification of Bohr’s atomic orbital theory through Frank-Hertz experiment.
8. Determination of Hall co-efficient of semiconductors.
9. Determination of band gap of semiconductors
10. Use of carry Foster's bridge to determine unknown resistance

E. Teaching/ Learning/ Practice Pattern:
   Teaching : 40%
   Learning : 10%
   Practice : 50%

F. Examination Pattern:
   1. Theoretical Examination: Open book and online.
   2. Practical Examination: Conducting Experiment and Viva-Voce.

G. Reading lists:
   Books:
   8. S. N. Ghoshal, “Atomic Physics” S. Chand
   10. A. B. Gupta, “Modern Atomic and Nuclear Physics” BOOKS and Allied (P) Ltd.

Magazines:
1. Resonance
2. American Teacher
3. Scientific Physics
4. Physics Today
5. Physics For You
6. Physics Teacher (IPS)
7. Physics World (IoP-UK)
8. Physics News (IPA)

Journals:
1. Nature
2. Physical Review Letter
3. Physical Review A & B
5. Journal of Applied Physics (JAP)
6. American Journal of Physics
7. Proceedings of the National Academy of Sciences
8. Chemical Physics Letters
9. Journal of Physics: (Including A, B, C, D, E, F & G)

Name of the Module: Digital Electronics & Logic Design
Module Code: ECE 201
Semester: 2nd
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to make the students to build a solid foundation about Boolean algebra
2. to make the students to study Digital Logic Gates and Circuits
3. to provide a clear foundation of Modern Digital System

B. Learning outcomes:
At the end of this module, students are expected to be able to
1. clear understanding & utilization of logic gates
2. design and develop of advanced TTL logic circuits
3. utilization of Combinational and Sequential circuits, Counters, ADC and DAC

C. Subject matter:
Unit I:
Number Systems: Decimal, Binary, Octal and Hexadecimal systems, conversion of a number from one base to another.
Codes: BCD, Excess- 3, Gray, Reflected, ASCII, EBCDIC.
Algebra for logic circuits: Logic variables; Logic constants; Logic functions- NOT, AND, OR, NAND, NOR, Ex-OR;
Combinational circuits: Full Adder / Subtractor, BCD Adder, LAC Adder, Comparator, Decoder, Encoder, Priority Encoder, MUX/DEMUX & there structures, Combinational logic design using ROM array, Applications of MSI designs.

Unit II:

Unit III:  
Other Gates & Circuits: Difference between combinational and sequential circuits,  
Sequential Gates: Triggering of sequential logic circuits. Difference between flip flop and latch – Construction of RS, D, JK, JK master slave, T flip flops using basic gates, preset and clear signal,  
Shift Registers: Serial in serial out – Serial in parallel out, Parallel in serial out, Parallel in parallel out, Universal Shift Registers & their Applications.  
Counters: Asynchronous and synchronous counter, Ripple counter, Mod-N counter, Up-down counter, Ring counter, Johnson counter, Programmable counter – Applications. Design of Synchronous State Machine (including Counter) and Asynchronous state machine.

Unit IV:  
Logic Families: Comparative studies of different type of logic families like RTL, Diode logic, DTL, TTL, IIL,HTL, ECL, MOS & CMOS etc. with the following characteristics: (a) logic levels, (b) power dissipation, (c) fan in and fan out, (d) propagation delay, and, (e) noise immunity.  
Data Converters: Digital to Analog Converters: Binary weighted resistor type, R-2R ladder type, Specifications and applications of DA converter. Analog to Digital Converter: Comparator type, Successive approximation type, Dual slope AD converter, Specifications and applications of AD converter.

D. List of Experiments: (Minimum eight experiments should be conducted by students)

1. Study Data Hand Book and list atleast 5 chips for each of primary, secondary gates & flip-flops and draw their diagram with pin configuration.  
2. Verify Truth Table of NOT, 2-input AND and 2-input OR gate thereby inference.  
   i) Single line definition of multiple input AND & OR gate.  
   ii) What is the primary difference between NOT gate from AND & OR gate.  
3. Study the Truth Table of the following by circuits.

I.
II. Compare the Truth Table of i) & ii) and that of AND gate and state inference.

4. Design Gray to Binary and Binary to Gray Converter & test
5. Design and test byte operated even parity generator & then convert it to odd parity generator.
6. Design and test (7,4) Hamming Code Generator and Error Correction decoder.
7. Design a Majority Gate and use it & a XOR gate to realize Adder Circuit & Verify.
8. With Serial Data input design a single circuit for test of >, < and = for two data.
9. Minimize the following logic system with SOP by tabular technique & implement the circuit.
   i) \( f_1(A,B,C,D) = m_0 + m_1 + m_2 + m_3 + m_5 + m_6 + m_{10} + m_{11} + m_{15} \)
   ii) \( f_2(A,B,C,D) = m_0 + m_1 + m_2 + m_3 + m_6 + m_7 + m_{10} + m_{11} \)
   iii) \( f_3(A,B,C,D) = m_1 + m_3 + m_4 + m_5 + m_6 + m_7 \)
10. Minimize the following logic circuit defined in POS by tabular minimization technique:
    i) \( f_4(X,Y,Z) = M_0.M_1.M_2.M_3 \)
    ii) \( f_5(X,Y,Z) = M_0.M_1.M_2.M_4.M_7 \)
11. Write a C program to implement Tabular Technique for minimization of system as in problem (8) & (9)
12. Test Truth Table of
    i) S – R flip flop
    ii) J – K flip flop
    iii) D – flip flop
    iv) T – flip flop
13. Design 1 bit Read/Write memory with flip-flop and other logic gate & test.
15. Design a binary counter & test.
16. Design one ADC & one DAC circuit & test.

E. Teaching/Learning/Practice pattern:
   Teaching : 40%
   Learning : 10%
   Practice : 50%

F. Examination pattern:
   1. Theoretical Examination: Open book/ Regular examination and on line test.
   2. Practical Examination: Conducting Experiment and Viva-Voice.

G. Reading lists:
   Books:

Magazines:

Journals:
1. International Journal of Electronics Devices and Circuits.

Name of the Module: Historiography of Science & Technology
Module Code: HSS 201
Semester: 2nd
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. providing teaching with inclusive learning.
2. imparting theoretical lectures with case discussion.
3. making students aware of the importance of this subject in their future career.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. work with efficiency as they are equipped with background knowledge on the subject.
2. perform much better in their workplace.

C. Subject matter:
Unit I
Introduction:A n overview: definitions, Different approaches to the scientific explorations, to introduce humanity’s endeavour behind science and its application over the centuries, characteristics of histography of science and technology.

Unit II
Motivation: Nature of drives, needs and motives, work motives, need of hierarchy theory and two factor theory of motivation, How to motivate the workers at work, factors effecting the morale of workers.

Lives of Eminent Scientists: To understand the Background, Opportunities, Achievements and Qualities in their efforts to become Scientist of first order.

Scientific Eras: Course of Civilization and Scientific Endeavour.

Contribution of science: Contribution to the present day World.

Unit III

Answers to the Criticism that Science has created a World full of Pollutions

D. Teaching/Learning/Practice pattern:

- Teaching : 40%
- Learning : 10%
- Practice : 50%

E. Examination pattern:

1. Theoretical Examination: Open book/ Regular examination and on line test.

F. Reading lists:

Books:

Magazines:
1. Science and Technology Magazine
2. Histograpghy of contemporary Science and Technology

Journals:
1. Historiography in Graduate Technology
2. Innovation, Technology or History
3. Historiography of the Sciences

Name of the Module: Basic Civil Engineering

Module Code: CE 202

Semester: 2nd

Credit Value: 2 [P=3, T=0, L=0]

Module Leader:

A. Objectives:

The course is designed to meet the following objectives:
1. increase the ability to understand Engineering Drawing.
2. learn to sketch and take field dimensions.
3. learn to take data and transform it into graphic drawings.
4. learn basic engineering drawing formats.
5. prepare the student for future Engineering positions.

B. Learning outcomes:
Upon completion of the subject:
1. student’s ability to perform basic sketching techniques will improve.
2. students will be able to draw orthographic projections and sections.
3. student’s ability to use architectural and engineering scales will increase.
4. students ability to produce engineered drawings will improve
5. student’s ability to convert sketches to engineered drawings will increase.
6. students will become familiar with office practice and standards.

C. Subject matter:
Unit I:
Traditional Materials: stones, bricks, lime, cement, timber. Mortar: sand, cement mortar, mud mortar, special mortar, test on mortar
Concrete: plain concrete, reinforced cement concrete, reinforced brick concrete

Unit II:
Metals as Building materials: Ferrous metals, aluminum, copper. Miscellaneous Building materials: Glass, plastics, bitumen, asbestos, paints, distempers, varnishes, solid and hollow concrete Blocks, Roofing and flooring tile

Unit III:
Superstructures: Types of superstructure based on the method of load transfer, walls, stone masonry, brick masonry, plastering, pointing, flooring, roof, doors and lintels, stairs.

Unit IV:
Surveying: Introduction to surveying-Object and uses of surveying, primary divisions of surveying, fundamental principles of surveying, classification of surveying, plans and maps, scales.

D. Teaching/Learning/Practice pattern:
Teaching : 40%
Learning : 10%
Practice : 50%

E. Examination pattern:
1. Theoretical Examination: Open book/ Regular examination and on line test.

F. Reading lists:
Books:
2. Ramamurtham, “Basic Civil Engineering”, Dhanpat Rai and sons
3. SSBhavikatti “Basic Civil Engineering” New Age international Publishers,

Magazines:
1. Civil Engineering and construction Review.

Journals:
1. ASCE.
Name of the Module: Workshop Practice-II

Module Code: ME 202
Semester: 2\textsuperscript{nd}
Credit Value: 2 [P=3, T=0, L=0]

Module Leader:

A. Objectives:
The course is designed to meet the following objectives:
1. acquire skills in basic engineering practice.
2. identify the hand tools and instruments.
3. acquire measuring skills.
4. acquire practical skills in the trades.
5. acquire practical skills in welding, carpentry, fitting.

B. Learning outcomes:
Upon completion of the subject, students should have the knowledge of:
1. workshop safety.
2. handling workshop tools, machines.
3. different welding types.
4. different carpentry joints.
5. different tools and their working principles.

C. Subject matter:
Unit I:
\textbf{Bench work and Fitting}: Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses, plumbing, Sheet metal Work.

Unit II:
\textbf{Metal Joining}: Definitions of welding, brazing and soldering processes, and their applications. Oxy acetylene gas welding process, equipment and techniques. Types of flames and their applications. Manual metal arc welding technique and equipment. AC and DC welding, electrodes, constituents and functions of electrodes. Welding positions. Types of weld joint. Common welding defects such as cracks, slag inclusion and porosity.

Unit III:
\textbf{Machine Shop}: Introduction, Basic Principles of Lathe, Shaper, Milling, Drilling, Grinding, Power Hacksaw, etc.

D. List of practicals:
1. To practice Gas welding using a 3mm thick mild steel plate. (Welding Shop)
2. To prepare a Lap joint and Butt joint by Gas Welding from 3mm thick mild steel plate (Welding Shop).
3. To practice Manual metal arc welding using a 5mm thick mild steel plate (Welding Shop).
4. To prepare various patterns using wood as a pattern material with the help of specific tools. (Carpentry Shop)
5. To perform various bench working operations like sawing, filling and finishing on a 5mm thick mild steel plate using specific tools (Fitting Shop).
6. To prepare jobs (Square, Angular and Semi Circular grooves) using 5mm mild steel plate using specific tools (Fitting Shop)
7. T-Lap joint and Bridle joint (Carpentry Shop).
8. Gas Welding practice on mild steel flat/sheet upto 3 mm thick.
9. Lap joint by Gas Welding (upto 3mm thick).
10. Manual Metal Arc Welding practice (upto 5mm thick).
11. Pattern Making. (Carpentry Shop)
12. Laying out (bench work); Sawing and Finishing by Filing.

E. Teaching/Learning/Practice pattern:
   Teaching: 20%
   Learning: 20 %
   Practice: 60%

F. Examination pattern:
   1. Job making.
   2. Viva-voce.

G. Reading lists:
   Books:
   4. Hazra and choudhary “Workshop Technology” Vol. 1, 2, Media Promoters
   5. Virender Narula “Workshop Technology”, S.K.Kataria & Sons

Magazines:
   1. International Metal Working News.
   2. Industrial Distribution

Journals:
   1. International Journal of Machine Tools and Manufacture
   2. Journal of Manufacturing Science and Engineering, Transactions of the ASME
   3. Journal of Manufacturing Technology and Research

Name of the Module: Foreign Language (German/Chinese) (Audit)
Module Code: HSS202
Semester: 2nd
Credit Value: 2 \(P=2, T=0, L=0\)
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:

1. the French Language course accords to a method created for Indian students who are complete beginners in French and who wish to acquire verbal communication skills in current scenario.

B. Learning outcomes:
Students successfully completing this module will be able to:

1. develop four skills in French i.e. Reading, Writing, Speaking, Comprehension

C. Subject matter:
Unit-I:
Social Interaction: Self Introduction, Introducing Friends, Family & persons Topical writing, Essays Description of persons Place, Things, Class, City, Country, House, Plan a Week-End, Excursion,

Unit-II:
Developing Writing Skills: Making Resume, Interviews Letter Writing, Rejecting or accepting proposals. Invitation, Dialogues, Tastes & Preferences

Unit-III:
Professional Dialogue: Conversational French between Known & Unknown people, Telephonic Conversation with Friends & Client

D. List of practicals:
1. Writing Resumes and Applications
2. Writing Memos
3. Reading Comprehension
4. Vocabulary
5. Presentation Skills
6. Group Discussion
7. Extempore

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination

G. Reading lists:
Books:
1. Suggested book-Ailes Volume-II
2. G. Mauger: II (La Langue et de Civilisation francaise) Alliance francaise Paris Ile-de-France.
Name of the Module: Discrete Mathematics  
Module Code: MAS 301  
Semester: 3rd  
Credit Value: 4[P=0, T=1, L=3]  
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. To extend student’s Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
2. Apply logical reasoning to solve a variety of problems.

B. Learning outcomes:
Upon completion of the subject:
1. Students will have acquired greater precision in logical argument and have gained a core mathematical understanding of discrete mathematics.
2. Students will have learned and practised basic concepts of mathematical proof (direct proof, proof by contradiction, mathematical induction).
3. Students will be able to handle the standard logical symbols with some confidence.
4. Students will have learned elementary combinatorial and counting techniques and how to apply them to simple problems.
5. Students will be able to simplify complex mathematical expressions and apply general formulae to specific contexts.
6. Students will have learned how to state precisely and prove elementary mathematical statements and solve problems.
7. Students will have a basic understanding of information technology and its use in mathematical contexts.

C. Subject matter:
Unit I:


Unit II:


Unit III:

Recurrence Relations and Recursive Algorithms: Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Homogenous Solutions, Particular Solution.

Unit IV:
Group and Rings: Groups, Subgroups, Generators and Evaluation of Powers, Cosets and Lagrange’s Theorem, Permutation Groups and Burnside’s Theorem, Codes and Group Codes, Isomorphisms and Automorphisms, Homomorphisms and Normal Subgroups, Rings, Integral Domains, and Fields.


D. Teaching/ Learning/ Practice pattern:
Teaching: 70%
Learning: 30%
Practice: 0%

E. Examination pattern:
1. Theoretical Examination:

F. Reading lists:
Books:

Magazines:
1. Current Science (Indian Academy of Science)
2. The Mathematics Student (Math Student) (Indian Mathematical Society)
3. Mathematical Spectrum (The University of Sheffield)
4. Mathematics Magazine (Mathematical Association of America)
5. +Plus magazine (University of Cambridge)
6. Ganithavahini (Ramanujan Mathematical Society)

Journals:
1. SIAM Journal on Discrete Mathematics.

Name of the Module: Circuit Theory & Networks
Module Code: EE 301
Semester: 3rd
Credit Value: 4 [P = 2, T = 0, L 3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. imparting knowledge to the students for classification of networks and systems based on different criteria and their analysis using network theorems,
2. applicability of Fourier and Laplace transforms in circuit analysis,
3. making familiar with SPICE modeling,
4. use of MATLAB for circuit solving procedures.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. Students will be made aware of the basic Network Theorems and their applicability in DC Bilateral Linear Circuits.
2. Students will be skilled both theoretically and practically for circuit modeling and study of various parameters related to circuit theory.
3. Students will be trained for use of simulation software like PSPICE and MULTISIM.

C. Subject matter:
Unit I:

Unit II:
Network theorems and their applications in circuit analysis, Formulation of network equations, Source transformations, Loop variable analysis and node variable analysis. Graph of network, concept of tree branch, tree link. Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials.

Unit III:
Two port networks, Open circuit Impedance and Short circuit Admittance parameters, Transmission parameters, hybrid parameters, and their inter-relations. Indefinite admittance matrix-their applications to the analysis of active network. Active filter analysis and synthesis using operational amplifier.

Unit IV:
SPICE: How SPICE works. Model statement, models for passive and active device, D.C. circuits analysis, small signal analysis, capacitors and inductors in D.C. Circuits, steady state and transient, plotting and printing, input and output Impedance, D.C. sensitivity analysis, harmonic decomposition (Fourier Series), Harmonic re-composition, voltage controlled components

D. List of Practicals:
1. Transient response in R-L and R-C Network: Spice, Simulation/hardware.
3. Determination of Impedance (Z) and Admittance(Y) parameters of two port network.
5. Frequency response of BP and BR filters.
6. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form.
7. Evaluation of convolution integral, Discrete Fourier transform for periodic & non-periodic signals and simulation of difference equations using MATLAB.
8. Representation of poles and zero sine-plane, determination of partial fraction expansion in z
9. Domain and cascade connection of second order system using MATLAB
10. Determination of Laplace transform and inverse Laplace transformation using MATLAB
11. Spectrum analysis of different signals

E. Teaching/Learning/Practice pattern:
Teaching: 40%
Learning: 10%
Practice : 50%
(Teacher is to divide components for T/R/P)
(Some industrial experts will deliver lectures)
F. Examination Pattern:
1. Theoretical Examination: Written
2. Practical Examination: Conducting experiments and viva-voce.

G. Reading lists:
Books:
1. Sudhakar: Circuits & Networks: Analysis & Synthesis 2/e TMH New Delhi
3. Engineering Circuit Analysis with PSPICE and probe-Roger
5. A. Chakravarty: Networks, Filters & Transmission Lines
6. D. Chattopadhyayand P. C. Rakshit: Electrical Circuits
7. A. V. Oppenheimer and A. S. Wilsky: Signals & Systems, PHI
8. R. V. Jalgaonkar: Network Analysis & Synthesis. EPH.

Magazines:
1. IEEE Xplore
2. Electrical India Magazine

Journals:
1. Circuits and Systems, IEEE Transactions
2. Circuits, devices and Systems, IET.

Name of the Module: Computer Organization & Architecture
Module Code: CSE 301
Semester: 3rd
Credit Value: 4[P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. helping the students to develop an understand the nature and characteristics of the organisation and design of the modern computer systems,
2. focusing on the organisation & operation of the CPU. The Intel Pentium CPU will be used as the main case study.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand the key concepts that are likely to be included in the design of any modern computer system,
2. understand and to apply the basic metrics by which new and existing computer systems may be evaluated,
3. understand and to evaluate the impact that languages, their compilers and underlying operating systems have on the design of computer systems,
4. understand and to evaluate the impact that peripherals, their interconnection and underlying data operations have on the design of computer systems,
5. demonstrate the techniques needed to conduct the design of a computer,
6. examine different computer implementations and assess their strengths and weaknesses.

C. Subject matter:

Unit I:
Fundamentals of Computers: Digital computers, layers in computer system, types of computers, history of computers
Data representation and computer arithmetic: Data types, complement, fixed point representation, floating point representation, multiplication and division of sign and unsigned integers.

Unit II:
Microoperation and design of arithmetic logic unit: Register transfer micro operation, bus transfer, memory transfer, arithmetic micro operation, logic micro operation, logic unit, shift unit, design of arithmetic and logic unit.
Instruction set: Instruction code, register, computer instruction, timing and control, instruction cycle, instruction formats, CPU organization, instruction length, addressing standard, addressing mode, instruction set, RISC, CISC, case study of RISC.

Unit III:
Design of control unit: hardware control design, microprogrammed control.
Memory organization: memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

Unit IV:
Input-output organization: peripheral device, I/O interface and I/O driver, synchronous and asynchronous data transfer, modes of data transfer, priority interrupt, DMA, input-output processor.
Parallel processing: performance measurement of computer, parallel computer structure, general classification of computer architecture, pipelining, vector processing, multiprocessor system, flow computers.

D. List of practical’s:
1. Realization of different circuits using MUX.
2. Design of BCD adder.
3. Design of BCD subtractor.
4. Four bit CPU design using few instructions.
5. Design of ALU using bit dice ALU
6. Design of timer circuit/ control

E. Teaching/ Learning/ Practice pattern:
   Teaching: 40%
   Learning: 10%
   Practice: 50%
F. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

G. Reading lists:
Books

Magazines:

Journals:

Name of the Module: Data Structure & Algorithm
Module Code: CSE 302
Semester: 3rd
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. designing principles of algorithms and data structures,
2. learning efficiency and scaling of algorithms,
3. learning essential algorithms in computing,
4. understanding generic data structures for common problems.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. assess performance efficiency of sequential algorithms,
2. design data structures to enable algorithms and design sequential algorithms for performance,
3. implement designing algorithms and corresponding data structures using object oriented programming languages,
4. demonstrate deployment of essential data structures such as lists, stacks, queues, and trees,
5. demonstrate the use of algorithm design methods such as divide and conquer.

C. Subject matter:
Unit I:
Introduction: Basic concept of data, structures and pointers.

Arrays: Representation, implementation, polynomial representation, limitations.

Unit II:
Recursion - Design of recursive algorithms, Tail Recursion, When not to use recursion, Removal of recursion.
Linked List: Static and dynamic implementation. Single, double, circular, multiple linked lists.
Stack, queue, matrices.

Unit III:
Hash Tables: Hash tables implementation. Hashing techniques, single, double.
Storage Management: Memory Management techniques, garbage collection.
Trees: Binary trees, tree traversal, binary search trees, static and dynamic implementation. AVL tree, B+ tree, B tree, tree operations: insert, delete, and search.
Heaps: Implementation, sorting etc.
Sorting and Searching: Different sorting techniques. Insertion sort, selection sort, bubble sort, radix sort, quick sort, merge sort, heap sort.

Unit IV:
File Structures - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index, Multi-indexed Files, Inverted Files, Hashed Files.
Graphs: Representation of graphs, BFS, DFS sort.

D. List of practicals: (Minimum eight experiments should be conducted by students)
1. Experiments should include but not limited to: Implementation of array operations.
2. Implementation of Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem: Evaluation of expression operations on Multiple stacks & queues:
4. Implementation of polynomial addition, polynomial multiplication, sparse Matrices: multiplication, addition. Recursive and Non recursive traversal of Trees
5. Implementation of threaded binary tree traversal.
6. Application of Trees.
7. Application of sorting.
8. Implementation of different types of searching techniques like linear search, binary search with real life analysis.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Open book and on line.
2. Practical Examination: Conducting experiment and viva voice

G. Reading lists:
Books:

Magazines:
1. MSDN Magazine, Microsoft and 1105 Media, USA
2. IBM system Magazine, IBM, USA

Journals:
1. IEEE Transactions on Computers, IEEE, Computer Society, United State
2. ACM Transactions on Embedded Computing Systems (TECS), ACM, United State

Name of the Module: Optimization Methods
Module Code: MAS 302
Semester: 3rd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to make the students introduction of the methods of Operations Research,
2. emphasize the mathematical procedures of nonlinear programming search techniques,
3. a scientific approach to decision making, which seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. identify and develop operational research models from the verbal description of the real system & use mathematical software to solve the proposed models,
2. understand the mathematical tools that are needed to solve optimisation problems,
3. develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

C. Subject matter:

Unit I:
Introduction: Introduction to OR modelling approach and various real life situations. Linear programming problems and applications, various components of LP problem formulation, Solving Linear Programming problem using simultaneous equations and Graphical Method, Simplex Method and extensions, Sensitivity analysis - Duality theory, Revised Simplex Transportation and assignment problems.

Unit II:
Network Analysis: Shortest Paths, Maximal Flow including PERT-CPM. Integer programming concepts, formulation, solution and applications.
Dynamic Programming: Modelling, Optimization, Replacement.

Unit III:

Unit IV:

D. Teaching/Learning/Practice pattern:
Teaching: 70%
Learning: 30%
Practice: 0%

E. Examination pattern:
1. Theoretical examination and open book examination.

F. Reading lists:
Books:
5. Hillier & Lieberman—Introduction to Operations Research, 7/e (with CD), TMH

Magazines:
1. Current Science (Indian Academy of Science)
2. The Mathematics Student (Math Student) (Indian Mathematical Society)
3. Mathematical Spectrum (The University of Sheffield)
4. Mathematics Magazine (Mathematical Association of America)
5. +Plus magazine (University of Cambridge)
6. Ganithavahini (Ramanujan Mathematical Society)
Journals:
2. Journal of the Operational Research Society of India.

Name of the Module: Object Oriented Programming
Module Code: CSE 303
Semester: 3rd
Credit Value: 4 \[P=2, T=0, L=3\]
Module Leader: 
Module Tutor(s): 

A. Objectives:
The course is designed to meet the objectives of:
1. learning to program in an object-oriented programming language,
2. focusing those who already have some experience with another programming language, and who now wish to move on to an object-oriented one,
3. learning object-oriented programming language namely, Java.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. explain the principles of the object oriented programming paradigm specifically including abstraction, encapsulation, inheritance and polymorphism using Java,
2. use an object oriented programming language, and associated class libraries, to develop object oriented programs using Java,
3. design, develop, test, and debug programs using object oriented principles in conjunction with an integrated development environment using Java.

C. Subject matter:
Unit I:
Introduction: Basic features & concepts of Object Oriented Programming, (OOP), Benefits, Languages and Applications of OOPs.
Tokens, Expressions and Control Structures: Tokens, Keywords, Identifiers & Constants, Basic data types, User-defined data types, Derived data types, Memory management operators, Manipulators, Expressions, Operator overloading, Control structures
Functions in C++: Main function, function prototyping, call by reference, inline functions, default functions, function overloading
Classes and Objects: Specifying a class, defining member functions, private member functions, array within a class, memory allocation for objects, arrays of objects, objects as function arguments, returning objects, pointers to members, local classes

Unit II:
Constructors & Destructors: Constructors, Parameterized constructors, Constructors with default arguments, Dynamic initialization of objects, Dynamic constructors & destructors
Operator Overloading & Type Conversion: Definition & rules of overloading operators, Overloading binary & unary operators
Inheritance: Definition, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual base classes, abstract classes

Pointers, Virtual Functions and Polymorphism: Pointers, Pointers to objects and derived classes, virtual functions, Pure virtual functions.

Unit III:
Templates: Class templates, function templates, overloading of function templates, member function templates
Strings: Creating and manipulating string objects, accessing characters in strings.
Java Basics: History of Java, Java buzzwords, datatypes, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.
Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring packages – Java.io, java.util.
Exception handling and multithreading: Concepts of exception handling, benefits of exception handling, Terminating or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Unit IV:
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components - labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grib bag.
Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.
Networking: Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, Java .net package Packages – java.util.

D. List of practicals: (Minimum eight experiments should be conducted by students)
1. Write a program in Java to demonstrate class, constructor, overloading, inheritance, overriding
2. Write a program in Java to demonstrate wrapper class, vectors, arrays
3. Write a program in Java to demonstrate interfaces- multiple inheritance, extending interfaces
4. Write a program in Java to demonstrate packages
5. Write a program in Java to demonstrate multithreaded programming, handling errors and exceptions, applet programming and graphics programming
6. Write a program in Java to demonstrate Java SWING application.
7. Write a program in Java to demonstrate Client Server Programming.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Regular Examination and online Examination.
2. Practical Examination: Conducting experiment and viva voice.

G. Reading lists:
Books:
8. Bruce Eckel, “Thinking In Java”, Prentice Hall.

Magazine:
1. Java Magazine by Oracle, Oracle, California, United States.

Journals:

Name of the Module: Behavioural Science
Module Code: HSS 301
Semester: 3rd
Credit Value: 2 [P=0, T=0, L=2]

A. Objectives:
The course is designed to meet the objectives of:
1. imparting theoretical lectures with case discussion.
2. providing teaching with inclusive learning.
3. making students aware about the importance of this subject in their future career.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. work with efficiency as they had knowledge of the subject.
2. with the backup knowledge their performance will definitely much better in their workplace.
C. Subject Matter:

Unit I

**Behavioral Science:** An overview: definitions, Man the critical factor, Behavioral science and its historical development.

**Motivation:** Nature of drives, needs and motives, work motives, need hierarchy theory and two factor theory of motivation, how to motivate the workers at work, factors effecting the morale of workers.

Unit II

**Industrial Sociology:** Concept and Definitions; Importance for Engineers; Growth; Criticism of the Hawthorne Studies; Nature and scope of Industrial sociology, Industry and Community, Industry and Tradition in India.

**Society and Technical Change:** Concept of social change, meaning and definitions of social change, nature of social change. Factors such as Natural, Cultural, Economic, Planning, Technological, Indian Information Technology Scenario, Effect of Technology on Social Institutions.


Unit III

**Groups:** Meaning and Definitions, types of Groups, characteristics, functions of formal and informal groups, merits and demerits of informal groups.

Unit IV

**Human relations:** Historical overview, definitions, early and later approaches to human relations, strategies for establishing healthy human relations.

**Labour management relations:** Industrial relations; meaning, objectives and definitions, Dunlop’s theory of industrial relations, Psychological and Gandhian approach to industrial relations, industrial relations in Japan and India, industrial relation in coming years, challenges of coming years, new dimensions of industrial relations, the ways of industrial peace. Trade unions; meaning and definitions, functions of Indian trade Unions, recent emerging trends in Indian trade unions.

D. Teaching/Learning Pattern:

1. Teaching : 50%
2. Learning/case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination Pattern:

1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading List:

Books:


**Magazines:**
1. *Leadership Quarterly*
2. *HBR Magazine*

**Journals:**
1. *Journal of Behavioural Sciences*
2. *Behavioural and Brain Sciences*
3. *Journal of Contextual Behavioural Sciences*
Fourth Semester

<table>
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<tr>
<th>Subject Code</th>
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<th>P</th>
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<td>Entrepreneurship &amp; Innovation</td>
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Name of the Module: Stochastic Process  
Module Code: MAS 401  
Semester: 4th  
Credit Value: 4 \[P=0, \ T=1, \ L=3\]  
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. imparting theoretical knowledge and practical application to the students in the area of Stochastic Process,
2. introducing the basic notions of probability theory and develops them to the stage where one can begin to use probabilistic ideas in statistical inference and modeling, and the study of stochastic processes,
3. providing confidence to students in manipulating and drawing conclusions from data and provide them with a critical framework for evaluating study designs and results,
4. injecting future scope and the research directions in the field of stochastic process.

B. Learning outcomes:
Upon Completion of the subjects:
1. students will add new interactive activities to fill gaps that we have identified by analyzing student log data and by gathering input from other college professors on where students typically have difficulties,
2. students will add new simulation-style activities to the course in Inference and Probability,
3. students will be substantially prepared to take up prospective research assignments.

C. Subject matter:
Unit I:  
Probability:  
Theory of Probability: Random Experiment, Sample space; Random Events; Probability of events. Axiomatic definition of probability; Frequency Definition of probability; Finite sample spaces and equiprobable measure as special cases; Probability of Non-disjoint events (Theorems). Counting techniques applied to probability problems; Conditional probability; General Multiplication Theorem; Independent events; Bayes’ theorem and related problems.
Random variables (discrete and continuous); Probability mass function; Probability density function and distribution function. Distributions: Binomial, Poisson, Uniform, Exponential, Normal, t and χ². Expectation and Variance (t and χ² excluded); Moment generating function; Reproductive Property of Binomial; Poisson and Normal Distribution (proof not required). Transformation of random variables (One variable); Chebychev inequality (statement) and problems.

Unit II: Approximation Theory: Binomial approximation to Poisson distribution and Binomial approximation to Normal distribution (statement only); Central Limit Theorem (statement); Law of large numbers (Weak law); Simple applications.

Unit III:
Statistics:
Sampling Theory: Population; Sample; Statistic; Estimation of parameters (consistent and unbiased); Sampling distribution of sample mean and sample variance (proof not required).
Estimation Theory: Point estimate, Maximum likelihood estimate of statistical parameters (Binomial, Poisson and Normal distribution). Interval estimation.
Testing of Hypothesis: Simple and Composite hypothesis; Critical Region; Level of Significance; Type I and Type II Errors; Best Critical Region; Neyman-Pearson Theorem (proof not required); Application to Normal Population; Likelihood Ratio Test (proof not required); Comparison of Binomial Populations; Normal Populations; Testing of Equality of Means; χ²—Test of Goodness of Fit (application only).

Unit IV:
Correlation and Regression: Simple idea of Bivariate distribution; Correlation and Regression; and simple problems

D. Teaching/Learning/Practice pattern:
Teaching: 70%
Learning: 30%
Practice: 0%
(Teacher is to divide components for T/L/P)

E. Examination pattern:
1. Theoretical Examination & Open book examination.

F. Reading lists:
Books:

Magazines:
1. Current Science (Indian Academy of Science)
2. The Mathematics Student (Math Student) (Indian Mathematical Society)
3. Mathematical Spectrum(The University of Sheffield)
4. Mathematics Magazine (Mathematical Association of America)
5. +Plus magazine (University of Cambridge)
6. Ganithavahini (Ramanujan Mathematical Society)

Journals:
1. Advances in Probability and Related Topics (Marcel Dekker)
3. Annals of Probability (Institute of Mathematical Statistics)
4. Communications on Stochastic Analysis
5. Electronic Journal of Probability
6. Séminaire de Probabilités (Lecture Notes in Mathematics, Springer-Verlag)
7. Stochastic Modelling and Applied Probability (Springer-Verlag)
8. Stochastic Processes and their Applications
10. Theory of Probability and its Applications (SIAM)
18. SANKHA, ISI, Kolkata.

Name of the Module: Formal Language and Automata Theory
Module Code: CSE 401
Semester: 4th
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet with the objectives of:
1. providing a deeper understanding of programming languages design motivations and semantics,
2. facilitating students to select and use the most appropriate language for a given task and write correct programs,
3. illustrating language processing techniques: compilation and interpretation.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand and apply formal notations via regular expressions and grammars, as well as their recognizers (finite automata, push-down automata),
2. provide relevant formal definitions for given languages,
3. discuss virtual machines and intermediate languages trade-offs,
4. understand and apply basic language processing techniques: compilation and interpretation.

C. Subject matter:
Unit I:
- **Instruction** to the theory of formal languages, Chomsky Hierarchy of languages, 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 e-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.
- **Finite State Machines**: Definition, concept of sequential circuits, state table & state assignments, concept of synchronous, asynchronous and linear sequential machines.

Unit II:
- **Finite State Models**: 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 loss less & inverse machines: testing table & testing graph.

Unit III:
- **Closure Properties of Regular Sets**: Pumping lemma & its application, closure properties minimization of finite automata: minimization by distinguishable pair, Myhill–Nerode theorem.
- **Context Free Grammars**: Introduction, definition, derivation trees, simplification, CNF & GNF.

Unit IV:
- **Closure Properties of CFLs**: Pumping lemma & its applications, ogden’s lemma, closure properties, decision algorithms.
- **Introduction to Z**: Regular language properties and their grammars. Context sensitive languages. Turing machine and the concept of computability, halting problem of TM.

D. Teaching/ Learning/ Practice pattern:
- Teaching: 60%
- Learning: 40%
- Practice: 0%
E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

G. Reading lists:
Books:

Magazines:
1. Formal language theory.
2. JFLAP (Java Formal Languages and Automata Package).

Journals:
1. Journal of Automata, Languages and Combinatorics, Otto-von-Guericke University Magdeburg, Germany.

Name of the Module: Advanced Computer Architecture
Module Code: CSE 402
Semester: 4th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet with the objectives of:
1. helping the student develop an understanding of the nature and characteristics of the organisation and design of the modern computer systems,
2. focusing on the organisation & operation of the CPU. The Intel Pentium CPU will be used as the main case study.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand the key concepts that are likely to be included in the design of any modern computer system,
2. understand and apply the basic metrics by which new and existing computer systems may be evaluated,
3. understand and evaluate the impact that languages, their compilers and underlying operating systems have on the design of computer systems,
4. understand and evaluate the impact that peripherals, their interconnection and underlying data operations have on the design of computer systems,
5. demonstrate the techniques needed to conduct the design of a computer to examine different computer implementations and assess their strengths and weaknesses.

C. Subject matter:
Unit I:
**Computer performance analysis**: classification of computer architecture: SISD, SIMD, MISD, MIMD.
**Instruction level parallelism**: 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, Super scaler and VLIW architecture.

Unit II:
**Vector processors**: Use and effectiveness, memory to memory vector architectures, vector register architecture, vector length and stride issues, and compiler effectiveness in vector processors. Case study with real life Intel processor.

Unit III:
**Memory**: hierarchy Cache Introduction, mapping technique; direct, set associative and fully associative. 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, memory mapped management technique.
**RISC architectures**: addressing modes, instructions formats, effect of simplification on the performance, example processors such as MIPS, PA-RISC, SPARC, Power PC, etc.

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

D. List of practical:
1. Hands on experience with VHDL/Verilog tools, synthesize circuits targeted to standard gate library.
2. Write VHDL/Verilog codes for 4 bit. Design and implement a pipelined 4 bit CPU with few instructions and synthesize. CPU with few instructions synthesize and port it to FPGA.
3. Design and implement a pipelined 4 bit CPU with few instructions and synthesize.
4. Design and implement a parallel 4 bit CPU with few instructions and synthesize.
5. Study of cache performance in presence of multi-level cache hierarchy.

E. Teaching/ Learning/ Practice pattern:
   Teaching: 40%
   Learning: 10%
   Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice
G. Reading lists:

Books:

Magazines:
1. IEEE Micro Magazine | IEEE Computer Society - IEEECS, United States

Journals:
1. ACM Transactions on Architecture and Code Optimization (TACO), ACM New York, USA
2. IEEE Transactions on Computers, IEEE Computer Society, United States
3. ACM Transactions on Embedded Computing Systems (TECS), ACM New York, USA
4. Future Generation of Computer Systems, Elsevies, Netherlands
5. International Journal of Parallel Programming, Springer, United States

Name of the Module: Design & Analysis of Algorithm
Module Code: CSE 403
Semester: 4th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. learning specification of the concept of algorithm and analysis of its computational complexity,
2. learning design principles of algorithms and their application to computing problems,
3. making analysis accessible to all levels of readers.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. design algorithms for difficult problems,
2. analyse and understand their complexity,
3. implement the algorithms in practice.
C. Subject matter:

Unit I:
- **Models of computation**: RAM, TM etc. time and space complexity
- **Asymptotic Notation**: Big-O, omega, theta etc.; finding time complexity of well known algorithms like- heap sort, search algorithm etc.
- **Algorithm Design techniques**: Recursion- Definition, Use, Limitations, and Examples: Hanoi problem. Tail Recursion
- **Divide and Conquer**: Basic method, use, Examples: Merge sort, Quick Sort, Binary Search

Unit II:
- **Dynamic Programming**: Basic method, use, Examples: matrix-chain multiplication, all pair shortest paths, single-source shortest path, travelling Salesman problem
- **Branch and Bound**: Basic method, use, Examples: The 15-puzzle problem
- **Backtracking**: Basic method, use, Examples: Eight queens problem, Graph coloring problem, and Hamiltonian problem

Unit III:
- **Greedy Method**: Basic method, use, Examples: Knapsack problem, Job sequencing with deadlines, minimumspanningtree(Prim's and Kruskal's algorithms)
- **Lower Bound Theory**: Bounds on sorting and sorting techniques using partial and total orders.
- **Disjoint Set Manipulation**: Set manipulation algorithm like UNION-FIND, union by rank, Path compression.
- **Properties of graphs and graph traversal algorithms**: BFS and DFS

Unit IV:
- **Matrix manipulation algorithms**: Different types of algorithms and solution of simultaneous equations, DFT & FFT algorithm; integer multiplication schemes
- **Notion of NP-completeness**: Non deterministic algorithm, COOK’s theorem, P class, NP-hard class, NP-complete class, CNF Satisfiability problem, proof a problem to be NP hard, Clique Decision Problem.
- **Approximation algorithms**: Necessity of approximation scheme, performance guarantee, Polynomial time approximation schemes: 0/1 knapsack problem

D. List of practicals: (Minimum five experiments should be conducted by students)
Write the following problems in any programming language. Programming Language used: C
1. Divide and Conquer:
   - Implement Binary Search using Divide and Conquer approach
   - Implement Merge Sort using Divide and Conquer approach
   - Implement Quick Sort using Divide and Conquer approach
   - Find Maximum and Minimum element from a array of integer using Divide and Conquer approach
2. Dynamic Programming:
   - Find the minimum number of scalar multiplication needed for chain of matrix
   - Implement all pair of Shortest path for a graph (FloyedWarshall Algorithm)
   - Implement Traveling Salesman Problem
   - Implement Single Source shortest Path for a graph (Dijkstra, Bellman Ford)
3. Branch and Bound:
   - Implement 15 Puzzle Problems
4. Backtracking:
   - Implement 8 Queen Problem
   - Graph Coloring Problem
5. Greedy method:
   - Knapsack Problem
   - Job sequencing with deadlines
   - Minimum Cost Spanning Tree by Prim's Algorithm
   - Minimum Cost Spanning Tree by Kruskal's Algorithm

6. Graph Traversal Algorithm:
   - Implement Breadth First Search (BFS)
   - Implement Depth First Search (DFS)

E. Teaching/ Learning/ Practice pattern:
   - Teaching: 60%
   - Learning: 40%
   - Practice: 0%

F. Examination pattern:
   1. Theoretical Examination: Regular Examination.
   2. Practical Examination: Conducting experiment and viva voice

G. Reading Lists :
A. Books:

B. Magazines:
   1. Slaves to the algorithm - Aeon Magazine
   2. Algorithm Articles - Offshore Magazine

C. Journals:
Name of the Module: System Software & Administration  
Module Code: CSE 404  
Semester: 4th  
Credit Value: 4 [P=2, T=0, L=3]  
Module Leader:

The course is designed to meet with the objectives of learning:

1. working principle of Assemblers, Macro Processors, Loaders etc,  
2. different loaders and loading schemes,  
3. working principle and different configurations in unix based operating systems,  
4. process programming in unix based operating system,  
5. structure of file Systems in unix operating systems and Network File Systems, and  
6. process of system backup and recovery.

B. Learning outcomes:
Students successfully completing this module will be able to:

1. know assembler, linker, loader, macro and their working principles,  
2. practice different general commands and pipelining used in unix commands,  
3. learn different types of loaders using programming languages,  
4. learn shell programming in unix based operating systems,  
5. program linux assembly level programming,  
6. configuration of different services in unix operating systems.

C. Subject matter:
Unit I:  
Assemblers: General design procedures, instructions and data representations, Design of two pass assemblers, Linux assembly language, assembly language programming and simulation using X86, Cross Assemblers  
Macro Processors: Features of a macro facility, macro instruction arguments, conditional macro expansion, macro calls within macros, Macro Assemblers.

Unit II:  
Loader schemes: Compile and go loaders, absolute loaders, relocating loader, Linking, Reallocation-static & dynamic linking, Direct linking loaders.  
Binders, Overlays, dynamic binders; working principle of Editors, Debuggers.

Unit III:  
Overview of Unix system, commands and utilities; Basic Linux administration and installation: grub, rpm, yum, disk partitioning; Basic Linux utilities, logging, backup, authentication; Internet mail system: send mail, elm, mail administration; Program Maintenance: make, sccs, debugging with gdb and ddd (Data Display Debugger)
Archiving: shar, tar; Shell use: redirection, .cshrc, environment variables; Regular Expression parsing: grep, egrep, sed, awk; Shell programming: bash; Scripting Languages like Perl, Python, Java Script; Database Driven Web Site: PHP and MySQL;
Study of Unix file systems and functionalities of different directories, directory layout.

Unit IV:

**Different Editors and their operation techniques:** vi, nano, vim, emacs

**Documentation and Presentation:** Document writing and Slides using LaTeX; Windows administration: Managing the server operating system, file, and directory services, Software distribution and updates, Profiling and monitoring assigned servers, Security and Troubleshooting;

**Services and Daemons:** Configuring the Default Runlevel, Configuring the Services, Running Services, Additional Resources, list of services and their names, Case study of services: NFS, FTP, DNS etc

Case study on Bit bucket, GitHub

**D. List of practical: (Minimum eight experiments should be conducted by students)**

1. Study and installation of Unix based operating system.
2. Study and practices of basic Unix commands, shortcuts and pipelining, managing accounts, privileges given to different users, create groups, changes passwords etc
3. Introduction of Shell Programming with examples.
4. Study and practice of Linux assembly language programming using x86 assembly language programming.
5. Study and practice of NASM assembly language programming.
7. Implementation of Macro processor
8. Implementation a Symbol Table With different functions.
10. Study and configuration of NFS Configuration.

**E. Teaching/ Learning/ Practice pattern:**

Teaching: 40%
Learning: 20%
Practice: 40%

**F. Examination pattern:**

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

**G. Reading lists:**

**Books:**


Magazines:
1. IBM Systems Magazine, IBM, NewYork, U.S
2. Linux Magazine
3. Open Source Magazine
4. ADMIN Magazine

Journals:
1. Journal of Software Engineering and Applications, Inderscience, Switzerland, ISSN online: 2053-2474, ISSN print: 2053-2466.
3. Software and System Modeling (SoSyM), Springer, ISSN: 1619-1366 (Print) 1619-1374 (Online).

Name of the Module: Control System Engineering
Module Code: EE 405
Semester:4th
Credit Value: 3[P = 2, T = 0, L = 3]
Module Leader:
Module Tutor(s):

A. Objectives:

The course is designed to meet the objectives of:

1. imparting theoretical and practical knowledge to the students in the area of process control engineering.
2. study of basic characteristics of feedback control systems.
3. introduction to FRA and State Variable Analysis.
4. study of basic concepts of optimal control and non-linear control.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand the basic terminology used in control system engineering.
2. use and apply skills in designing and operation of control systems employed in various industries.

C. Subject matter:
Unit I:
Introduction: Concept of feedback and Automatic Control, Electrical analogy of physical system. Transfer Function, Design and Compensation of control systems, Block diagram representation of Control Systems, Block Diagram Algebra, Signal Flow Graph, and Mason’s gain formula, Modelling in state space.

Unit II:
Control system components: Error sensing devices, potentiometer, Synchros, D.C. and A.C. tacho meters, servo motors, modulators and demodulators.
Mathematical modelling of physical systems: State space representation of differential equations, Liquid level systems, Pneumatic systems, Hydraulic systems, Thermal systems, Transformation of mathematical models in MATLAB.

Unit III:
Steady State and Transient Analysis: Introduction to first order, second order and higher order control systems, Transient analysis of closed loop systems, Transient errors and their minimisation, steady state error and their minimisation, error coefficients, P, PI and P-I-D type controllers, Effects of integral and derivative control on system performance, Tuning methods: Ziegler-Nichol’s Tuning, Zero placement approach, degrees of freedom.

Unit IV:

D. List of practicals:
1. Familiarization with MATLAB control system toolbox, MATLAB Simulink toolbox & PSPICE.
2. Determination of step response for first order & second order system with unity feedback on CRO & calculations of control system specification.
3. Calculation and verification of time constant, peak over shoot, setting time etc. from the response.
4. Simulation of step response & impulse response for type-0, type-1 & type-2 system with unity feedback using MATLAB & PSPICE.
5. Determination of Root Locus, Bode-Plot, Nyquist Plot using MATLAB-Control system.
toolbox for 2\textsuperscript{nd} order system determination of different control system specifications from the plot.
6. Determination of PI, PD, PID controller action of first order simulated process.
7. Determination of approximate transfer function experimentally from Bode plot.
8. Evaluation of steady state error, settling time, percentage peak over shoot, gain margin, phase margin, with addition of lead compensator & by compensator in forward path transfer function for unity feedback control system using PSPICE.
9. Determination of control system specifications for variations of system parameters in practical position control system.
10. a. Design of a second order linear time invariant control system and study of system response with unit step input.
   \[
   \begin{array}{c}
   \text{u}(t) \\
   \frac{\omega_n^2}{s^2 + 2\xi\omega_n + \omega_n^2} \\
   \text{c}(t)
   \end{array}
   \]
   b. Design a scheme for minimization of possible oscillation with generation of the dotted signal as shown below.
   \[
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   \text{c}(t) \\
   \text{t}
   \end{array}
   \]
   c. Generalization of the technique for oscillation free response based on above idea (b).

E. Teaching/Learning Practice Pattern:
- Teaching: 50% 
- Learning: 40% 
- Practice: 10%

F. Examination Pattern:
1. Theoretical Examination: On line.
2. Practical Examination: Performing experiments and viva voce.

G. Reading Lists:
Books:

Magazines:
1. Industrial Electronics Magazine, IEEE.
2. Control and Automation Magazine, IEEE.
4. Control and Automation Magazine, IET.

Journals:
1. Intelligent Systems, IEEE Transactions.

Name of the Module: Entrepreneurship and Innovation:
Module Code: HSS 401
Semester: 4th
Credit Value: 3 [P=0, T=0, L=3]

A. Objectives:
The course is designed to meet the objectives of:
1. to involve themselves in the business activities
2. starting innovative practices in their entrepreneurial activities.
3. developing their skills on the traits that they want to carry forward.
4. starting activities on Forest based Technology.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. start their venture more scientifically.
2. start their venture by linking with the financial institutions.

C. Subject matter:
Unit I:
Introduction to Entrepreneurship: Meaning, Role of Entrepreneur, Entrepreneur Process: different approaches, Motivation for becoming an Entrepreneur.
SME Concept, its role, status, prospects and policies for promotion of SMEs.
Importance of Entrepreneurship: innovations, Qualities of successful Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneur, Issues & Problems Entrepreneurial Practices,

Unit II:
Importance of Entrepreneurship: innovations: Converting Innovation to Economic Value which includes, Growth Strategies, value position, Market Segments, Value Chain Structure, Revenue Model
etc., Qualities of successful Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneur, Issues & Problems Entrepreneurial Practices.
Entrepreneur Carrier: Different Stages, Entrepreneur Development Programmers (EDPs).

Unit III:
Women Entrepreneurship: Opportunities, promotion Hurdles and Prospects of women Entrepreneurs.
Factors & Models of Entrepreneurial Development.
Social Entrepreneurial Initiative: Solving social Problems, Business plan, Strategic Plan vs Business Plan

Unit IV
Forest based Industries: Mobilization of resources from NTFP products, Processing units, Technical and Financial Feasibility study and analysis of projects under self employment scheme including small entrepreneur.
Farm based enterprises for production and post production of Agri-produce:
Handlooms & Sericulture; Handicraft, coir, jute & leather
Micro entrepreneurial skills development and good production practices

D. Teaching/ Learning/ Practice pattern:
Teaching: 70%
Learning: 30%
Practice: 0%

E. Examination pattern:
1. Theoretical Examination

F. Reading Lists:
Books:
5. Entrepreneurship: Successfully Launching New Ventures by Barringer, Pearson Education Publishing

Magazines:
1. Longe Magazine
2. Home Business Magazine
3. Entrepreneur
Journals:
1. International Journal of Entrepreneurship
2. International Journal of Innovation Management
3. Journal of Small business and Entrepreneurship
5. Journal of Management Research
Name of the Module: Microprocessor, Microcontroller & Embedded System  
Module Code: ECE 501  
Semester: 5th  
Credit Value: 4 [P=2, T=0, L=3]  
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. To study the Architecture of microprocessor and microcontroller
2. To study the Interrupts and DMA
3. To study the synchronous, asynchronous, interrupt driven using 8255

B. Learning outcomes:
Upon completion of the subjects, the student would be able to:
1. Design a microprocessor
2. Configure or design a microprocessor-based system.
3. Understand efficiency in microprocessor-based system.
4. Write code or a compiler for a microprocessor which takes advantage of the advanced architectural techniques.

C. Subject matter:
Unit I:
Architecture of microprocessor; case study with intel series of microprocessors. Assembly language programming using intel 8085 microprocessor.

Unit II:
Interfacing of memory to a microprocessor; system bus, timing diagram, peripheral chips (IO mapped IO & Memory mapped IO). Interrupts and DMA. Interfacing of I/O devices; modes of data transfer, synchronous, asynchronous, interrupt driven using 8255 PPI, interfacing of DAC and ADC. Serial mode of data transfer using 8251.

Unit III:
Interfacing of key board and display devices using 8279, Peripherals: 8279, 8255, 8251, 8253, 8237, 8259, A/D and D/A converters and interfacing of the same. Typical applications of a microprocessor.
Unit IV:
Microprocessor versus Microcontroller architecture. Memory and I/O interfacing to 8051 microcontroller. 16 bit processors: 8086 and architecture, segmented memory hascycles, read / write cycle in min / max mode. Reset operation, wait state, Halt state, Hold state, Lock operation, interrupt processing. Addressing modes and their features.

D. List of Practical:
1. Start two set of integer into two arrays. Add even number into two arrays. Add even number of one array with odd number of another & vice-versa.
2. To develop a subroutine to add two floating point quantities.
3. To develop program to multiply two single byte unsigned numbers, giving a 16 bit product.
4. To develop subroutine which will multiply two positive floating point numbers.
5. Design a delay loop using i) NOP instruction and ii) Loop Instructions. ADD X, Y for a fixed period. Compare the two.
6. To write program to evaluate P* Q*+R*S are 8 bit binary numbers.
7. To write a program to divide a 4 byte number by another 4 byte number.
8. Write a program for adding first N natural numbers and store the results in memory location X.
9. Write a program which decrements a hex number stored in register C.
10. To design and interface a circuit to read data from an A/D converter, using the 8255 A
11. To design and interface a circuit to convert digital data into analog signal using the 8255 A in the memory mapped I/O.
12. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
13. To design a circuit to interface a memory chip with microprocessor with given memory map.

E. Teaching/Learning/Practice pattern:
Teaching : 40%
Learning : 10%
Practice : 50%

F. Examination pattern:
1. Theoretical Examination: Open book/ Regular examination and on line test.
2. Practical Examination: Conducting Experiment and Viva-Voce.

G. Reading Lists:
Books:
3. The 8051 Microcontroller And Embedded Systems Using Assembly And C, 2/E by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay, Pearson India
4. An introduction to microcomputers Vol.2– some real Microprocessor – Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
5. Advanced Microprocessors by Rayand Bhurchandi-TMH
8. Assembly Language Programming the IBMPC by Alan R. Miller, Subex Inc, 1987
9. The Intel Microprocessors: 8086/8088,80186,80286,80386&80486, Bary B.Brey, Prentice Hall, India

Magazines:
1. IEEE Spectrum
2. Electronics for you
3. Electropages
4. The Future of Microprocessors

Journals:
1. Microprocessors and Microsystems- Embedded hardware design (Elsevier)
2. International Journal of Embedded Systems

Name of the Module: Principle of Communication Engineering
Module Code: ECE-521
Semester: 5th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. To make the students to understand different types of modulation and demodulation techniques.
2. Communication signals to be encountered in communication engineering and to study their behaviour in time and frequency domain.
3. To make students familiarization about radio signals transport by multiplexing and de multiplexing.
4. To make students to know about noise problem in communication, and to solve the problem.

B. Learning outcomes:
At the end of this module, students are expected to be able to
1. Utilize the appropriate modulation techniques & multiplexing in transporting signals over a channel.
2. To reject noise from the communication signals.

C. Subject matter:
UNIT I:
Review: Classification of signals, Basic blocks of communication system, Introduction to various terminologies: Transmitter, Receiver, Modulation, Carrier, Channel etc, Review of Frequency Bands, Fourier Transform and Fourier series.
Amplitude Modulation Systems: Need for modulation, normal AM, generation and demodulation (envelope & synchronous detection), modulation index, DSB-SC: generation and demodulation, Effect of phase and frequency offset on demodulation, SSB: Generation using filter and phasing method, detection. Frequency division multiplexed systems using SSB.

UNIT II:
Angle Modulation Systems: Concept of frequency and phase modulation, frequency deviation and modulation index, FM spectra, Carson’s rule, narrowband FM, generation of Wideband FM Armstrong method, direct FM generation. Demodulation of FM-discriminatory, Effect of non-
linear distortion and interferences, Superheterodyne analog AM/FM receivers, FM Broadcasting system, Pre-emphasis and de-emphasis, PLL.

Radio Receivers: TRF and superheterodyne receiver, AGC, FM receiver, sensitivity, selectivity, image frequency rejection measurements, communication receiver and its special features.

UNIT III:
Sampling and Discrete time Modulations: Sampling Theorem – low pass and band pass, Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM) their generation and detection-phase time division multiplying. Review of random signals and noise, signal to noise ratio in amplitude and angle modulated systems. Thermal and shot noise, White noise and filtered noise, AWGN Properties, Noise equivalent bandwidth concept.


UNIT IV:

D. List of Practicals: (Minimum eight experiments should be conducted by students)
1. Design an AM transmitter (or Use AM Trainer kit) to study Amplitude Modulation with given input wave and carrier wave, and hence the power efficiency of AM.
2. Use the AM transmitter designed in experiment number 1 to generate SSB and DSB transmitter with necessary other circuits. Study the output and power efficiency of the circuit.
3. Design a FM transmitter (or Use FM Trainer kit) to study Frequency Modulation with given input wave and carrier wave, and hence the power efficiency of FM.
4. Use the FM transmitter designed in experiment number 3 to generate PM with necessary other circuits. Study the output and power efficiency of the circuit of PM transmitter.
5. Design an SSB-SC receiver and use it with the circuit of experiment number 2 (SSB-SC transmitter) to design a complete SSB-SC radio.
6. Design PLL demodulator of PM and test the same with PM transmitter designed in experiment number 4.
7. Design any practical noise filtering circuit, and study its input and output in term of signal to noise ratio.
9. Design a 4 to 1 FDM and study its operation.
10. Design a 1 to 4 demultiplexer and use it with the circuit of experiment number 9 and justify the communication by multiplexing.

E. Teaching/Learning/Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Open book/ Regular examination and online test.
2. Practical Examination: Conducting Experiment and Viva-Voce.
G. Reading Lists:

Books:

Magazines:
1. Electronics For You
2. Electronics Business Magazine.
3. Chip

Journals:
2. Springer
3. IEEE Spectrum
5. Electronics Letter

Name of the Module: Operating System
Module Code: CSE 501
Semester: 5th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. appreciating the role of an operating system,
2. making aware of the issues in management of resources like processor, memory and input-output,
3. selecting appropriate productivity enhancing tools or utilities for specific needs like filters or version control,
4. obtaining some insight into the design of an operating system.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understands what is an operating system and the role it plays,
2. get high level understanding of the structure of operating systems, applications, and the relationship between them,
3. gather knowledge of the services provided by operating systems,
4. get exposure to some details of major OS concepts.

C. Subject matter:

Unit I:
System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), Operating System services, system calls.
Process Management: Processes: Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication. Threads: overview, benefits of threads, user and kernel threads.

Unit II:
CPU Scheduling: Scheduling criteria: pre-emptive & non-pre-emptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.
Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Unit III:
Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.
Storage Management: Memory Management: background, logical vs. physical addresses space, TLB, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging. Virtual Memory: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.
File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

Unit IV:
I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.
Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.
Protection & Security: Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.
Case Studies: Dos & Unix.

D. List of practicals:
Familiarization with UNIX system calls for process management and inter-process communication;
Experiments on process scheduling and other operating system tasks through simulation under a simulated environment (like Nachos, pintos).

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
F. Examination pattern:

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

G. Reading lists:

Books:

Magazines:
1. SIGOPS - Operating Systems Review, ACM New York, USA

Journals:
1. TOCS - ACM Transactions on Computer Systems, ACM, United State
2. TPDS - IEEE Transactions on Parallel and Distributed Systems, IEEE Computer Society, United State

Name of the Module: Database Management System
Module Code: CSE 503 (I)
Semester: 5th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet with the objectives of understanding
1. the purpose of a database management system (DBMS),
2. the role of the database administrator,
3. what is meant by data consistency, data integrity, data redundancy and data independence,
4. the concept of entity relationships and data normalisation,
5. the concept of a client/server database, and
6. the relevant advantages of a client/server database over a non-client/server database,

B. Learning outcomes:
Students successfully completing this module will be able to
1. design database, different operations, queries performed for a management system problems,
2. understand and design of ER-diagram in DBMS,
3. Implementation of different normalizations for database size reduction and removal of redundancy, and
4. able to implement PL/SQL, SQL injection, procedures etc.

C. Subject matter:

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

Unit II:
Relational Model: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.
SQL and Integrity Constraints: Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Sub queries, Database security application development using SQL, Stored procedures and triggers.

Unit III:
Relational Database Design: Functional Dependency, Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition, Boyce-Code Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF
Internals of RDBMS: Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, stateserializability, lock base protocols, two phase locking.

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

D. List of practicals: (Minimum three experiments should be conducted by students)

Write the following in Oracle PL/SQL Stored Procedure
1. Design and perform different operations on a database for a management problem.
2. Study and implementation of different group functions (eg. avg, count, max etc.).
3. Study and implementation of different types of joins (eg. left, right, inner join etc.).
4. Study and implementation of views, indices.
5. Study and implementation of different types of integrity constraints.
6. Study and implementation of normalizations.
7. Perform and study of cursors and triggers.
8. Study and implement various PL/SQL procedures.
9. Study, use and implementation of different front end development tools in applications.
10. Perform and study of ODBC and CORBA calls from application programs.
11. Study and perform import and export in database.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Open Book and online Examination.
2. Practical Examination: Conducting experiment and viva voice

G. Reading Lists:
Books:

Magazines:
1. IBM Systems Magazine, IBM, New York, U.S.
2. IT - Data Management Magazines, IBM, New York, U.S.
3. Relational Database Management Systems (RDBMS and DBMS), IBM, New York, U.S.

Journals:
1. Journals in Database Management & Info Retrieval - Springer, United States
3. Journal of Database Management (JDM), IGI, Hershey-New York, USA

Name of the Module: Industrial Management
Module Code: HSS 501
Semester: 5th
Credit Value: 3 [P=0, T=0, L=3]

A. Objectives:
The course is designed to meet the objectives of:
1. Imparting theoretical lectures with case discussion.
2. Providing teaching with inclusive learning.
3. Making students aware about the importance of this subject in their future career.

B. Learning outcomes:
Students successfully completing this module will be able to:

1. Students will be work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely much better in their workplace.

C Subject matter:

Unit I:
Concept of Management: Various Approaches to Management, Management as – an art, a Science, and a Profession, Managerial skills, Process of management, Planning-Mission, Goals, Strategy, Program and Procedure; Decision making-process, decision making under risk and uncertainty, Models of decision making.

Unit II:
Principles of Organization: Organizational Structure, span of control, Staffing function with emphasis on, Performance Appraisal, Training and Development.

Unit III:
Direction and coordination: Motivation and Leadership, control function-Process and Techniques.

Unit IV:
Production Management: Types of Production, Locational Decisions, Plant layout and design, Production
Planning scheduling and control: work study, method Study, and Wage Payment Schemes and Bonus, Productivity – concept and measurement.
Material Management: Inventory Planning, Procurement-functions, procedures and control, storing-planning procedure and control, issue and pricing, Inventory control Techniques, Value analysis and Engineering.

D. Teaching/ Learning pattern:
1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:
1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading lists:
Books:

Magazines:
1. Industrial Management and Entrepreneurship
2. Industrial Management Magazine
Journals:
1. Group and Organization Management
2. Journal of Organizational Behaviour

Name of the Module: Graph Theory & Combinatorics
Module Code: CSE 505
Semester: 5th
Credit Value: 3 \([P=0, \; T=0, \; L=3]\)
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. imparting theoretical and practical application to the students in the area of Graphs and combinatorics,
2. injecting future scope and the research directions in the field of Graphs and Combinatorics,
3. making students competent to analyse and design of real world problem.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. adequately trained to model problems of real world.
2. skilled both theoretical and practical application to other branch of engineering.
3. substantially prepared to take up prospective research assignments.

C. Subject matter:
Unit I:
Graph Theory
Graph Theory: Basic concepts, Graph isomorphism, Subgraph, Degree, Walk, Path, Cycle, Trees, Spanning trees, Cut vertices and cut edges, Connectivity, Euler tours and Hamiltonian cycles. Matching, Perfect matching, Colour of a graph, Vertex colouring, Chromatic polynomial, edge colouring. Planer and non-planer graphs, Euler’s formula, Kuratowski’s theorem. Test and planarity, Four colour theorem, Directed graphs, Tournaments, Network, Max Flow, Min cut theorem, Graphs and vector space. Graph enumeration. Polya’s counting theorem, Graph algorithms, shortest path, Minimal spanning tree, Fundamental circuit, Isomorphism;

Unit II:
Combinatorics

D. Teaching/Learning/Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%
(Teacher is to divide components for T/R/P)

E. Examination pattern:
1. Theoretical Examination : Open book and on line.
2. Practical Examination : Conducting Experiments and Viva-Voce.

G. Reading lists:
Books:

Journals:
1. Combinatorica
2. Discrete Applied Mathematics
3. Discrete Mathematics
4. European Journal of Combinatorics
5. Graphs and Combinatorics
6. Journal of Combinatorial Theory, Series A
7. Journal of Combinatorial Theory, Series B
8. Journal of Graph Theory
9. SIAM Journal on Computing
10. SIAM Journal on Discrete Mathematics
11. Theoretical Computer Science

Magazines:
1. Current Science (Indian Academy of Science)
2. The Mathematics Student (Math Student) (Indian Mathematical Society)
3. *Mathematical Spectrum* (The University of Sheffield)
4. *Mathematics Magazine* (Mathematical Association of America)
5. + *Plus magazine* (University of Cambridge)
6. *Ganithavahini* (Ramanujan Mathematical Society)

**Name of the Module:** Computational Numerical Methods  
**Module Code:** MAS 521  
**Semester:** 5th  
**Credit Value:** 4 \([P=2, T=0, L=3]\)  
**Module Leader:**

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**A. Objectives:**  
The course is designed to meet the objectives of:

1. Introducing the basic concepts of round off error, truncation error, numerical stability and condition, Taylor polynomial approximations; to derive and apply some fundamental algorithms for solving scientific and engineering problems: roots of nonlinear equations, systems of linear equations, polynomial and spline interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations.
2. Application of computer oriented numerical methods which has become an integral part of the life of all the modern engineers and scientists. The advent of powerful small computers and workstation tremendously increased the speed, power and flexibility of numerical computing.
3. Injecting future scope and the research directions in the field of numerical methods.

**B. Learning outcomes:**  
Upon Completion of the subject:

1. Students will be skilled to do Numerical Analysis, which is the study of algorithms for solving problems of continuous mathematics.
2. Students will know numerical methods, algorithms and their implementation in ‘C’ for solving scientific problems.
3. Students will be substantially prepared to take up prospective research assignments.

**C. Subject matter:**

**Unit I:**  
**Errors in computation:** Overflow and underflow; Approximation in numerical computation; Truncation and round off errors; Propagation and control of round off errors; Chopping and rounding off errors; Pitfalls (hazards) in numerical computations (ill conditioned and well conditioned problems).

**Unit II:**  
**Interpolation:** Lagrange’s Interpolation, Newton’s forward & backward Interpolation Formula. Extrapolation; Newton’s Divided Difference Formula; Error; Problems.

**Unit III:**  
**Numerical Differentiation:** Use of Newton’s forward and backward interpolation formula only.  
**Numerical Integration:** Trapezoidal formula (composite); Simpson’s 1/3rd formula (composite); Romberg Integration (statement only); Problems.
Unit IV:

**Numerical Solution of System of Linear Equations:** Gauss elimination method; Matrix Inversion; Operations Count; LU Factorization Method (Crout’s Method); Gauss-Jordan Method; Gauss-Seidel Method; Sufficient Condition of Convergence.

**Numerical Solution of Algebraic and Transcendental Equations:** Iteration Method: Bisection Method; Secant Method; Regula-Falsi Method; Newton-Raphson Method.

**Numerical solution of Initial Value Problems of First Order Ordinary Differential Equations:** Taylor’s Series Method; Euler’s Method; Runge-Kutta Method (4th order); Modified Euler’s Method and Adams-Moulton Method.

D. List of practicals: (Minimum six experiments are required to be performed by students)

1. Assignments on Interpolation: Newton forward & backward, Lagrange.

E. Teaching/Learning/Practice pattern:

- Teaching: 40%
- Learning: 10%
- Practice: 50%

(Teacher is to divide components for T/L/P)

F. Examination pattern:

1. Theoretical Examination: Open book and on line.
2. Practical Examination: Conducting Experiments and Viva-Voce.

G. Reading lists:

**Books:**


Magazines:
2. The Mathematics Student (Math Student) (Indian Mathematical Society).
3. Mathematical Spectrum(The University of Sheffield).
5. +Plus magazine (University of Cambridge).

Journals:
3. SIAM Review, University of Bristol, UK.
5. SIAM Journal on Numerical Analysis, University of Bristol, UK.
6. SIAM Journal on Scientific Computing, University of Bristol, UK.
Name of the Module: Computer Networking  
Module Code: CSE 601  
Semester: 6th  
Credit Value: 4 [P=2, T=0, L=3]  
Module Leader:  

A. Objectives:
The course is designed to meet with the objectives of:
1. understanding the state-of-the-art in network protocols, architectures, and applications,
2. examining and studying of different protocols in OSI and TCP/IP,
3. understanding of network addressing, mapping etc
4. understanding error control, flow control, packet recovery etc.
5. understanding the structure of LAN, WAN and MAN, and
6. understanding internetworking of devices.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. learn components and rules of communications,
2. configuration and design of a small network.
3. learn about research areas and future internets research fields.
4. learn to configure NAT, DHCP, switch security, VLAN etc

C. Subject matter:
Unit I:  
Basic: Introduction to Networking and its origin, layered task, Protocol stack, OSI model, TCP/IP model and brief functionality  
Physical layer and media: Data, Signals, Transmission, Digital transmission- digital to digital conversion, Analog to digital conversion, bandwidth utilization and spread spectrum.  
Data link layer: Error correction and Detection, Data link control- framing, flow and error control, Noise less channels- Simple Protocols, Stop and wait protocol, Noisy channel protocol- Stop and Wait ARQ, Go and Back N ARQ, Selective Repeat Automatic Repeat Request, HDLC-Configuration and Transfer mode, Multiple Access-Random Access, Control access, Channelization, Wired Network, Wireless Network, Virtual LAN, Virtual Circuit Networks-Frame relay and ATM

Unit II
Network Layer: Logical Addressing, Internet Protocol (IP), Address mapping, Error reporting, and multicasting- ARP, RARP, BOOTP, DHCP, ICMP, IGMP, Network Address Translators (NAT)
Network Delivery-Delivery, Forwarding and Routing, Unicast routing protocol- Intra & inter domain routing, distance vector routing, link state routing, path vector routing, Multicast routing protocols,

Unit III
Transport layer: Process to Process delivery-Connection oriented and connection less service, UDP, TCP, SCTP, error and flow controls, Congestion control and Quality of service- Open loop congestion control, Closed loop congestion control, Congestion control in TCP and in frame relay Quality of service-flow characteristics, flow cases, different techniques to improve QoS, RSVP.

Unit IV:
Application layer: Name Space, Domain in Namespace, Distribution of name space, DNS- generic, country and inverse domain, Resolution: Resolver, Mapping name to Address, Mapping address to names, recursive resolution.
Remote logging- telnet, Electronic mail-SMTP, POP, IMAP and file transfer- FTP architecture, commands of FTP.
WWW and HTML- Architecture, web documents, HTTP, Web services. Uniform Resource Locators (URL) and Universal Resource Identifier (URI).
Multimedia protocols- RTP, RTCP.

D. List of practicals: (Minimum eight experiments should be conducted by students)
1. Study of different types of cross-wired cable and straight through cable.
2. Study of Basic network commands and network configuration commands.
3. Socket programming using Java or C programming language.
4. Network topology configuration using Cisco packet tracer software
5. Network topology configuration of static routing using Cisco packet tracer software
7. Firewall Configuration using iptables and ipchains and solve different general problems in Linux OS.
8. Practical on Server Configuration Example, Web Server, Mail Server, FTP Server, DHCP, NFS etc.
9. Introduction to ns2 (network simulator) - small simulation exercises to study TCP behaviour under different scenarios and study link layer protocols such as Ethernet and 802.11 wireless LAN.
10. Experimental study of application protocols such as HTTP, FTP, SMTP, using network packet sniffer and analyzers such as Etherereal. Small exercises in socket programming in C/C++/Java.
11. Experiments with packet sniffers to study the TCP protocol. Using OS (netstat, etc) tools to understand TCP protocol FSM, retransmission timer behaviour, congestion control behaviour.
12. Basic introduction and practical’s of software defined networking using mininet emulator, POX controller etc.

E. Teaching/ Learning/ Practice pattern:
   Teaching: 40%
   Learning: 10%
   Practice: 50%

F. Examination pattern:
   1. Theoretical Examination: Regular Examination.
   2. Practical Examination: Conducting experiment and viva voice

G. Reading lists:
   Books

Magazines:
   1. Network World, IT, United states, Massachusetts
   2. Network Magazine, Indian Express, India

Journals:
   3. Journal of Computer Networks and Communications, Elsevier, Netherland
Name of the Module: Software Engineering
Module Code: CSE 602
Semester: 6th
Credit Value: 4\{P=2, T=0, L=3\}
Module Leader:

A. Objectives:
The course is designed to meet with the objectives of understanding:
   1. the need of software engineering, its different life cycles and different phases,
   2. to measure cost, efforts, time and team management etc,
   3. testing and maintenance techniques of big projects and
   4. different risks and its management systems.

B. Learning outcomes:
Students successfully completing this module will be able to learn:
   1. the scope and necessity of software engineering,
   2. the causes solutions for software crisis,
   3. fragment problems into small units, code reusability, efficient coding and software development management and
   4. different ways of software life cycles and their phases.

C. Subject matter:
   Unit I:
   
   Unit II:
   System Design: Problem Partitioning, Top-Down And Bottom-Up design ;Decision tree, decision table and structured English; Functional vs. Object-Oriented approach.

   Unit III:
   Coding & Documentation: Structured programming, OO programming, information hiding, Reuse, system documentation.

   Unit IV:
   Software Project Management: Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring.
   Software modelling: with Unified Modelling Language.

   Case Tools: Concepts, use and application.

D. List of practicals: (Minimum eight experiments should be conducted by students)
   Practicing and Modeling UML use case diagram & capturing use case scenarios: Use case diagrams, Use Case, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Relationship, Extend Relationship, Generalization Relationship, Identifying Actors, Identifying Use cases, E-R modeling.
Practicing and Modeling DFD: Data Flow Diagram, Graphical notations for Data Flow Diagram, Explanation of Symbols used in DFD, Context diagram and levelling DFD.

Estimation of test coverage metrics & structural complexity: Control Flow Graph, Terminologies, McCabe's Cyclomatic Complexity, Computing Cyclomatic Complexity, Optimum Value of Cyclomatic Complexity, Merits, Demerits


E. Teaching/ Learning/ Practice pattern:
   Teaching: 60%
   Learning: 40%
   Practice: 0%

F. Examination pattern:
   1. Theoretical Examination: Regular Examination.
   2. Practical Examination: Conducting experiment and viva voce

G. Reading lists:

Books

Magazines:
1. CrossTalk Magazine
2. Software Quality Engineering
3. Better Software Magazine

Journals:
Name of the Module: Engineering Ethics & IPR
Module Code: HSS 601
Semester: 6th
Credit Value: 3 [P=0, T=0, L=3]

A. Objectives:
The course is designed to meet the objectives of:
1. imparting theoretical lectures with case discussion.
2. providing teaching with inclusive learning.
3. making students aware about the importance of this subject in their future

B. Learning outcomes:
Students successfully completing this module will be able to:
1. work with efficiency as they had knowledge of the subject.
2. with the backup knowledge their performance will definitely be much better in their workplace.

C. Subject matter:
Unit I:
Engineering as a profession, historical and social context, Ethics in Engineering,
Codes of Engineering Ethics, history and purpose, consequentialism and utilitarianism, Deontological
approaches, duties, rights and respect for a person, responsibility, virtue Ethics, honesty, moral autonomy,
obligations of Engineering profession and moral propriety.

Unit II:
Engineer’s moral responsibility for safety and human right, risk assessment and communication, product
liability, development ethics, engineers and employer relationship, whistle blowing and its moral
justifications.

Unit III:
Computer Ethics: Social impact of computers, Computer and gender issues, n privacy, cyber crime, ethical
use of software’s, intrinsic value of nature.

Unit IV:
IPR I: Intellectual property, definition, types, rights and functions, patents, trademark, software design,
industrial designs, semi-conductor and integrated circuits layout design, grant of patent in India, authority
and procedure, patent forms, surrender and revocation of patents and compulsory licensing, acquisition of
inventions by the Government.

IPR II: Contents of draft application for patents, Drafting patent specification and claims, WTO and
drafting patent specification and claims, IPR in fringement and piracy under Indian Laws.

D. Teaching/ Learning:
1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:
1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading lists:
Books:
1. Chowdhury, Subir, Blending the best of the East & West, EXCEL
2. Ghosh, Vikas, Ethics and Mgmt. & Indian Ethos,
3. Pherwani, Business Ethics, EPH
4. Balachandran Raja,Nair, Ethics, Indian Ethos and Mgmt., Shroff Publishers
5. Velasquez, Business Ethics: concept and cases, Pearson

Magazine:
1. Industry Week
2. Business Ethics magazine
3. The Weekly Standard
4. Harpers
5. The Week

Journals:
1. Journal of Business Ethics
2. The Journal of Ethics
3. Ethics, University of Chicago Press
4. Kennedy Institute of Ethics Journal
5. Journal of Global Ethics

Name of the Module: Disaster Management
Module Code: HSS 602
Semester: 6th
Credit Value: 2 [P=0, T=0, L=2]

A. Objectives:
The course is designed to meet the objectives of:
1. Imparting theoretical lectures with case discussion.
2. Providing teaching with inclusive learning.
3. Making students aware about the importance of this subject in the future prospect

B. Learning outcomes:
Students successfully completing this module will be able to:
1. Students will be able to work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely be much better in their workplace.

C. Subject matter:
Unit I:
   Introduction: Disaster preparedness, Goals and objectives of ISDR Programme, Risk identification, Risk sharing.
   Disaster and development: Development plans and disaster management. Alternative to dominant approach, disaster-development linkages, Principle of risk partnership

Unit II:

Unit III:
   Awareness of risk reduction: Trigger mechanism, constitution of trigger mechanism, risk reduction by education, disaster information network, risk reduction by public awareness.

Unit IV:
   Development planning on disaster: Implication of development planning, financial arrangements, areas of improvement, disaster preparedness, community based disaster management, emergency response.
   Seismicity: Seismic waves, Earthquakes and faults, measures of an earthquake, magnitude and intensity ground damage, Tsunamis and earthquakes

D. Teaching/ Learning/Practice pattern:
1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:
1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading lists:
Books:
7. Pardeep Sahni, Madhavi Malalgoda and Aariyabandu, Disaster risk reduction in south Asia, PHI, 2009
9. MHA, GOI-UNDP, Disaster Management in India, 2009

Magazines:
1. Crises and Disaster Management Magazine
2. Emergency Management

Journals:
1. Asian Journal of Environment and Disaster Management
2. International Journal of Disaster Management
3. IDRIM Journal
4. Journal of Disaster Risk Studies
5. Emergency Management Review

**Name of the Module:** Creative Design  
**Module Code:** CSE 603  
**Semester:** 6th  
**Credit Value:** 1\[P=2, L=0, T=0]\  
**Module Leader:**

**A. Objectives:**
The course is designed to meet the objectives of:
1. to give students broad but comprehensive theoretical analysis, ideas & practical design & implementation of useful computer systems,
2. to impart the essential knowledge of computer system design with the fine arts & analysis to enhance hands on experience & to encourage innovations.

**B. Learning outcomes:**
Students successfully completing this module will be able to:
1. take up innovative project for designing computer systems of varied nature.
2. learn system analysis, system design, fine arts etc.

**C. Subject matter:**
**Unit: 1**
**System analysis:** Requirement analysis, Scope definition, Logical Design, Business Analysis, Accident Analysis, Problem analysis, Decision analysis, policy analysis.
Different tools to represent in creative system design

**Unit: 2**
**System Design:** Physical design, Logical design, Alternative Design analysis: Rapid Application development (RAD), Joint application design (JAD), System Development Life cycle (SDLC).

**Unit: 3**
**Creative Design:** Creative design process, Hypothesis techniques and methods, Hypothesis Testing, Creative design Life cycle and phases.

**Unit: 4**
Fine arts: Fine arts rules and entities, colour composition, 2d 3d animation, Portrait sketch. Create any model for any perspective of engineering fields with some innovation.

D. Teaching/ Learning/Practice pattern:
   Practical: 30%
   Presentation: 40%
   Assignment: 30%

E. Examination pattern:
   1. Theoretical Examination : 50
   2. Class test : 30
   3. Assignment : 20

F. Reading lists:
Books:
Magazines:
Journals:

Name of the Module: Computer Graphics & Multimedia Technology
Module Code: CSE 604
Semester: 6th
Credit Value: 4 [P=2, T=0, L=3]

Module Leader:

A. Objectives:
   The course is designed to meet with the objectives of:
   1. introducing graphical techniques such as modelling, representation, illumination, shadowing, rendering and texturing,
   2. to learn two dimensional and three dimensional computer graphics with comprehend advanced software tools of computer graphics.

B. Learning outcomes:
   Students successfully completing this module will be able to:
   1. comprehend mathematical basics which are used in computer graphics and also learn how to use them in designing computer graphics programs.
   2. create graphics programming using OpenGL.
   3. describe basic graphics principles which are used in games, animations and film making.

C. Subject matter:
Unit I:

**Introduction to computer graphics & graphics systems:** Overview of computer graphics, representing pictures; color models; storage tube graphics display, Raster scan display, printers etc.; Active & Passive graphics devices; Computer graphics software.

**Scan conversion:** Points & lines, Line drawing algorithms; DDA algorithm, Bresenham’s line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Unit II:

**2D transformation & viewing:** Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines; clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

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

Unit III:

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

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

Unit IV:

**Introduction to Multimedia:** Concepts, uses of multimedia, text representation; Image, video and audio standards.

**Audio:** digital audio, MIDI, processing sound, compression.

**Video:** MPEG compression standards, various compression techniques.

D. List of practicals: (Minimum five experiments should be conducted by students)

1. Point plotting, line & regular figure algorithms
2. Raster scan line & circle drawing algorithms
3. Clipping & Windowing algorithms for points, lines & polygons
4. 2-D / 3-D transformations
5. Simple fractals representation
6. Filling algorithms
7. Graphics programming using OpenGL.

E. Teaching/ Learning/ Practice pattern:

- Teaching: 40%
- Learning: 10%
- Practice: 50%

F. Examination pattern:

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice
G. Reading lists:

Books

Magazines:
1. IEEE Multi Media Magazine, IEEE Computer Society, United State

Journals:
1. International Journal of Graphics and Multimedia (IJGM)
2. SERSC: International Journal of Computer Graphics, SERSC, Spain

Name of the Module: Compiler Design
Module Code: CSE 605
Semester: 6th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet with the objectives of:
1. providing a thorough introduction to the theory and practice of programming language translation and to provide extensive hands-on experience with compiler construction tools and techniques,
2. introducing to the design and implementation of programming language translators,
3. learn theoretical aspects of language design and translation are discussed and practically demonstrated by developing a working compiler and grasp of compiler construction.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. design lexical and syntax analyzer phases of compiler.
2. demonstrate the basic notions and techniques for programming language translation
3. demonstrate the basic notions and techniques for intermediate code generation.
4. generate and program a small compiler or interpreter.
C. Subject matter:

Unit I:
Compilers, Analysis of the source program: The phases of the compiler, Cousins of the compiler.
The role of the lexical analyzer: Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a token, Finite automata, From a regular expression to an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (LEX). Push Down Automata with working principle architecture.

Unit II:
The role of a parser: Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.
Syntax director definitions: Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes. Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions.

Unit III:
Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.
Intermediate languages: Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Unit IV:
Issues in the design of code generator: a simple code generator, Register allocation & assignment.

D. List of practicals: (Minimum ten experiments should be conducted by students)
1. Write a program for dividing the given input program into lexemes.
2. Write a program to compute FIRST function.
3. Write a program to compute FOLLOW function.
4. Write a program to implement operator precedence parsing.
5. Write a program on recursive descent parsing.
6. Write a program to design LALR bottom up parser.
7. Write a program to implement lexical analyzer using LEX tool.
8. Write a LEX program to identify a simple and a compound statement.
9. Write a LEX program to count the number of keywords and identifiers in a sentence.
10. Write a LEX program to convert an octal number into decimal number.
11. Write a YACC program to check the validity of an arithmetic expression.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice
G. Reading lists:

Books

Magazines:
1. IBM Systems Magazine, IBM, USA

Journals:
1. IEEE Explore - Compiler design issues for embedded processors, IEEE Computer Society, United State
3. ACM TOPLAS, ACM, United State
Name of the Module: Internet & Web Technology
Module Code: CSE 701
Semester: 7th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to complete an in-depth knowledge of web technology,
2. to know and to have the idea for different web application that most web developers are likely to use,
3. to be aware of, and to have used, the enhancements of the web applications,
4. to know the different types of web application software.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. develop client/server applications
2. update and retrieve the data from the databases using SQL
3. develop server side programs in the form of servlets

C. Subject matter:
Unit I:
Introduction to HTML: HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
Introduction to Java: Scripts, Objects in Java Script, Dynamic HTML with Java Script

Unit II:
Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB’s

Unit III:

Unit IV:

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations


D. List of practicals:

1. Basic use of html tag, linking image table, frame, form design.
2. DHTML- inline styles, creating style sheets with the style element, linking external style sheet, positioning elements, user style sheet.
3. Creating event handler that responds to mouse and keyboard event: Onload, on mouse over, on mouse out, on focus, on blur, on submit, on result, on click, on change.
4. Structuring data with xml, xml parser, extensible style language (xsl); customising markup language.
5. Configuring apache-tomcat server.
6. Building simple jsp: Declaring variables and methods in jsp, inserting java expression in jsp, processing request from user, generating dynamic response for the user. Accessing database from jsp, inserting applet into jsp.

E. Teaching/ Learning/ Practice pattern:

Teaching: 40%
Learning: 10%
Practice: 50%

F. Examination pattern:

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

Reading Lists:

Books
6. Dietel and Nieto, “Internet and World Wide Web – How to program”, PHI/ Pearson Education Asia
8. Ian Graham, “The XHTML 1.0 Web Development Sourcebook”, Wiley
10. Ian Graham, John, “The HTML Stylesheet Sourcebook”, Wiley and Sons
Magazines:
1. Digital Web Magazine, Nick Finck, United State

Journals:
1. International Journal of Information Technology and Web Engineering (IJITWE), Information Resources Management Association,
2. Journal of Web Semantics - Elsevier, Netherland

Name of the Module: Mass Communication for Technology
Module Code: HSS 701
Semester: 7th
Credit Value: 3[P=0, T=0, L-3]

A. Objectives:
The course is designed to meet the objectives of:
1. Imparting theoretical lectures with case discussion.
2. Teaching with inclusive learning.
3. Making students aware about the importance of this subject in their future career.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. Students will be able to work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely much better in their workplace.

C. Subject matter:
Unit-I:
Fundamentals of Mass Communication- Definition of Mass Communication, importance, scope, importance, related fields, history of mass communication.

Unit-II:
Dissemination of Scientific & Technical knowledge (DSTK): Difficulties with distribution of scientific and technical information is rapid increasing with unprecedented spade of science and technology. Further, engineers are made to meet with this challenge. The subject should cover the knowledge so as to establish adequate and effective distribution of information. Lack of information cannot make a sound engineer. Engineers should be specialists in information dissemination for which a course on DSTK is of paramount importance. Engineers should be made to write articles and research papers fluently and confidently. They should be taught to organize seminars and conferences deliver talks as well in the seminars and conferences. They should also be taught the technique of publishing magazines and journals.

D. Teaching/ Learning/ Practice pattern:
1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:
1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20
F. Reading lists:

Books:

Magazines:
1. Media and Communication
2. Communication Magazine

Journals:
1. Mass Review
2. Journal of Communication Studies
3. Mass Communication and Society
4. Journal of Mass Communication
5. Communicator
6. Journal of Communication

Name of the Module: Research Paper Communication
Module Code: XXX-701
Semester: 7th
Credit Value: 1[P=2, T=0, L=0]

A. Objectives:
The course is designed to meet the objectives of:
1. Business research is a process of planning, acquiring, analyzing and disseminating relevant data, information and insights to decision makers in ways that mobilize the organization to take appropriate actions that, in turn, maximize business performance.
2. Making students aware about the importance of this subject in their future career.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. Understanding of Research process and types
2. Formulate the research problem
3. Design the research
4. Able to collect data
5. Analyze the data using SPSS
6. Interpret the results
7. Write the report

C. Subject matter:
Unit 1:
Introduction to Business Research—Meaning and Significance of Research in Business; Different Approaches to Research – Scientific Methods and Non-scientific Methods;
Data Collection in Classroom: Principles and purposes, description, strengths and limitations, where and how to begin data collection, designing suitable instruments, recording data, data maintenance.

Unit II:
The Research Problem and Design-Formulation and Definition of Business Research Problem; Formulation of Research Hypotheses, Business Research Design – Meaning and Formulation

Unit III:

Unit IV:
Data Collection Tools and Data Processing-Questionnaires and Observation Forms; Questionnaire Design Process;

Unit V:

Unit VI:
Business Research Report-Importance of the Report & Presentation; Business Report Format; Report Writing; Oral Presentation; Research Follow-up

D. Teaching/ Learning/ Practice Pattern:
1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:
1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading lists:
Books:
3. Cooper & Schindler. Business Research Methods, TMH
4. C.R. Kothari, Research Methodology: Methods and Techniques, New Age International,
Magazines:
1. R & D Magazine
2. Research Magazine
3. Scientific Magazine
Journals:
1. Mass Review
2. Journal of Communication Studies
3. Mass Communication and Society
Name of the Module: Cryptography & Network Security
Module Code: CSE 702
Semester: 7th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. security breaches can be very expensive in terms of business disruption and the financial losses that may result,
2. increasing volumes of sensitive information are transferred across the internet or intranets connected to it,
3. networking that make use of internet links are becoming more popular because they are cheaper than dedicated leased lines. This, however, involves different users sharing internet links to transport their data,
4. directors of business organizations are increasingly required to provide effective information security.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. identify some of the factors driving the need for network security,
2. identify and classify particular examples of attacks,
3. define the terms vulnerability, threat and attack,
4. identify physical points of vulnerability in simple networks,
5. compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems,
6. explain the implications of implementing encryption at different levels of the OSI reference mode,
7. explain what is meant by data integrity and give reasons for its importance,
8. describe methods of providing assurances about data integrity,
9. describe the use of hash functions and explain the characteristics of one-way and collision-free functions,
10. describe and distinguish between different mechanisms to assure the freshness of a message,
11. explain the role of third-party agents in the provision of authentication services,
12. discuss the effectiveness of passwords in access control and the influence of human behaviour,
13. identify types of firewall implementation suitable for differing security requirements,
14. apply and explain simple filtering rules based on IP and TCP header information,
15. distinguish between firewalls based on packet-filtering routers, application level gateways and circuit level gateways.

C. Subject matter:

Unit I:

Unit II:

Unit III:
Key management: Key Transport Protocols, Needham Schroeder Protocol, Key Agreement Protocol, Diffie-Hellman Protocol, Station to Station Protocol, Merkless Puzzle Technique of key agreement, Public Key Distribution, Message integrity and message authentication, Cryptography hash function, Digital Signature, Entity Authentication.

Unit IV:

D. List of practicals:
(i). Finding GCD of two integer numbers: Euclidian and Extended Euclidian Algorithm, Finding the inverse: Additive and multiplicative
(ii). Traditional Symmetric Cipher techniques:
   a) Mono alphabetic Cipher: Additive, Multiplicative, Affine
   b) Poly alphabetic Cipher: Autokey cipher, Playfair cipher, Hill cipher, Vigenere cipher.
   c) Transposition cipher
(v). Digital Signatures: RSA digital signature scheme, Elgamal digital signature, etc.
(vi). Entity Authentication: Challenge response, Zero knowledge, etc.
(vii). Key management: Diffie-Hellman, etc.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%
F. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

G. Reading lists:
Books

Magazines:
2. InfoSec Magazines, United Kingdom

Journals:

Name of the Module: Artificial Intelligence & Neural Network
Module Code: CSE 703
Semester: 7th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. To introduce the fundamental concepts of artificial intelligence;
2. To equip students with the knowledge and skills in logic programming using Prolog;
3. To explore the different paradigms in knowledge representation and reasoning;
4. To understand the contemporary techniques in machine learning;
5. To evaluate the effectiveness of hybridization of different artificial intelligence techniques.

B. Learning outcomes:
1. understand the history, development and various applications of artificial intelligence;
2. familiarize with propositional and predicate logic and their roles in logic programming;
3. understand the programming language Prolog and write programs in declarative programming style;
4. learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
5. appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic);
6. master the skills and techniques in machine learning, such as decision tree induction, artificial neural networks, and genetic algorithm;

C. Subject matter:
Unit I:
Artificial Intelligence (AI): its roots and scope: Early history and applications; the development of formal logic; the Turing test; overview of AI application areas: game playing, automated theorem proving, expert systems, natural language understanding and semantics, planning and robotics, and machine learning.

Unit II:
Knowledge representation: Technique using semantic network & conceptual dependency: The Propositional Calculus and Predicate Calculus; using inference rules to produce predicate calculus expressions; strategies and structures for state space search; heuristic search; i.e; DFS, BFS, bidirectional search, Best first search, A & A* algorithm, problem reduction AO* search, constraint satisfaction, Mini Max search, recursion-based search; admissibility, monotonicity and informedness of search algorithms.

Unit III:
Knowledge representation and reasoning: Rule-based production systems; case-based reasoning systems and model based reasoning systems; reasoning under uncertain situations: stochastic methods, fuzzy logic and fuzzy set theory; fuzzy expert systems.
Machine learning: Decision tree induction algorithms; artificial neural networks; genetic algorithms.

Unit IV:
Hybrid: intelligent techniques and maintenance of intelligent systems: Hybridization of neural networks, fuzzy logic, genetic algorithms and other intelligent techniques for problem solving; maintenance of the completeness, correctness and consistency of intelligent systems.

D. List of practicals:
1. Simulate DFS
2. Simulate BFS
3. Simulate A*
4. Simulate 8-Puzzle Problem
5. WAP to implement and function using ADALINE with BIPOLAR inputs and outputs
6. WAP to implement and function using MADALINE with BIPOLAR inputs and outputs
7. WAP to implement discrete Hopfield network and test for input patterns
8. Write a programme to implement fuzzy set operation and properties
9. Write a programme to implement composition of fuzzy and crisp relations.
10. WAP to perform MAX-MIN composition of two matrices obtained from Cartesian product.
11. Write a programme for maximizing \( f(x) = x^2 \) using GA where \( x \) is ranges from 0 to 31 perform only 5 iteration.

E. Teaching/ Learning/ Practice pattern:
Teaching: 40%
F. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

G. Reading Lists:
Books

Magazines:
1. AI Magazine - Association for the Advancement of Artificial Intelligence, AAAI Press, USA
2. IEEE Intelligent Systems Magazine, Computer Society, United State

Journals:
1. Artificial Intelligent by Elsevier, Netherland
2. Artificial Intelligent in medicine by Elsevier, Netherland
3. Journal of Artificial Intelligent Research(JAIR) , AAAI Press, USA
Name of the Module: Bio-Informatics  
Module Code: CSE 701A  
Semester: 7th  
Credit Value: 3[P=0, T=0, L=3]  
Module Leader:

A. Objectives:  
The course is designed to meet the objectives of:  
1. To introduce the fundamental concepts of Bioinformatics,  
2. To equip students with the software of Bioinformatics,  
3. To explore the different paradigms in Data mining, HMM, Biocomputing.

B. Learning outcomes:  
Students successfully completing this module will be able to:  
1. know concepts of genomics and proteomics,  
2. describe bioinformatics algorithms such as dynamic programming, hidden markov models and monte carlo,  
3. utilize bioinformatics tools such as Pymol, Blast, and ClustalW,  
4. code solutions to bioinformatics problems utilizing tools such as R, biopython, bioperl,  
5. do research areas in bioinformatics.

C. Subject matter:  
Unit -I  
Introduction to Bioinformatics: Definition and History of Bioinformatics, Internet and Bioinformatics, Introduction to Data Mining, Applications of Data Mining to Bioinformatics Problems and Applications of Bioinformatics  
Unit –II  
Bioinformatics Softwares: Clustal V, Clustal W 1.7, RasMol, Oligo, Molscript, Treeview, Alscript, Genetic Analysis Software, Phylip  
Unit -III  
Unit -IV  
Markov chains and applications: Systems Biology-an introduction  
Machine Learning Methods, Hidden Markov models, Applications of HMM in gene identification and Profiles HMMs, Neural Networks and Support Vector machines

D. Teaching/ Learning/ Practice pattern:  
Teaching: 40%  
Learning: 10%  
Practice: 50%
E. Examination pattern:

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:

Books
11. Patterson, B.K., Techniques in Quantification and Localization of Gene Expression.
12. Mont, D.W., Bioinformatics: Sequence and Genome Analysis.

Magazines:

Journals:
1. International Journal of Bioinformatics Research and Applications, inderscience publication, Switzerland

Name of the Module: Quantum Computing
Module Code: CSE702A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to understand the building blocks of a quantum computer.
2. to understand the principles, quantum information and limitation of quantum operations formalizing.
3. to understand the quantum error and its correction.
B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand and explain the basic notions of Quantum Computing—including Quantum Bits and registers, Quantum Evolution, Quantum Circuits, Quantum Teleportation and the basic Quantum Algorithms known at the present time,
2. identify the essential difference between the classical paradigm and the quantum paradigm of computation and appreciate why quantum computers can solve currently intractable problems.
3. know different kinds of synthesis techniques and algorithms.
4. design different reversible circuits using different simulators eg. Revkit, JQuantum etc.

C. Subject matter:
Unit I:
Fundamental Concepts: Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

Unit II:

Unit III:


Unit IV:

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.

F. Reading lists:
Books:
11. Marinescu Dan C.,”Approaching Quantum Computing”, Pearson Education

Magazines:
1. Cosmos, Australia.
2. The Quantum Quest for a Revolutionary Computer, Time.

Journal:
1. Quantum information and Computing, Rinton press, New Jersey, US, ISSN: 1533-7146
2. Information and Computation, Elsevier, ISSN:0890-5401
3. The Future of Quantum Information Processing, Science (Special Issue).
4. The IEEE Journal of Quantum Electronics, IEEE

Name of the Module: Robotics
Module Code: CSE703A
Semester: 7th
Credit Value: 3{P=0, T=0, L=3}
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. understand the basic concepts associated with the design and functioning and applications of Robots,
2. study about the drives and sensors used in Robots,
3. learn about analyzing robot kinematics and robot programming.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. perceive human states using multimodal interfaces,
2. model and recognise human actions,
3. use adaptive shared control methods to assist humans in their task,
4. use learning algorithms to improve their performance through interaction with humans.

C. Subject matter:

Unit I:

**Fundamentals Of Robot**:
- Robot – Definition
- Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification
- Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load
- Robot Parts and Functions – Need for Robots – Different Applications

Unit II:

**Robot Drive Systems And End Effectors**:
- Applications and Comparison of Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations

Unit III:

**Sensors And Machine Vision**:

Unit IV:

**Robot Kinematics And Robot Programming**:
- Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems.
- Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

**Implementation And Robot Economics**:
- RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

D. Teaching/ Learning/ Practice pattern:
- Teaching: 40%
- Learning: 10%
- Practice: 50%

E. Examination pattern:
- 1. Theoretical Examination: Regular Examination.
- 2. Practical Examination: Conducting experiment and viva voice

G. Reading Lists:

Books


Magazines:
1. Robot Magazine, Maplegate Media, 42 Old Ridgebury Road, Danbury, CT 06810

Journals:
1. Robotics and Autonomous Systems, Elsiver, Netherlands
3. International journals of robotics research publisher, Sage Publications, United State

Name of the Module: Data Mining & Warehousing
Module Code: CSE-704A
Semester: 7th
Credit Value: 3\{P=0, T=0, L=3\}
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. understand classical models and algorithms in data warehousing and data mining,
2. enable students to analyse the data, identify the problems, and choose the relevant models and algorithms to apply,
3. assess the strengths and weaknesses of various methods and algorithms and to analyse their behaviour.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. learn implementation of classical algorithms in data mining and data warehousing,
2. learn to identify the application area of algorithms, and apply them,
3. learn clustering application and resent works in data mining.

C. Subject matter:
Unit I:
Data Warehousing: Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support –Data Extraction, Cleanup, and Transformation Tools –Metadata.

Unit II:

Unit III:

Unit IV:
Association Rule Mining and Classification: Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction

Unit V:

D. Teaching/ Learning/ Practice pattern:
  Teaching: 40%
  Learning: 10%
  Practice: 50%

E. Examination pattern:
  1. Theoretical Examination: Regular Examination.
  2. Practical Examination: Conducting experiment and viva voice

F. Reading lists:
Books
Magazines:

Journals:
1. Knowledge and Data Engineering, IEEE Transactions, ISSN: 1041-4347
2. Data Mining and Knowledge Discovery, Springer, ISSN: 1384-5810 (Print) 1573-756X (Online)
3. International Journal of Data Mining, Modelling and Management, ISSN online: 1759-1171, ISSN print: 1759-1163

Name of the Module: Data Compression
Module Code: CSE-705A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. introduce the fundamentals concepts of Data Compression,
2. equip students with the knowledge and skills of coding Theory,
3. explore the different paradigms of image and data compression.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. learn Lossy, Lossless compression.
2. learn Transformation for compression like DCT, DFT, vector transformation.
3. learn JPEG compression techniques.
4. learn Video, audio compression etc.

C. Subject matter:
Unit I:

Unit II:

Unit III:

**Unit IV:**

**Mathematical Preliminaries for Lossy:** Coding Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

**Vector Quantization:** Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree Structured Vector Quantizers. Structured Vector Quantizers.

**D. Teaching/ Learning/ Practice pattern:**
- Teaching: 40%
- Learning: 10%
- Practice: 50%

**E. Examination pattern:**
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

**F. Reading lists:**

**Books**

**Magazines:**

**Name of the Module: Real-time systems**

**Module Code: CSE 706A**

**Semester: 7th**

**Credit Value: 3[P=0, T=0, L=3]**

**Module Leader:**

**A. Objectives:**
The course is designed to meet the objectives of:
1. To characterize the problem space real-time systems address and what are the specialized requirements of real-time systems
2. To describe the solutions for standard problems of real-time systems
3. To characterize the solution space real-time systems employ and how these solutions tend to differ from other systems
4. To describe and justify adaptations to the development process to support real-time systems
5. To understand the evaluation of real time systems

B. Learning outcomes:
Students successfully completing this module will be able to:
1. possess knowledge and skill in embedded systems,
2. demonstrate embedded system applications,
3. possess research skills, analytical skills and problem solving skills,
4. recognition of the need for and an ability to engage in lifelong learning and development.

C. Subject matter:
Unit I:

Unit II:

Unit III:
Real Time Databases: Real time Databases - Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Databases for Hard Real Time systems.

Unit IV:

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading lists:
Books

Magazines:

Journals:

Name of the Module: Software Project Management
Module Code: CSE 707A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]

Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. deliver successful software projects that support organization's strategic goals,
2. match organizational needs to the most effective software development model,
3. plan and manage projects at each stage of the software development life cycle (SDLC),
4. create project plans that address real-world management challenges,
5. develop the skills for tracking and controlling software deliverables.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand various aspects of project management,
2. work in software project management projects,
3. understand requirements of a project plan,
4. group of tasks performed in a definable time period in order to meet a specific set of objectives.

C. Subject matter:
Unit I:

Unit II:

Unit III:

Unit IV:

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
Books:
2. Humphrey Watts, “Managing the software process”, Addison Wesley, 1989. (Unit IV)

Magazines:
1. Software Developers, Poland

Journals:
1. International Journal of Project Management, Elsevier

Name of the Module: Software Quality Engineering
Module Code: CSE 708A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:
A. Objectives:
The course is designed to meet the objectives of:
1. Software Quality matrices and their types.
2. Software Quality Assurance
3. Software Verification, Validation, testing and different tools.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. know Quality standards and Software quality assurance
2. know the origins and rationale behind the ISO 9000 standards.
3. know Quality matrices and internal & external attributes.
4. know CMM, ISO certification and its requirements for assurance.

C. Subject matter:
Unit I:

Unit II:

Unit III:

Unit IV:

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.

F. Reading Lists:
Books
Name of the Module: Neural Networks
Module Code: CSE 709A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. understand and explain strengths and weaknesses of the neural-network algorithms
2. determine under which circumstances neural networks are useful in real applications
3. distinguish between supervised and unsupervised learning and explain the key principles of the corresponding algorithms

B. Learning outcomes:
Students successfully completing this module will be able to:
1. understand neural network (NN) paradigms
2. learn fuzzy logic
3. have a knowledge of evolutionary computations, genetic algorithm (GA), evolutionary programming, classifier systems, genetic programming parse trees, mathematical foundation of GA variants of GA
4. efficiently and reliably implement the artificial algorithm and engineering problems,
5. describe principles of more general optimisation algorithms.

C. Subject matter:
Unit I:
Basic concepts of neuro computing: Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing

**Basic terminology related to an artificial neuron:** a summing dendrite, synapses and their weights, pre and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions.

**Unit II:**

**The Perceptron:** The Perceptron and its learning law. Classification of linearly separable patterns


**Unit III:**


**Unit IV:**


Self-Organising Feature Maps Kohonen networks. Radial-Basis function networks


**D. Teaching/ Learning/ Practice pattern:**

Teaching: 40%
Learning: 10%
Practice: 50%

**E. Examination pattern:**
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

**F. Reading Lists:**

**Books**
1. Mathukumalli Vidyasagar, “Learning and Generalization: With Applications to Neural Networks”, Springer
2. B. Yegnanarayana, “Artificial Neural Networks”, Prentice Hall of India
3. Helge Malmgren, Magnus Borga, “Artificial Neural Networks in Medicine and Biology: “, Springer
5. Raj Kumar Bansal, Ashok Goel, Manoj Kumar Sharma ”MATLAB and Its Applications in Engineering”, Pearson Education India
8. Callan Robert, “The Essence of Neural Networks”, Pearson Education India

Magazines:

Journals:
1. Neural Networks, Journal, Elsevier, Netherland, ISSN: 0925-2312
3. International Journal of Neural Networks and Applications, Serials publication, India

Name of the Module: Fuzzy Systems
Module Code: CSE 710A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to provide a general introduction fuzzy system
2. to provide the fundamentals of fuzzy application
3. to explain advanced of fuzzy expert system

B. Learning outcomes:
Students successfully completing this module will be able to:
1. represents the extending and improvement of the artificial intelligence knowledge with special focus on analysis and development of knowledge systems using the fuzzy mathematic and fuzzy logic principles and approaches.
2. students will be ready for design, development and practical application of fuzzy oriented expert systems and fuzzy controllers.

C. Subject matter:
Unit I:

Unit II:

Unit III:

Unit IV:
Applications-Fuzzy logic controllers: Types of FLC- Types of Fuzzy rule formats. Block diagram of fuzzy logic controller, multi input multi output control system. Fuzzy control of a cement kiln, Automatic train operating system, Fuzzy pattern recognition. Inverted pendulum, aircraft landing control, air conditioner control.

D. Teaching/ Learning/ Practice pattern:
   Teaching: 40%
   Learning: 10%
   Practice: 50%

E. Examination pattern:
   1. Theoretical Examination: Regular Examination.
   2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
   Books:
   1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 2/e, McGraw Hill

Magazines:

Journals:
   2. International Journal of Fuzzy System Applications (IJFSA) - IGI Global, IJFSA, Taiwan

Name of the Module: Parallel Algorithms I
Module Code: CSE 711A
Semester: 7th
Credit Value: 3{P=0, T=0, L=3}
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
   1. To acquaint students with the basic concepts of parallel and distributed computing.
2. The course aims to the general principles of parallel and distributed algorithms and their time complexity.
3. study different aspects of Parallel Models
4. Study different aspects of Interconnection Architecture
5. analyse fundamental parallel algorithms from various application domains.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. design, implementation and evaluate parallel algorithms and in the field of HPC (High Performance Computing) in general.
2. understand the role of computation models in parallel computation,
3. understand the circuit and comparison network models,
4. understand the basics of merging and sorting networks.

C. Subject matter:
Unit I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Costoptimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.

Unit III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC/, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding. Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
Books:

Magazines:

1. International Journal of Parallel Programming, Springer, United State, ISSN: 0885-7458 (Print) 1573-7640 (Online)
2. Journal of Parallel and Distributed Computing, Elsevier, Neitherland

Name of the Module: Real Time Operating Systems
Module Code: CSE 712A
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]

Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. participant with basics of real-time operating systems
2. give the participant knowledge and skills necessary to develop software for embedded computer systems using a real-time operating system.

B. Learning outcomes:
Students successfully completing this module will be able to:
1. evaluate the nature of real-time systems in appropriate terminology .
2. critically evaluate the real-time characteristics of a system to assist in deciding which software or kernel is appropriate for a problem.
3. interpret and compare the design of a real-time system in a range of formats.
4. evaluate advanced real-time system areas, including scheduling and distributed.
5. formulate judgements and synthesise conclusions following completion of research into a real-time system topic.

C. Subject matter:
Unit I:
Introduction to Operating System: Computer Hardware Organization, BIOS and Boot Process, Multi-threading concepts, Processes, Threads, Scheduling.
Basics of real-time concepts: Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel

Unit II:
Process Management: Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms

Threads: Multi-threading models, threading issues, thread libraries

Unit III:

Mutex: creating, deleting, prioritizing mutex, mutex internals

Inter-process communication: buffers, mailboxes, queues, semaphores, deadlock, priority inversion, Pipes

Unit IV:

Memory Management: process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection

Kernel Design Issues: structure, process states, data structures, inter-task communication mechanism, Linux Scheduling

D. Teaching/ Learning/ Practice pattern:

Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:

Books:

Magazine:

Journals:
1. Real-Time Systems, Springer, United State, ISSN: 0922-6443 (Print) 1573-1383 (Online)
2. TOCS - ACM Transactions on Computer Systems, ACM, United State, ISSN:0734-2071
ELECTIVE -II

Name of the Module: Information Coding Techniques
Module Code: CSE 705B
Semester: 7th
Credit Value: 3\[P=0, T=0, L=3\]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
   1. basics and introduction of error–control coding,
   2. understand encoding and decoding of digital data streams,
   3. introduce methods for the generation of these codes and their decoding techniques.
   4. knowledge of compression and decompression techniques,
   5. introduce the concepts of multimedia communication,
   6. study audio, video, text coding and compression,

B. Learning outcomes:
Students successfully completing this module will be able to:
   1. apply the basics of information theory to calculate channel capacity and other measures,
   2. design specific data compression techniques and calculate the compression achieved,
   3. apply and control specific coding methods and be able to calculate the rate and error probabilities achieved,
   4. understand the basic concepts and complexity of cryptographic security methods and their practical applications.

C. Subject matter:
Unit I:
   Information Entropy Fundamentals: Uncertainty, Information and Entropy – Source coding Theorem
      – Huffman coding – Shannon Fano coding – Discrete Memory less channels – channel capacity –
      channel coding Theorem – Channel capacity Theorem.

Unit II:
   Data and Voice Coding: Differential Pulse code Modulation – Adaptive Differential Pulse Code
      Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of
      speech signal at low bit rates (Vocoders, LPC).

Unit III:
   Error Control Coding: Linear Block codes – Syndrome Decoding – Minimum distance consideration
      – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes –
      calculation of syndrome – Convolutional codes.

Unit IV:
   Compression Techniques: Principles – Text compression – Static Huffman Coding – Dynamic
      Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged
   Audio And Video Coding: Linear Predictive coding – code excited LPC – Perceptual coding, MPEG
      audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG
      Video standards.

D. Teaching/ Learning/ Practice pattern:
   Teaching: 40%
Learning: 10%  
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:

Books

Magazines:

Journals:
1. International Journal of Information and Coding Theory, Inderscience, Switzerland, ISSN online: 1753-7711, ISSN print: 1753-7703
2. IEEE Transactions on Information Theory, IEEE, United State, ISSN: 00189448

Name of the Module: Pattern Recognition & Image Processing
Module Code: CSE 706B
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. introduction of pattern recognition System and its research fields,
2. introduce methods in image processing,
3. understand different clustering techniques and general understanding of the fundamentals of digital image processing,
4. introduce the student to analytical tools which are currently used in digital image processing as applied to image information for human viewing,
5. develop the student’s ability to apply these tools in the laboratory in image restoration, enhancement and compression,
6. understand differences between computer vision and image processing,
7. know the basic components of an image processing system.

B. Learning outcomes:
Students who successfully complete this module will be able to:
1. understand the basics of the human visual system as they relate to image processing; including spatial frequency resolution and brightness adaption,
2. understand how images are represented; including optical images, analog images, and digital images,
3. Understand image types such as binary images, gray-scale images, color and multi-spectral images,
4. know the key concepts in image file formats,
5. understand the model for an image analysis process,
6. understand why preprocessing is performed and know about image geometry, convolution masks, image algebra and basic spatial filters,
7. understand image quantization in both the spatial and brightness domains,
8. know about the 2-D Fourier, discrete cosine, Walsh-Hadamard and wavelet transforms; including implied symmetry, phase, circular convolution, vector inner and outer products and filtering,
9. know why log remapping is necessary for viewing spectral image data,
10. understand lowpass, highpass, bandpass, notch filters; including ideal and non-ideal filters such as the Butterworth.

C. Subject matter:
Unit I:

Unit II:
Bayes classified: decision function For Bayes classifier Bayes Classifier for normal patterns. Trainable pattern classifiers deterministic approach, perception approach reward punishment concept.
Gradient approach: Gradient Descent algorithms LMSE Algorithms Multi category classification.

Unit III:
Trainable pattern classifiers: statistical approach stochastic approximation methods, Robbin Minro algorithms increment correction algorithms, LMSE algorithms. Syntactic patter recognition formulation syntax directed recognition picture descrit.
Digital Image fundamentals: Representation, elements image transforms Fast Fourier transform, DCT and DWT.

Unit IV:
Image enhancement: Spatial domain - frequency domain methods Histogram, Modification techniques Image Smoothing, image sharpening.
Image encoding: Fidelity criteria, Encoding process, Mapping Quantizer coder Image Segmentation Masks Point detection Line Detection Edge Detection.

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:

Books

A. Magazine:
1. Pattern recognition, Elsevier, Neitherland

B. Journals:
1. IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE, United State
3. Pattern Recognition and Image Analysis, Springer, Neitherland

Name of the Module: Embedded System Design
Module Code: CSE 707B
Semester: 7th
Credit Value: 3\[P=0, T=0, L=3\]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. Introduce to features that build an embedded system.
2. To help the understanding of the interaction that the various components within an embedded system have with each other.
3. Techniques of inter facing between processors & peripheral device related to embedded processing.
4. To enable writing of efficient programs on any dedicated processor.
5. To present in lucid manner the basic concepts of systems programming like operating system, assembler compliers etc and to understand the management task needed for developing embedded system.

B. Learning outcomes:

Students successfully completing this module will be able:

1. to know about Embedded systems and the interface issues related to it,
2. to know about different techniques on embedded systems,
3. to know about the real time models, languages and operating systems,
4. to analyze real time examples, obstacles and solutions.

C. Subject matter:

Unit I:
Introduction to Embedded System: Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

Unit II:
Processor And Memory Organization: Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management – Cache mapping techniques, dynamic allocation - Fragmentation.

Unit III:
Devices & Buses For Devices Network: I/O devices; timer & counting devices; serial communication using I2C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system – Serial port & parallel port.

I/O Programming Schedule Mechanism: Intel I/O instruction – Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts. Multi threaded programming – Context switching, premature & non-premature multitasking, semaphores. Scheduling – Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

Unit IV:
Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools.

D. Teaching/ Learning/ Practice pattern:

Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:

1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:

Books:


Magazines:
1. The IEEE Embedded Systems Letters (Esl), IEEE, United State

Journals:
1. International Journal of Embedded Systems - Inderscience, Switzerland
2. EURASIP Journal on Embedded Systems - Springer, United State

Name of the Module: Digital audio & speech Process
Module Code: CSE 708B
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to Study different aspects of the speech communication process,
2. to Study different aspects of principles of discrete-time processing of speech and music.

B. Learning outcomes:
Students who successfully complete this module will be able to:
1. implement algorithms for processing audio and speech signals,
2. take into account the properties of acoustic signals and human hearing in the design of audio signal processing systems,
3. understands the speech production apparatus and its models,
4. estimate the effect of the signal representations on sound quality.

C. Subject matter:
Unit I:
Audio Processing: Auditory perception and psychoacoustics - Masking, frequency and loudness perception, spatial perception, Digital Audio, Audio Coding - High quality, low-bit-rate audio coding standards, MPEG, AC-3, Multichannel audio - Stereo, 3D binaural and Multichannel surround sound.


Unit II:
Time Domain Models For Speech Processing: Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination
using energy & zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing. Digital Representations of The Speech Waveform: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Unit III:
Homomorphic Speech Processing: Homomorphic systems for convolution, Complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.
Linear Predictive Coding Of Speech: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications.

Unit IV:
Automatic Speech Recognition: Introduction, Speech recognition vs. Speaker recognition, Signal processing and analysis methods, Pattern comparison techniques, Hidden Markov Models, Artificial Neural Networks.

D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
Books:

Magazines:
1. IEEE Signal processing magazine, IEEE, United State

Journals:
1. IEEE transaction on Audio, Speech and language processing, IEEE, United State
2. ACM Transactions on Speech and Language Processing, ACM, United State
3. EURASIP Journal on Audio, Speech, and Music Processing, Springer, United State

Name of the Module: Parallel Algorithms II
Module Code: CSE 711B
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to Study different aspects of Parallel Models
2. to Study different aspects of Interconnection Architecture
3. analyse a number of fundamental parallel algorithms from various application domains.

B. Learning outcomes:
Upon successful completion of the module students should be able to:
5. understand the role of computation models in parallel computation,
6. understand the circuit and comparison network models,
7. understand the basics of merging and sorting networks.

C. Subject matter:
Unit I:
Parallel Models (SIMD, MIMD, PRAMs, Interconnection Networks);
Performance Measures (Time, Processors, Space, Work);

Unit II:
Interconnection Architectures (Linear Array, Meshes, Trees, Mesh of Trees, Hypercubes, Butterfly Networks, Cube Connected Cycles, Benes Networks);

Unit III:
Techniques (Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Pipelining, Systolic Computation, Accelerated Cascading, Prefix Computation, List Ranking, Euler Tour, Tree Contraction);

Unit IV:
Sorting, Searching, Merging; Matrix Operations; Graph Algorithms (Connected Components, Spanning Trees, Shortest Paths); Complexity (Lower bounds, NC Class and P-Completeness).

D. Teaching/Learning/Practice pattern:
  Teaching: 40%
  Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
Books

Journals:
1. International Journal of Parallel Programming, Springer, United State, Print ISSN: 0885-7458, Online ISSN: 1573-7640
2. Journal of Parallel and Distributed Computing, Elsevier, Neitherland

Name of the Module: Computational Complexity
Module Code: CSE 710B
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to introduce students to important models of computation and how they are related,
2. fundamental notions of computation such as ‘computable’ and ‘efficiently computable,
3. the design and analysis of efficient algorithms.

B. Learning outcomes:
Upon successful completion of the module students should be able to
1. to have an understanding of different models of computation and their relevance to computer science,
2. to have an understanding of how algorithms can be used to solve fundamental problems within Computer Science.

C. Subject matter:
Unit I:
- Resources for computation (time, space, nondeterminism, randomness) and their associated complexity classes.
- Relationships among resources (P vs. NP and more) Reductions & completeness,

Unit II:
- Provably intractable problems: hierarchy thms, EXPSPACE-completeness
- Space complexity: PSPACE, L, NL, Randomized computation: RP, BPP

Unit III:
- Alternation: the polynomial hierarchy (PH), time-space tradeoffs for SAT Relativization (why diagonalization can't resolve P vs NP)
- Basic circuit complexity (P/poly, NC) Interactive proofs (AM, MA, IP), Probabilistically checkable proofs (PCP) and nonapproximability
- Possible topics

Unit IV:
- Unique Games Conjecture, Parity not in AC, Average-case complexity, Counting: P, Toda's Thm, approximate counting, Communication complexity and applications, Algebraic complexity: VNP, VP, Permanent vs. Determinant, Quantum computation: BQP, Shor's Factoring algorithm

D. Teaching/ Learning/ Practice pattern:
- Teaching: 40%
- Learning: 10%
- Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
Books:

151

Magazines:

Journals:
1. International Journal of Computational Complexity and Intelligent Algorithms, Inderscience, Switzerland.
2. Journal of Complexity, Elsevier, Netherland

Name of the Module: Natural Language Processing
Module Code: CSE 712B
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]

Module Leader:

A. Objectives:
The course is designed to meet the objectives of:
1. to provide a general introduction including the use of state automata for language processing,
2. to provide the fundamentals of syntax including a basic parse,
3. to explain advanced feature like feature structures and realistic parsing methodologies,
4. to explain basic concepts of remotes processing,
5. to give details about a typical natural language processing applications.

B. Learning outcomes:
Upon successful completion of the module students should be able:
1. to expose the basic principles of language processing and typical applications of natural language processing systems,
2. to set up and implement language technology experiment step by step,
3. to evaluate language technology components,
4. to familiar with a sample of machine learning techniques and can assess which ones are suitable for a given problem,
5. to interaction between rule based and probabilistic methods in language technology.

C. Subject matter:
Unit I:

Unit II:

Unit III:

Unit IV:


D. Teaching/ Learning/ Practice pattern:
Teaching: 40%
Learning: 10%
Practice: 50%

E. Examination pattern:
1. Theoretical Examination: Regular Examination.
2. Practical Examination: Conducting experiment and viva voice

F. Reading Lists:
Books:
3. Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, MIT press
4. Steven Bird, Ewan Klein, Edward Loper, “Natural Language Processing with Python”, O’Reilly
5. Ela Kumar, “Natural Language Processing”, I. K. International
6. Philip M. McCarthy, Chutima Boonthum-Denecke, Chutima Boonthum, “Applied Natural Language Processing and Content Analysis”, information science reference


Magazines:

Journals:
1. IJCLNLP International Journal of Computational Linguistics and Natural Language Processing, ISSN number 2279 – 0756
2. IEEE Transactions on Audio, Speech, and Language Processing, IEEE, United State, ISSN: 1558-7916.
3. ACM Transactions on Audio, Speech, and Language Processing, ACM, United State, ISSN: 2329-9290
Eighth Semester

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