Heritage Institute of Technology

Anandapur, Kolkata - 700107

Structures of Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Release Date: June 2017

B. Tech in (i) Applied Electronics & Instrumentation Engineering
(ii) Computer Science and Engineering
(iii) Electronics and Communication Engineering
(iv) Information Technology

1st Year 1st Semester Syllabus:

Theory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	HMTS1101	Business English & Communication	2	0	0	2	2
2	CHEM1001	Chemistry I	3	1	0	4	4
3	MATH1101	Mathematics I	3	1	0	4	4
4	ELEC1001	Basic Electrical Engineering	3	1	0	4	4
5	MECH1101	Engineering Mechanics	3	1	0	4	4
		Total Theory	**14**	**4**	**0**	**18**	**18**

Laboratory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CHEM1011	Chemistry I Lab.	0	0	3	3	2
2	ELEC1011	Basic Electrical Engineering Lab.	0	0	3	3	2
3	MECH1012	Engineering Drawing	1	0	3	4	3
		Total Laboratory	**1**	**0**	**9**	**10**	**7**

Sessional							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	HMTS1112	Communication Practice I Lab.	0	0	2	2	1
2	HMTS1121	Extra curricular activities	0	0	2	2	1
		Total Sessional	**0**	**0**	**4**	**4**	**2**
Total of Semester			**15**	**4**	**13**	**32**	**27**

B. Tech in (i) Applied Electronics & Instrumentation Engineering
(ii) Computer Science and Engineering
(iii) Electronics and Communication Engineering
(iv) Information Technology

1st Year 2nd Semester Syllabus:

Theory							
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points
			L	T	P	Total	
1	CSEN1201	Introduction to Computing	3	1	0	4	4
2	PHYS1001	Physics I	3	1	0	4	4
3	MATH1201	Mathematics II	3	1	0	4	4
4	ECEN1001	Basic Electronics Engineering	3	1	0	4	4
5	MECH1201	Engineering Thermodynamics and Fluid Mechanics	3	1	0	4	4
		Total Theory	**15**	**5**	**0**	**20**	**20**

Laboratory							
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points
			L	T	P	Total	
1	CSEN1211	Introduction to Computing Lab	0	0	3	3	2
2	PHYS1011	Physics I Lab.	0	0	3	3	2
3	ECEN1011	Basic Electronics Engineering Lab	0	0	3	3	2
4	MECH1011	Workshop Practice	1	0	3	4	3
		Total Laboratory	**1**	**0**	**12**	**13**	**9**
		Total of Semester	**16**	**5**	**12**	**33**	**29**

B Tech in IT: 2nd Year 1st Semester Syllabus:

Theory							
Sl. No	**Paper Code**	**Paper Name**	**Contact Hrs per Week**				**Credit Point**
			L	**T**	**P**	**Total**	
1	HMTS2001	Human Values and Professional Ethics	2	0	0	2	2
2	PHYS2001	Physics II	3	1	0	4	4
3	MATH2002	Numerical and Statistical Methods	3	0	0	3	3
4	CHEM2001	Basic Environmental Engineering & Ecology	3	0	0	3	3
5	CSEN2001	Data Structure and Basic Algorithms	3	1	0	4	4
6	INFO2101	Digital Electronics	3	0	0	3	3
7	INFO2102	Computer Organization	3	0	0	3	3
		Total Theory				**22**	**22**

Laboratory							
Sl. No	**Paper Code**	**Paper Name**	**Contact Hrs per Week**				**Credit Point**
			L	**T**	**P**	**Total**	
7	MATH2012	Numerical and Statistical Methods Laboratory	0	0	2	2	1
8	PHYS2011	Physics II Laboratory	0	0	3	3	2
9	CSEN2011	Data Structures Laboratory	0	0	3	3	2
10	INFO2112	Digital Electronics & Computer Organization Laboratory	0	0	3	3	2
		Total Laboratory				**11**	**7**
Total Semester						**33**	**29**

B Tech in IT: 2nd Year 2nd Semester Syllabus:

Theory							
Sl. No	**Paper Code**	**Paper Name**	**Contact Hrs per Week**				**Credit Point**
			L	**T**	**P**	**Total**	
1	HMTS2002	Indian Culture & Heritage	2	0	0	2	1
2	MATH2203	Graph Theory and Algebraic Structures	4	0	0	4	4
3	INFO2201	Switching Theory & Automata	3	1	0	4	4
4	INFO2202	Design & Analysis of Algorithms	3	1	0	4	4
5	INFO2203	Information Theory & Coding	4	0	0	4	4
6	INFO2204	Object Oriented Programming	4	0	0	4	4
		Total Theory				**22**	**21**

Laboratory							
Sl. No	**Paper Code**	**Paper Name**	**Contact Hrs per Week**				**Credit Point**
			L	**T**	**P**	**Total**	
7	HMTS2011	Language Practice Laboratory	0	0	3	3	2
8	INFO2212	Design & Analysis of Algorithms Laboratory	0	0	3	3	2
10	INFO2214	Object Oriented Programming Laboratory	0	0	3	3	2
		Total Laboratory				**9**	**6**
Total Semester						**31**	**27**

B Tech in IT: 3rd Year 1st Semester Syllabus:

Theory							
Sl. No	**Paper Code**	**Paper Name**	**Contact Hrs per Week**				**Credit Point**
			L	**T**	**P**	**Total**	
1	HMTS3101	Economics for Engineers	3	0	0	3	3
2	INFO3101	Operating Systems Concepts	4	0	0	4	4
3	INFO3102	Computer Architecture	3	0	0	3	3
4	INFO3103	Software Engineering & Project Management	3	0	0	3	3
5	INFO3104	DBMS	4	0	0	4	4
6		Professional Elective - I	3	0	0	3	3
		Total Theory				**20**	**20**

Laboratory							
Sl. No	**Paper Code**	**Paper Name**	**Contact Hrs per Week**				**Credit Point**
			L	**T**	**P**	**Total**	
7	INFO3111	UNIX & Operating Systems Laboratory	0	0	3	3	2
8	INFO3112	Computer Architecture Laboratory	0	0	3	3	2
9	INFO3113	Software Engineering & Project Management Laboratory	0	0	3	3	2
10	INFO3114	DBMS Laboratory	0	0	3	3	2
		Total Laboratory				**12**	**8**
Total Semester						**32**	**28**

Professional Elective – I Papers (any one):

6(a) INFO3131 Communication Theory
6(b) INFO3132 Compiler Design
6(c) INFO3133 Discrete Mathematics

B Tech in IT: 3rd Year 2nd Semester Syllabus:

Theory							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
1	HMTS3201	Principles of Management	2	0	0	2	2
2	INFO3201	Data Warehousing & Data Mining	3	0	0	3	3
3	INFO3202	Computer Network	3	0	0	3	3
4	INFO3203	Advanced Java & Web Technology	3	0	0	3	3
5		Professional Elective - II	3	0	0	3	3
6		Professional Elective - III	3	0	0	3	3
		Total Theory				**17**	**17**
Laboratory							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
7	INFO3211	Data Analysis Laboratory	0	0	3	3	2
8	INFO3212	Computer Network Laboratory	0	0	3	3	2
9	INFO3213	Advanced Java & Web Technology Laboratory	0	0	3	3	2
10		Professional Elective - II Laboratory	0	0	3	3	2
		Total Laboratory				**12**	**8**
Sessional							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
10	HMTS3221	Personality Development	1	0	0	1	1
11	INFO3221	Seminar - I	0	0	3	3	2
		Total Sessional				**4**	**3**
Total Semester						**33**	**28**

Professional Elective – II Papers (any one):

5(a) INFO3231 E-Commerce & ERP
5(b) INFO3232 Computer Graphics & Multimedia
5(c) INFO3233 System Software and Administration

Professional Elective – III Papers (any one):

6(a) INFO3241 Artificial Intelligence
6(b) INFO3242 Wireless & Mobile Computing
6(c) INFO3243 Pattern Recognition

Professional Elective – II Laboratories (Corresponding to Professional Elective – II theory paper opted for):

9(a) INFO3236 E-Commerce & ERP Laboratory
9(b) INFO3237 Computer Graphics & Multimedia Laboratory
9(c) INFO3238 System Software and Administration Laboratory

B Tech in IT: 4th Year 1st Semester Syllabus:

Theory							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
1	INFO4101	Internet Technology	3	1	0	4	4
2	INFO4102	Image Processing	3	1	0	4	4
3		Professional Elective - IV	3	0	0	3	3
4		Free Elective - I	3	0	0	3	3
		Total Theory				**14**	**14**

Laboratory							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
5	INFO4111	Internet Technology Laboratory	0	0	3	3	2
6	INFO4112	Image Processing Laboratory	0	0	3	3	2
		Total Laboratory				**6**	**4**

Sessional							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
7	HMTS4121	Professional Development	0	0	3	3	2
8	INFO4131	Industrial Training Evaluation	0	0	0	0	2
9	INFO4121	Industry Competence Laboratory	0	0	3	3	2
10	INFO4191	Project - I	0	0	6	6	4
		Total Sessional				**12**	**10**
Total Semester						**32**	**28**

** Free Elective papers offered by the Department of Information Technology:

1. INFO4181 Cyber Crime & Cyber Security
2. INFO4182 Cloud Computing

Professional Elective – IV Papers (any one):

3(a) INFO4141 Distributed Operating System
3(b) INFO4142 Cyber Law & Security Policy
3(c) INFO4143 Fundamentals of Cloud Computing

Free Elective – I Papers (any one):

4(a) ECEN4181 VLSI Design Automation
4(b) MATH4181 Operations Research and Optimization Techniques
4(c) AEIE 4182 Introduction to Embedded System

B Tech in IT: 4th Year 2nd Semester Syllabus:

Theory							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
1	HMTS4201	Organizational Behavior	2	0	0	2	2
2		Professional Elective - V	3	1	0	4	4
3		Free Elective - II	3	0	0	3	3
		Total Theory				**9**	**9**

Sessional							
Sl. No	Paper Code	Paper Name	Contact Hrs per Week				Credit Point
			L	T	P	Total	
5	INFO4231	Comprehensive Viva Voce	0	0	0	0	3
6	INFO4291	Project - II	0	0	12	12	8
		Total Sessional				**12**	**11**
Total Semester						**21**	**20**

** Free Elective papers offered by the Department of Information Technology:

1. INFO4281 Fundamentals of Cryptography
2. INFO4282 Soft Computing Application

Professional Elective – V Papers (any one):

2(a) INFO4241 Parallel Computing
2(b) INFO4242 Natural Language Processing
2(c) INFO4243 Cryptography & Network Security
2(d) INFO4244 Soft Computing

Free Elective – II Papers (any one):

3(a) AEIE4282 Control System & Application
3(b) BIOT4281 Computational Biology
3(c) ECEN4281 Cellular & Satellite Communication

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Structures of Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Year: 1st Year

Document Release Month & Year: June 2017

1st year 1st Semester:

Course Name : BUSINESS ENGLISH & COMMUNICATION					
Course Code: HMTS1101					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**0**	**2**	**2**

Module I – [5L]

Communication Skill
Definition, nature & attributes of Communication
Process of Communication
Models or Theories of Communication
Types of Communication
Levels or Channels of Communication
Barriers to Communication

Module II-[12L]

Business Communication- Scope & Importance
Writing Formal Business Letters
Writing Reports
Organizational Communication: Agenda & minutes of a meeting, notice, memo, circular
Project Proposal
Technical Report Writing
Organizing e-mail messages
E-mail etiquette
Tips for e-mail effectiveness

Module III-[10L]

Language through Literature
Modes of literary & non-literary expression
Introduction to Fiction, (An Astrologer's Day by R.K. Narayan and Monkey's Paw by W.W. Jacobs), Drama (The Two Executioners by Fernando Arrabal) or (Lithuania by Rupert Brooke) & Poetry (Night of the Scorpion by Nissim Ezekiel and Palanquin Bearers by Sarojini Naidu)

Module IV-[3L]

Grammar in usage (nouns, verbs, adjectives, adverbs, tense, prepositions, voice change) -to be dealt with the help of the given texts.

References

1. Armand Matterlart and Michele Matterlart, Theories of Communication: A Short Introduction, Sage Publications Ltd., 1998.
2. Chan, Janis Fisher, and Diane Lutovich. Professional Writing Skills. San Anselmo, CA: Advanced Communication Designs, 1997.
3. Geffner, Andrew P. Business English. Hauppauge, New York: Barron's Educational Series, 1998.
4. Good, Edward C. Mightier Than the Sword. Charlottesville: Word Stone Publications, 1989.
5. Edward P.Bailey, Writing and Speaking at Work: A Practical Guide for Business Communication, Prentice-Hall, 7th edn, 2004.
6. Kitty O. Locker, Business and Administrative Communication, McGraw-Hill/ Irwin, 7th edn, 2004.
7. Lillian Chaney and Jeanette Martin, Intercultural Business Communication, Prentice Hall, 4th edn, 2005.
8. Yudkin, Marcia. Persuading on Course Name. Lansing, IL: Infinity Publishing, 2001.

Course Name : CHEMISTRY 1					
Course Code: CHEM 1001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module I [10 L]

Thermodynamics & Spectroscopy

Chemical Thermodynamics & Thermochemistry

Concept of Thermodynamic system, Introduction to first law of thermodynamics, Enthalpy Heat Capacity, Reversible and Irreversible processes, Adiabatic changes, Application of first law of thermodynamics to chemical processes, 2nd law of thermodynamics, Evaluation of entropy, Work function and free energy, Phase Changes, Clausius Clapeyron Equation, Chemical Potential, Gibbs Duhem Relation, Activity and Activity coefficient.

Spectroscopy

Electromagnetic Radiation, Basic idea of UV-visible & IR spectroscopy.

Module II [10 L]

Structure & Bonding

Chemical Bonding

Covalent bond, VSEPR Theory, Molecular Orbital Theory, Hydrogen bond, Intermolecular forces-vander Waals forces, Ionization energy, Electronegativity, Electron affinity, Hybridisation, Dipole moment

Solid State Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor.

Ionic Equilibria and Redox Equlibria

Acid Base Equilibria in water, Strength of acids and bases, Hydrogen ion exponent, Ionic product of water, Salt Hydrolysis and Henderson Equation, Buffer solutions, pH indicator, Common ion Effect, Solubility product, Fractional Precipitation, Redox Equilibria,

Structure and reactivity of Organic molecule

Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.

Brief study of some addition, eliminations and substitution reactions.

Module III [10 L]

Electrochemistry & Reaction Dynamics

Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance, ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). 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 $AgNO_3$.

Electrochemical Cell

Cell EMF and thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half-cell and calomel half cell (construction, representation, cell reaction, expression of potential, discussion, application) Storage cell, fuel cell (construction, representation, cell

reaction, expression of potential, discussion, application). Application of EMF measurement on a) the change in thermodynamic function (ΔG, ΔH, ΔS) b) the equilibrium constant of a reversible chemical reaction c) the valency of an ion.

Kinetics
Reaction laws: rate expression, order and molecularity, zero, first and second order kinetics. Pseudounimolecular reaction, Arrhenius equation.
Mechanism and theories of reaction rates (Collision theory and Transition state theory,).
Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics).

Module IV [10 L]

INDUSTRIAL CHEMISTRY & POLYMERIZATION

Industrial Chemistry
Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Coal analysis: Proximate and ultimate analysis.
Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Bio-diesel.
Gaseous fuels: Natural gas, water gas, coal gas, bio gas.

Polymerization
Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI). Polymerization processes (addition and condensation polymerization), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of T_m) and amorphicity (Concept of T_g) of polymer.

Preparation, structure and use of some common polymers: plastic (PE: HDPE, LDPE, PVC, Bakelite, PP), rubber (natural rubber, SBR, NBR) and Vulcanization., fibre(nylon 6.6, Nylon 6, Polyester).
Conducting and semi-conducting polymers.

Text Books

1. Engineering Chemistry, Gourkrishna Dasmohapatra, Vikas Publishing House
2. A Text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co Pvt Ltd
3. Engineering Chemistry, K. L. Chugh, Kalyani Publishers.

Reference Books

1. General & Inorganic Chemistry, R. P. Sarkar, Fuels and Combustion, New Central Book Agency P Ltd
2. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc
3. Organic Chemistry, Morrison & Boyd, Prentice Hall of India
4. Physical Chemistry, K. L. Kapoor, McMillan
5. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).

Course Name : MATHEMATICS I					
Course Code: MATH1101					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module I [10L]

Matrix:
Matrices and their basic attributes, Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi'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, Special Complex Matrices: Hermitian, Unitary, Normal(definition only), Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by :Cramer's Rule and Matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Characteristic Equation and computation of eigenvalues and eigenvectors of a square matrix (of order 2 or 3), Cayley-Hamilton theorem and its applications(with special reference to higher power of matrices, e.g. Idempotent and Nilpotent matrices)

Module II [10 L]

Mean Value Theorems & Expansion of Functions:
Rolle's theorem: its geometrical interpretation and its application, Concavity and Convexity of curves, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the functions: $\sin x, \cos x, e^x, \log(1+x), (a+x)^n, n$ being an integer or a fraction (assuming that the remainder $R_n \to 0$ as $n \to \infty$in each case).

Infinite Series:
Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test(statements and related problems on these tests), Raabe's test, Proof of e being irrational, Alternating series, Leibnitz's Test (statement, definition) illustrated by simple examples, Absolute convergence and Conditional convergence,

Module III [10 L]

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 and also to find $(y_n)_0$).

Calculus of Functions of Several Variables:
Recapitulation of some basic ideas of limit and continuity of functions of single variable, Introduction to functions of several variables with examples, Knowledge of limit and continuity, Determination of partial derivatives of higher orders with examples, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems.

Module-IV [10 L]

Multiple Integration and Vector Calculus:
Concept of line integrals, Double and triple integrals. Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative, Related problems on these topics, Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications).

Reduction formula:
Reduction formulae both for indefinite and definite integrals of types:
$\int \sin^n x$, $\int \cos^n x$, $\int \sin^m x \cos^n x$, $\int \cos^m x \sin nx$, $\int \frac{dx}{(x^2+a^2)^n}$, m, n are positive integers.

References

1. Advanced Engineering Mathematics: Erwin Kreyszig by Wiley India
2. Engineering Mathematics: B.S. Grewal (S. Chand & Co.)
3. Higher Engineering Mathematics: John Bird (Elsevier)
4. Advanced Engineering Mathematics: Wiley and Barrett (Tata McGraw-Hill)
5. Calculus: M. J. Strauss, G. L. Bradley and K. L. Smith (Pearson Education)
6. Engineering Mathematics: S. S. Sastry (PHI)
7. Advanced Engineering Mathematics: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP),Indian Edition.
8. Linear Algebra(Schaum's outline series): Seymour Lipschutz, Marc Lipson (McGraw Hill Education)
9. Vector Analysis(Schaum's outline series): M.R. Spiegel, Seymour Lipschutz, Dennis Spellman (McGraw Hill Education)
10. Introduction to Real Analysis: S.K.Mapa (Sarat Book Distributors)

Course Name : BASIC ELECTRICAL ENGINEERING					
Course Code: ELEC1001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module-I: [12 L]

DC Network Theorem: Kirchhoff's law, nodal analysis, mesh analysis, Superposition theorem, Thevenin's theorem, Norton theorem, Maximum power transfer theorem, star-delta conversion.

DC Machines: Construction, EMF equation, Principle of operation of DC generator, open circuit characteristics, external characteristics, Principle of operation of DC motor, Speed-torque characteristics of shunt and series machine, starting of DC motor, speed control of dc motor.

Module-II [8L]

Electrostatics: Gauss's law and its applications to electric field and potential calculation. Capacitor, capacitance of parallel plate capacitor, spherical capacitor and cylindrical capacitor.

Electromagnetism: Amperes law, Biot-savart's law, Ampere's circuital law and their applications, Magnetic circuits, analogy between magnetic and electric circuits, Faraday's law, self and mutual inductance. Energy stored in a magnetic field, Hysteresis and Eddy current losses.

Module-III [10L]

AC single phase system: concept of alternating signal, average and RMS values of alternating signal, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, AC series , parallel and series parallel circuits, Active power, Reactive power, power factor, Resonance in RLC series and parallel circuit, Q factor, bandwidth.

Three phase system: balanced three phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two wattmeter method.

Module-IV [10L]

Single phase transformer: Construction, EMF equation, no load and on load operation and their phasor diagrams, Equivalent circuit, Regulation, losses of a transformer, open and short circuit tests, efficiency.

3-phase induction motor: Concept of rotating magnetic field, principle of operation, Construction, equivalent circuit and phasor diagram, torque-speed/slip characteristics, Starting of Induction Motor.

Text Books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
3. Basic Electrical Engineering, Hughes
4. Electrical Technology, Vol-I,Vol-II,Surinder Pal Bali, Pearson Publication
5. A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company

Reference Books:

1. Electrical Engineering Fundamentals, Vincent Del Toro, Prentice-Hall
2. Advance Electrical Technology, H.Cotton, Reem Publication
3. Basic Electrical Engineering, R.A. Natarajan, P.R. Babu, Sictech Publishers
4. Basic Electrical Engineering, N.K. Mondal, Dhanpat Rai
5. Basic Electrical Engineering, Nath & Chakraborti
6. Fundamental of Electrical Engineering, Rajendra Prasad, PHI, Edition 2005.

Course Name : ENGINEERING MECHANICS					
Course Code: MECH 1101					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module-I [10L]

Importance of Mechanics in Engineering ; Definition of Mechanics; Concepts of particles & rigid bodies; Vector and scalar quantities; Vector algebra –definition and notation; Types of vectors – equal , equivalent , free , bound , sliding ; Addition , subtraction of vectors ; Parallelogram law , triangle law , vector polygon ; Scalar multiplication of vectors ; Resolution of vectors in Cartesian co–ordinate system ; Unit vector, unit co–ordinate vectors ($\hat{i}$, $\hat{j}$, $\hat{k}$) ; Direction cosines ; Addition/ subtraction of vectors in components form.

Definition of force vector ; Dot product , cross product and the application ; Important vector quantities (position vector , displacement vector) ; Moment of a force about a point and about an axis , moment of a couple ; Representation of force and moments in items of $\hat{i}$, $\hat{j}\hat{k}$. Principle of transmissibility of force (sliding vector); Varignon's theorem for a system of concurrent forces with proof; Resolution of a force by its equivalent force-couple system; Resultant of forces.

Module-II [10L]

Type of forces – collinear, concurrent, parallel, concentrated, distributed; Active and reactive forces, different types of reaction forces; Free body concept and diagram; Concept and equilibrium of forces in two dimensions; Equations of equilibrium; Equilibrium of three concurrent forces -- Lami's theorem.

Concept of friction: Laws of Coulomb's friction; Angle of friction, angle of repose, coefficient of friction -- static and kinematic.

Module-III [12L]

Distributed force system; Centre of gravity; Centre of mass & centroid; Centroid of an arc; Centroid of plane areas – triangle, circular sector, quadrilateral and composite area consisting of above figures.

Area moment of inertia: Moment of inertia of a plane figure; Polar moment of inertia of a plane figure; Parallel axes theorem.

Concept of simple stress and strain ; Normal stress , shear stress , normal strain, shear strain; Hooke's law; Poisson's ratio; stress- strain diagram of ductile and brittle material; Proportional limit, elastic limit, yield point , ultimate stress, breaking point; Modulus of elasticity.

Module-III [16L]

Introduction to dynamics: Kinematics & kinetics; Newton's laws of motion; Law of gravitation and acceleration due to gravity; Rectilinear motion of particles with uniform & non – uniform acceleration.
Plane curvilinear motion of particles: Rectangular components (projectile motion), normal and tangential components.
Kinetics of particles: D'Alembert's principle and free body diagram; Principle of work & energy; Principle of conservation of energy.
Impulse momentum theory: Conservation of linear momentum

References:

1. Engineering Mechanics:- Statics and Dynamics by Meriam & Kreige , Wiley india
2. Engineering Mechanics:- Statics and Dynamics by I.H. Shames, P H I
3. Engineering Mechanics by Timoshenko , Young and Rao , TMH
4. Element of strength of materials by Timoshenko & Young, E W P
5. Fundamentals of Engineering Mechanics by Nag & Chanda – Chhaya Prakashani.

Course Name : CHEMISTRY I LAB					
Course Code: CHEM 1011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

List of Experiments:

1. To determine the alkalinity in a given water sample.
2. Estimation of iron using $KMnO_4$: self indicator.
3. Estimation of iron using $K_2Cr_2O_7$: redox sensitive indicator.
4. To determine total hardness and amount of calcium and magnesium separately in a given water sample.
5. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
6. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Iodometric estimation of Cu^{2+}.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

Course Name : BASIC ELECTRICAL ENGINEERNG LAB.					
Course Code: ELEC1011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. Verification of Thevenin's & Norton's theorem.
4. Verification of Superposition theorem
5. Verification of Maximum Power Transfer theorem
6. Calibration of ammeter and voltmeter.
7. Open circuit and Short circuit test of a single phase Transformer.
8. Study of R-L-C Series / Parallel circuit
9. Starting and reversing of speed of a D.C. shunt Motor
10. Speed control of DC shunt motor.
11. No load characteristics of D.C shunt Generators
12. Measurement of power in a three phase circuit by two wattmeter method.

Course Name : Engineering Drawing					
Course Code: MECH 1012					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	1	**0**	**3**	**4**	**3**

1. Importance of engineering drawing; Acquaintance with different drafting equipment & accessories;
2. Introduction to lines : Practising different types of lines; Basic concepts in Lettering : Practising vertical & inclined letters (Practice Sheet 1)
3. Different systems of dimensioning with practice.Introduction to the concept of scale of drawing. (Practice Sheet 2)
4. Introduction to concept of orthographic projection: 1st angle and 3rd angle projection method; Symbols; projection of points. (Practice Sheet 3)
5. Projection of straight lines for different orientation including inclined to both the planes. (Practice Sheet 4)
6. Projection of plane surfaces inclined to HP and parallel to VP; Inclined to VP and Parallel to HP (Practice Sheet 5)
7. Projection of solids: Cube, rectangular prism, Hexagonal prism, Cylinder, Pyramid, Cone. (Practice Sheet 6)
8. Section of solids and their projections on principal and auxiliary planes for true shape: Cylinder, hexagonal pyramid. (Practice Sheet 7)
9. Isometric projections: Basic concepts, isometric scale; Isometric projection and view.
10. Practice with simple laminar and solid objects. (Practice Sheet 7)

References:

1. "Elementary Engineering Drawing" by Bhatt, N.D; Charotan Book Stall, Anand
2. "Engineering Graphics" by Narayana, K.L. and Kannaaiah P; TMH
3. "Engineering Graphics" by Lakshminarayanan, V. and Vaish Wanar, R.S, JainBrothers.

Course Name : Communication Practice I Lab [Sessional]					
Course Code: HMTS 1112					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**2**	**2**	**1**

Module I [3P]

Introduction to Linguistics (Phonology)
Phonetics-Vowel and Consonant Sounds (Identification &articulation)
Word- stress
Intonation (Falling and rising tone)
Voice Modulation
Accent training

Module II [3P]

Listening Skills
Principles of Listening
Approaches to listening
Guidelines for Effective Listening
Listening Comprehension
Audio Visual (Reviews)

Module III [2P]

Discourse Analysis-
Spoken Discourse
Conversational Skills/Spoken Skills
Analysing Speech dynamics
(Political Speeches
Formal Business Speeches)

Module IV [9P]

Writing Skill-
Descriptive, narrative and expository writing
Writing with a purpose---Convincing skill, argumentative skill/negotiating Skill (These skills will be repeated in oral skills).
Writing reports/essays/articles—logical organization of thoughts
Book review

References

1. Munter, Mary. Guide to Managerial Communication. 5th ed. Upper Saddle River, NJ: Prentice Hall, 1999.
2. Cypres, Linda. Let's Speak Business English. Hauppauge, NY: Barron's Educational Series, 1999. Crystal, David. 1971. *Linguistics.* Baltimore: Penguin Books.
3. Larsen-Freeman, D. (1986). "Techniques and principles in language teaching." Oxford: Oxford University Press.
4. Littlewood, W. (1981). "Language teaching. An introduction." Cambridge: Cambridge University Press.
5. Savignon, S. J., & Berns, M. S. (Eds.). (1983). "Communicative language teaching: Where are we going? Studies in Language Learning," 4(2). (EDRS No. ED 278 226, 210 pages)

Course Name : Extra Curricular Activities					
Course Code: HMTS 1121					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**2**	**2**	**1**

Objective: This course aims at instilling a sense of social responsibility. This objective can be achieved by bringing in awareness about the contemporary issues relevant to the GenX and Gen Y through enlightened discussions and active participation. Since the course has 1 credit detailed planning regarding the area of activities and method of evaluation should be charted at the start of the semester.

Module I:

Project Work
Development of projects based on integral and holistic developmental models to be implemented in rural areas or underdeveloped areas in the peripheral areas of cities. This could include a wide area of activity – from taking up a research projects to analyse the need of a particular under-developed area to trying to implement a project already formulated. This could also relate to mobilizing funds for a specific project.

Module II:

Action-oriented schemes
e.g.Organising Blood –donation camps
Conducting child –healthcare services
Helping the old and sick
(in coordination with NGOs and other institutes)

Module III:

Society and Youth
Developing Awareness among the youth about social issues both local and global for e.g. Eradication of social evils like drug abuse, violence against women and others.

Module IV:

Youth and Culture
Generating new ideas and help the participants to be creative and innovative for e.g.Enacting street plays, encouraging creative writing by organizing workshops and competitions. Active participation of the students in the nation building process by making positive changes in the social and individual space.

Mode of Evaluation
Total marks allotted -100. In a semester each student should take part in at least four activities. Group activity method is to be followed.

1st year 2nd Semester:

Course Name : Introduction to Computing					
Course Code: CSEN 1201					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Learning Objective: Introduction to the concept of computer and computation and solving of problems using C as a programming language. Coverage of C will include basic concepts, arithmetic and logic, flow control, and data handling using arrays, structures, pointers and files.

Module I: [13L]

Fundamentals of Computer

History of Computers, Generations of Computers, Classification of Computers.

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Assembly language, high level language, compiler and assembler (basic concepts).

Binary & Allied number systems (decimal, octal and hexadecimal) with signed and unsigned numbers (using 1's and 2's complement) - their representation, conversion and arithmetic operations. Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation (half- 16 bit, full- 32 bit, double- 64 bit). Binary Arithmetic & logic gates. Boolean algebra – expression, simplification, Karnaugh Maps.

Basic concepts of operating systems like MS WINDOW, LINUX. How to write algorithms & draw flow charts.

Module II: [5L]

Basic Concepts of C

C Fundamentals:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements.

Operators & Expressions:
Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Standard input and output, formatted output -- printf, formatted input scanf.

Module III: [8L]

Program Structures in C

Flow of Control:
Statement and blocks, if-else, switch-case, loops (while, for, do-while), break and continue, go to and labels.

Basic of functions, function prototypes, functions returning values, functions not returning values. Storage classes - auto, external, static and register variables – comparison between them. Scope, longevity and visibility of variables.

C preprocessor (macro, header files), command line arguments.

Module IV: [14L]

Data Handling in C

Arrays and Pointers:

One dimensional arrays, pointers and functions – call by value and call by reference, array of arrays. Dynamic memory usage– using malloc(), calloc(), free(), realloc(). Array pointer duality.

String and character arrays; C library string functions and their use.

User defined data types and files:

Basic of structures; structures and functions; arrays of structures.

Files – text files only, modes of operation. File related functions – fopen(), fclose(), fscanf(), fprintf(), fgets(), fputs();

Text Books

1. Schaum's outline of Programming with C – Byron Gottfried
2. Teach Yourself C- Herbert Schildt
3. Programming in ANSI C – E Balagurusamy

Reference Books

1. C: The Complete Reference – Herbert Schildt
2. The C Programming Language- D.M.Ritchie, B.W. Kernighan

Course Name : PHYSICS 1					
Course Code: PHYS 1001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module I: [22 L]

Optics

1.Interference :

The principle of superposition of waves, Superposition of waves: Two beam superposition, Multiple-beam superposition, coherent and incoherent superposition. Two source interference pattern (Young's double slit), Intensity distribution. Interference in thin films, wedge shaped films and Newton's rings, applications of interference. Newton's rings: Determination of wavelength of light, refractive index of liquid.

2 Diffraction:

Diffraction of light waves at some simple obstacles. Fraunhoffer diffraction through double slit and diffraction grating, grating spectra, resolving power of grating.

3. Polarisation & Fibre Optics:

Elementary features of polarization of light waves.Production and analysis of linearly, elliptic and Circularly polarized light, polaroids and application of polarizations. fibre optics - principle of operation, numerical aperture, acceptance angle

4 Laser

Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Module II : [8L]

Waves & Oscillation

Superposition of two linear SHMs (with same frequency), Lissajous' figures. Damped vibration – differential equation and its solution, Critical damping, Logarithmic decrement, Analogy with electric circuits. Forced vibration – differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance and Quality factor. Progressive wave- Wave equation and its differential form, Difference between elastic (mechanical) and electromagnetic waves.

Module III : [9L]

Quantum Mechanics

Need for Quantum physics-Historical overviews, Particle aspects of radiation-Black body radiation, Compton scattering, pair production., Origin of X-ray spectrum. Wave aspect of particles- matter wave, de Broglie Hypothesis, Heisenberg Uncertainty principles- Statement, Interpretation and application.

Module IV: [6L]

Introduction of Crystallography

Space Lattice**,** Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Miller Indices and its applications, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC. Bragg's law and its applications.

Text Books

1. Atomic Physics Vol 1 – S.N. Ghoshal
2. Optics – Ajoy Ghak
3. Waves & Oscillation – N.K. Bajaj
4. Quantum Physics of Atoms , Molecules, Solids, Nuclei and particles – Eisberg and Resnick

Reference Books

1. Introduction to Special Relativity – Robert Resnick
2. Prespective on Modern Physics - Arthur Beiser
3. Optics – Jenkins and White
4. University Press – Sears & Zemansky
5. Introduction to modern Physics – Mani and Meheta
6. Optics – Brijlal and Subrahmanyam

Course Name : Mathematics II					
Course Code: MATH1201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module I [10 L]

Ordinary differential equations (ODE)-
First order and first degree: Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear and non-linear differential equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).

Second order and first degree:
General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations.

Module II:[10L]

Basics of Graph Theory
Graphs, Digraphs, Weighted graph, Connected and disconnected graphs,Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph,Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph,Graph isomorphism, Bipartite graph.

Tree:
Definition and properties, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms.

Module III [10L]

Improper Integral:
Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations.

Laplace Transform:
Introduction to integral transformation, functions of exponential order, Definition and existence of LT (statement of initial and final value theorem only), LT of elementary functions, Properties of Laplace Transformations , Evaluation of sine , cosine and exponential integrals using LT, LT of periodic and step functions Definition and properties of inverse LT Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODEs with constant coefficients (initial value problem) using LT.

Module IV [10L]

Three Dimensional Geometry
Equation of a plane. General form. Transformation to the normal form. Intercepts. Equation of the plane through three given points. Equation of a plane passing through the intersection of two planes. Angle between two intersecting planes. Bisectors of angles between two intersecting planes. Parallelism and perpendicularity of two planes.

Canonical equation of the line of intersection of two intersecting planes. Angle between two lines. Shortest distance between two lines. Condition of coplanarity of two lines. Length of the perpendicular from a point to a given line.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, (Wiley Eastern)
2. Graph Theory: V. K. Balakrishnan, (Schaum's Outline, TMH)
3. A first course at Graph Theory: J. Clark and D. A. Holton (Allied Publishers LTD)
4. Introduction to Graph Theory: D. B. West (Prentice-Hall of India)
5. Graph Theory: N. Deo (Prentice-Hall of India)
6. Engineering Mathematics: B.S. Grewal (S. Chand & Co.)
7. Higher Engineering Mathematics: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
8. Calculus: Strauss, Bradley and Smith (3PrdP edition, Pearson Education)
9. Engineering Mathematics (Volume 2): S. S. Sastry (Prentice-Hall of India)
10. Introductory Course in Differential Equations: Daniel A. Murray (Longmans & Green).
11. Co-ordinate Geometry – S. L. Loney.
12. Analytical Geometry And Vector Algebra- R M Khan

Course Name : Basic Electronics Engineering					
Course Code: ECEN1001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module I [10 L]

Semiconductors:

Crystalline material, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Diodes and Diode Circuits:

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener Diode and its Application, Zener and Avalanche breakdown.
Simple diode circuits, load line, piecewise linear model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module II [10 L]

Bipolar Junction Transistors:

Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off, active and saturation modes of operation, transistor action, input & output characteristics, load line & amplifier operation and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor.

Module III [9 L]

Field Effect Transistors:

Junction field effect transistor (JEET): Principle of operation, JFET parameters, eqv. Circuit, JFET biasing, self bias, design of bias circuits, load line, amplifier characteristics.

MOSFETs:

Construction & principle of operation of p- & n-channel enhancement & depletion mode MOSFETs, drain & transfer characteristics, threshold voltage & its control.

Cathode Ray Osilloscope:

Construction and working principle of CRO, Lissajous pattern.

Module IV [9 L]

Feed Back Amplifier:

Concept-block diagram, properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, condition of oscillation, Barkhausen criteria.

Operational Amplifier:

Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; Concept of op-amp saturation, inverting and non-inverting mode of operation, Adders, Subtractors, Voltage follower, Integrator, Differentiator, Basic Comparator Circuit.

References:

1. Boylestad & Nashelsky:Electronic Devices & Circuit Theory
2. R.A Gayakwad:Op Amps and Linear IC's, PHI
3. D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
4. Adel S. Sedra, Kenneth Carless Smith: Microelectronics Engineering
5. Millman & Halkias: Integrated Electronics.
6. Salivahanan: Electronics Devices & Circuits.
7. Albert Paul Malvino: Electronic Principle.

Course Name : Engineering Thermodynamics & Fluid Mechanics					
Course Code: MECH1201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Module I [10 L]
Basic concepts of Thermodynamics:

Introduction; Macroscopic and microscopic concept; Definition of Thermodynamic systems; Surrounding, universe; Open, closed and isolated systems; Concept of control volume; Thermodynamic properties: intensive, extensive & specific properties; state.

Thermodynamic equilibrium; Change of state; Thermodynamic processes and cycles; Quasi-static processes; Reversible processes; Zeroth law of Thermodynamics -concept of temperature.

Heat & Work:

Definition of Thermodynamic work; Work transfer-displacement work for a simple compressible system, path function, PdV work in various quasi-static processes(isothermal, isobaric, adiabatic, polytropic, isochoric); Free expansion; Indicated diagram (P-V diagram). Definition of heat; Heat transfer-a path function; Similarities and dissimilarities between heat and work.
Module II [8 L]

First law of Thermodynamics: Statement; 1st law for a closed system executing a cycle; Concept of stored energy; Energy as a property, different forms of stored energy, internal energy, first law for a non-flow process; Flow work; Definition of enthalpy, C_p, C_v; Energy of an isolated system; Flow energy; First law for an open system - steady flow energy equation; Examples of steady flow devices(nozzle and diffuser, turbine, pump, compressor, boiler, condenser and throttling device); PMM-I

Module III [10 L]

Second law of Thermodynamics:

Qualitative difference between heat and work; Definition of source & sink: cyclic heat engine, heat pump and refrigerator, thermal efficiency of heat engine, C.O.P of heat pump and refrigerator; Kelvin-Plank and Clausius statements of second law; Equivalence of the two statements.

Reversible process; Irreversible process; Factors for irreversibility; Carnot cycle and Carnot efficiency; Reversible heat engine and heat pump; PMM-ll

Entropy: Mathematical statement of Clausius Inequality: Entropy as a property; Entropy principle; T-s plot for reversible isothermal, adiabatic, isochoric & isobaric processes.

Air standard Cycles:

Otto cycle & Diesel cycle, P-V & T-s plots, Net work done and thermal efficiency.

Module IV [10 L]

Properties & Classification of Fluid:

Definition of fluid; Concept of Continuum; Fluid properties- density, specific weight, specific volume, specific gravity; Viscosity : definition , causes of viscosity , Newton's law of viscosity, dimensional formula and units of viscosity, kinematic viscosity; Variation of viscosity with

temperature. Ideal and Real fluids; Newtonian and Non-Newtonian fluids; No-slip condition.
Compressibility and Bulk modulus of elasticity.
Difference between compressible and incompressible fluids.

Fluid Statics:

Introduction; Pascal's Law--statement and proof; Basic Hydrostatic Law and its proof; Variation of pressure with depth in incompressible fluid, piezometric head, pressure head; Unit and scales of pressure measurement.
Measurement of fluid pressure: Piezometer, Manometers -Simple and Differential U-tube manometer, Inverted tube manometer, Inclined tube manometer.
Characteristics and choice of manometric fluid.

Module V [10 L]

Fluid Kinematics:

Definition; Flow field and description of fluid motion(Eulerian & Lagrangian method), steady and unsteady flow, uniform and non-uniform flow-examples.
Acceleration of a fluid particle-local acceleration, convective acceleration. Stream line, Stream tube, Path line and Streak line; Laminar and Turbulent flow, Reynolds Number. Equations of streamlines and path lines.
Continuity equation for unidirectional flow and for differential form in 3-D Cartesian coordinate system.

Dynamics of Ideal fluids:

Introduction, Euler's equation of motion along a streamline; Bernoulli's equation-assumptions and significance of each term of Bernoulli's equation.
Application of Bernoulli's equation-problem on pipe line. Measurement of flow rate: Venturimeter and orificemeter .
Static pressure, Dynamic pressure, Stagnation pressure-measurement of velocity by Pitot tube.

References:

1. Engineering Thermodynamics- Nag, P.K. - T. M.H
2. Fundamentals of Thermodynamics- Sonntag, Borgnakke & Van Wylen, Wiley India
3. Thermodynamics- an Engineering approach - 6e, Cengel & Boles, TM
4. Fluid Mechanics & Hydraulic Machines – R.K. Bansal, Laxmi Publications Ltd, India
5. Introduction to Fluid Mechanics and Fluid Machines- S.K. Som, G. Biswas, & S. Chakraborty , T.M.H
6. Fluid Mechanics – A.K. Jain, Khanna Publishers.

Course Name : Introduction to Computing Lab					
Course Code: CSEN1211					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

Basic Computation & Principles of Computer Programming Lab
Software to be used: Cygwin and notepad++, Tiny C

Day 1: LINUX commands and LINUX based editor
Day 2: Basic Problem Solving
Day 3: Control Statements (if, if-else, if-elseif-else, switch-case)
Day 4: Loops - Part I (for, while, do-while)
Day 5: Loops - Part II
Day 6: One Dimensional Array
Day 7: Array of Arrays
Day 8: Character Arrays/ Strings
Day 9: Basics of C Functions
Day 10: Recursive Functions
Day 11: Pointers
Day 12: Structures and Unions
Day 13: File Handling

Course Name : PHYSICS I Lab					
Course Code: PHYS 1011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**3**

1. Determination of Young's modulus by Flexure Method and calculation of bending moment and shear force at a point on the beam.
2. Determination of modulus of rigidity by Static/Dynamic Method.
3. Determination of thermal conductivity of a good conductor by Searle's Method.
4. Determination of thermal conductivity of a bad conductor by Lee's and Chorlton's Method.
5. Determination of dielectric constant of a given dielectric material.
6. Use of Carey Foster's bridge to determine unknown resistance.
7. Determination of wavelength of light by Newton's ring method.
8. Determination of wavelength of light by Fresnel's biprism method.
9. Determination of wavelength of light by Laser diffraction method.
10. Determination of dispersive power of the material of a given prism.
11. Determination of co-efficient of viscosity of a liquid by Poiseulle's capillary flow method.

Course Name : Basic Electrical Engineering Lab					
Course Code: ELEC1011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**3**

List of Experiments

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs in CB mode
7. Study of I-V characteristics of BJTs in CE mode
8. Study of I-V characteristics of Field Effect Transistors.
9. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
11. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and

Course Name : Workshop Practice					
Course Code: MECH1011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	1	**0**	**3**	**3**	**3**

Job 1: General awareness of a typical workshop.

Theory requirements: Workshop definition, various shops in a typical workshop, Carpentry, Fitting, Foundry; Sheet Metal Shop, Welding and Brazing Shop, Machine Shop , Forging & Blacksmithy, Safety precautions to be followed in a workshop, Familiarization of Various safety devices and their uses.

Job 2: Making of a wooden pattern.

Theory requirements: Market forms of converted Timber ,eg, log, balk, plank,batten, beam ,Types of Wood, Hard Wood, Soft Wood, particle board; Seasoning of wood, Natural seasoning, Artificial seasoning, Carpentry Tools- Marking Tools, Cutting Tools, Planing Tools, Boring Tools, Striking Tools , Holding & Misc. Tools, Carpentry Processes (marking, sawing, planning, chiselling, boring, grooving, joining etc.), Safety precautions in Carpentry Shop.

Job 3: Making of a matched profile form MS plate.

Theory requirements: Work Bench, Fitting Tools (Bench Vice,Chisel,Hammer,Different types of Files, (Rough,Bastard, Second Cut, Half Round, Triangular File),Saw(Hack saw etc.), Scriber, Punch, Try Square, Angle Plate, caliper (outside & inside), Universal Surface Gauge, Centre Punch, Prick Punch, Drill (Flat,straight fluted, taper shank twist drill).
Fitting Operations,Filing, Marking, Drilling, Tapping (Rougher,Intermediate, Finisher taps), Tap Drill size (D=T-2d), Sawing, Dieing . Safety precautions in Fitting Shop.

Job 4: Making of an internal and external thread.

Theory requirements : Thread standards and thread classifications, Internal Thread,External Thread, Thread Nomenclature (Major dia, Minor dia, Pitch dia, pitch, Lead, TPI, Metric, BSP , Nominal size), Specifications of threaded fasteners (in Metric System). Safety precautions in Dieing and Tapping.

Job 5: Making of a green sand mould using the pattern made under Job no. 2.

Theory requirements: Mould making, Preparation of sand, (silica, clay, moisture, and misc items and their functions), Properties of a good sand mould, General procedure for making a good sand mould, Different tools used for preparation of a mould, Explanation of various terms , Cope and Drag Box, Runner, Riser, Gating and its utility, Parting sand, Vent holes.

Job 6: Demonstration of metal melting and casting

Theory requirements: Metal melting furnaces: Ladles, Using of Tongs, Molten metal pouring procedure, Safety precautions in pouring molten metal in a mould.

Job 7. Making of a stepped pin in a centre lathe. (2 Classes)

Theory requirements: Machining and common machining operations , Lathe M/c and its specifications, Head stock, Tailstock, Chuck-Self centering chuck , 4 jaw chuck, Bed, Carriage, Feed mechanism, Screw cutting mechanism, various lathe operations like turning, facing, grooving, chamfering, taper turning ,Thread cutting, Knurling, Parting, Cutting speed, Feed, Depth of cut , Different types of cutting tools-Safety precautions in a machine shop.

Job 8: Making of square prism from a round shaft by Shaping Machine

Theory requirements: Description of a Shaping machine, Base , Column, Saddle, Clapper box, Quick return mechanism, Feed Mechanism, Table, Rotation of table, Adjustment of stroke length, Adjustment of starting point of cut. Safety Precautions while working in Shaping Machine.

Job 9: Making of square prism from a round shaft by Milling Machine

Theory requirements: Description of a milling machine, Specification of a Milling machine, Types of Milling-Up Milling, Down Milling, Vertical Milling Machine, Horizontal Milling Machine , Safety precautions while working in Milling Machine.

Job 10 : Arc Welding practice and making of a welded joint

Theory requirements: Welding, Weldability, Types of Welding, MMAW, Gas Welding, Electrode , Functions of Flux, Equipment for MMAW, Different types of Flames in Gas Welding and Gas Cutting (Neutral-Oxidising-Reducing Flames), Different types of welding joints, AC Welding , DC Welding; Safety precautions in Welding Shop.

Job 11 : Sheet Metal forming & Brazing

Theory requirement: Specification of sheet metal, SWG vs. mm, HR sheet, CR sheet, GI Sheet, Stainless Steel Sheet, Aluminum sheets, Tin Plates, Sheet metal working Tools, Micrometer, Chisels, Punches, Hammers, Mallets, Hand Shear or Snippets, Various sheet metal forming operations, Shearing, Marking, Punching, Drilling, Bending, Drawing, Brazing, Safety precautions in Sheet Metal Working Shop.

References:

1. Elements of Workshop Technology (Vol- I and II)- Hajra Choudhury, Media Promoter &Publishers Privet Limited.
2. Workshop Technology (Vol- I and II) – Chapman , Viva Books Privet Limited.

Heritage Institute of Technology

Anandapur, Kolkata - 700107

Structures of Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Year: 2nd Year

Document Release Month & Year: June 2017

2nd Year 1st Semester:

Course Name : HUMAN VALUES AND PROFESSIONAL ETHICS					
Course Code: HMTS2001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**0**	**2**	**2**

Detailed Syllabus:

Module-I:

Human society and the Value System
Values: Definition, Importance and application.
Formation of Values: The process of Socialization
Self and the integrated personality
Morality, courage, integrity
Types of Values:
Social Values: Justice, Rule of Law, Democracy, Indian Constitution, Secularism
Aesthetic Values: Perception and appreciation of beauty
Organizational Values: Employee: Employer--- rights, relationships, obligations
Psychological Values: Integrated personality and mental health
Spiritual Values &their role in our everyday life
Value Spectrum for a Good Life, meaning of Good Life
Value Crisis in Contemporary Society
Value crisis at----
Individual Level
Societal Level
Cultural Level
Value Crisis management ----Strategies and Case Studies

Module II

Ethics and Ethical Values
Principles and theories of ethics
Consequential and non-consequential ethics
Egotism, Utilatirianism, Kant's theory and other non-consequential perspectives
Ethics of care, justice and fairness, rights and duties
Ethics-- Standardization
Codification
Acceptance
Application
Types of Ethics -- Ethics of rights and Duties
Ethics of Responsibility
Ethics and Moral judgment
Ethics of care
Ethics of justice and fairness
Work ethics and quality of life at work
Professional Ethics
Ethics in Engineering Profession;
Moral issues and dilemmas, moral autonomy (types of inquiry)
Kohlberg's theory, Giligan's theory (consensus and controversy)
Code of Professional Ethics Sample Code of ethics like ASME, ASCE. IEEE,Institute of Engineers,Indian Institute of materials management, Institute of Electronics and telecommunication engineers
Violation of Code of Ethics conflict, causes and consequences
Engineering as social experimentation, engineers as responsible experimenters (computer ethics, weapons development)

Engineers as managers, consulting engineers, engineers as experts, witnesses and advisors, moral leadership
Conflict between business demands and professional ideals
Social and ethical responsibilities of technologies.
Whistle Blowing: Facts, contexts, justifications and case studies
Ethics and Industrial Law
Institutionalizing Ethics: Relevance, Application, Digression and Consequences

Module-III:

Science, Technology and Engineering
Science, Technology and Engineering as knowledge and profession
----Definition, Nature, Social Function and Practical application of science
Rapid Industrial Growth and its Consequences
Renewable and Non- renewable Resources: Definition and varieties
Energy Crisis
Industry and Industrialization
Man and Machine interaction
Impact of assembly line and automation
Technology assessment and Impact analysis
Industrial hazards and safety
Safety regulations and safety engineering
Safety responsibilities and rights
Safety and risk, risk benefit analysis and reducing risk
Technology Transfer: Definition and Types
The Indian Context

Module-IV:

Environment and Eco- friendly Technology
Human Development and Environment
Ecological Ethics/Environment ethics
Depletion of Natural Resources: Environmental degradation
Pollution and Pollution Control
Eco-friendly Technology: Implementation, impact and assessment
Sustainable Development: Definition and Concept
Strategies for sustainable development
Sustainable Development--- The Modern Trends
Appropriate technology movement by Schumacher and later development
Reports of Club of Rome.

References:

1. Tripathi,A.N., Human Values, New Age International, New Delhi,2006
2. Ritzer, G., Classical Sociological Theory, The McGraw Hill Companies, New York, 1996.
3. Doshi,S.L., Postmodern Perspectives on Indian Society, Rawat Publications, New Delhi,2008.
4. Bhatnagar, D.K., Sustainable Development, Cyber Tech Publications, New Delhi, 2008.
5. Kurzwell,R., The age of Spiritual Machines, Penguin Books, New Delhi,1999.
6. Weinberg, S.K., Social Problems in Modern Urban Society, Prentice Hall,Inc.,USA, 1970.
7. Giddens, Anthony 2009. Sociology. London: Polity Press (reprint 13th Edition).

Course Name : PHYSICS II					
Course Code: PHYS2001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Course Outcome:

Students undertaking this course should develop a basic understanding of quantum mechanics with thorough knowledge of operator functions and solution and applications of Schrodinger equation; they should acquire the concepts of basic solid state physics and classification of solids; the students must develop an idea of the different types of statistical distributions and be able to understand semiconductor behavior by application of statistical methods. They will also get a thorough understanding of different dielectric materials, physical interpretation of magnetic properties of matter, and basic understanding of superconductivity. In all cases they must build an ability of addressing related problems and explore the applications of the different theories.

Detailed Syllabus:

Module-I: [10L]

Lagrange and Hamiltonian : 4L

Generalised coordinates, constrains, Lagrange's Equation of motion and Lagrangian, generalised force potential, momenta and energy. Hamiltonian formulation, Hamilton's Equation of motion.

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

Quantum Mechanics: 6L

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

Module-II: [10L]

Statistical Mechanics: 6L

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 and non –zero temperature.

Applications of Statistical Mechanics: 4L

Planck's Black body radiation, Fermi Level in Intrinsic and Extrinsic Semiconductors, Intrinsic Semiconductors and Carrier Concentration, Extrinsic Semiconductors and Carrier Concentration, Equation of Continuity, Direct & Indirect Band Gap Semiconductors

Module-III: [10L]

Dielectric Properties: 5L

Electric Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities - Internal Fields in Solids, Piezo-electricity, Pyro-electricity and Ferro- electricity.

Magnetic Properties: 5L

Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials, Ferrites and their Applications, Concept of Perfect Diamagnetism

Module-IV: [10L]

Band Theory of Solids: 6L

Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), Origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators, Concept of Effective Mass of an Electron and Hole.

Super Conductivity: 4L

Introduction (Experimental survey), General Properties of SC, Effect of Magnetic field, Meissner effect , Explanation in view of wave mechanical property, , Hard and Soft superconductors, Thermal properties of SC, London equations, penetration depth.

References:

Quantum Physics

1. Atomic Physics – S.N. Ghoshal – S Chand
2. Quantum Physics– Eisberg and Resnick – Wiley
3. Quantum Mechanics – A.K. Ghatak and S. Lokenathan –Springer

Classical Mechanics

1. Introduction to Classical Mechanics – R.G Takwale & P S Puranik –Tata MaGraw Hill
2. Classical Mechanics – N C Rana & P S Joag – Tata MaGraw Hill

Solid State Physics

1. Atomic Physics – S.N Ghoshal
2. Elementary Solid State Physics – M.Ali Omar – Pearson Education
3. Solid State Physics – A.J Dekkar – Macmillan
4. Introduction to Solid state Physics – C.Kittel

Statistical Mechanics

1. Thermodynamics, Kinetic Theory, and Statistical Mechanics–Sears and Salinger–Narosa

Course Name : NUMERICAL AND STATISTICAL METHODS					
Course Code: MATH2002					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successful completion of this course the students will be able to:

- Apply numerical methods to obtain approximate solutions to mathematical problems where analytic solutions are not possible.
- Develop algorithmic solutions for problems like system of linear equations, integration, ordinary differential equations which are pertinent to many physical and engineering problems.
- Apply probabilistic methods to engineering problems where deterministic solutions are not possible.
- Analyze probability distributions required to quantify phenomenon whose true value is uncertain.
- Find numerical solutions to algebraic and transcendental equations appearing in a vast range of engineering problems e.g in the study of Ideal and non ideal gas laws, pipe friction, design of electric circuits.
- Apply numerical methods to find solutions to linear system of equations appearing in spring-mass systems, resistor circuits, steady state analysis of a system of reactors.
- Solve problems in data analysis, least-cast treatment of wastewater where the knowledge of interpolation will be required.
- Compute numerical solution to integrals to find root mean square current.

Detailed Syllabus:

Module-I: [8L] - Numerical Solution to Linear and Non-Linear Equations
Solution Of Non-Linear Algebraic Equations And Transcendental Equations:
Bisection Method, Newton-Raphson Method, Regula-Falsi Method.
Solution of Linear System of Equations:
Gauss elimination method, Gauss-Seidel Method, LU Factorization Method.

Module-II: [8L] - Numerical Solution to Integration and Ordinary Differential Equations
Interpolation and Integration:
Newton's Forward and Backward Interpolation Method, Lagrange's Interpolation, Trapezoidal and Simpson's $1/3^{rd}$ Rule.
Solution of Ordinary Differential Equations:
Euler's and Modified Euler's Method , Runge-Kutta Method of 4^{th} order.

Module-III: [5L] - Fundamentals of Probability
Random experiment, Sample space , Events, Definition of Probability, Addition law of probability, Multiplication law and Conditional Probability. Bayes' Theorem (Statement only)

Module-IV: [15L] - Probability Distributions And Statistics
Random Variables:
Discrete and Continuous, Probability Mass Function, Probability Density and Cumulative Distribution Functions, Mathematical Expectation and Variance.
Special Distributions:
Binomial, Poisson, Uniform, Exponential and Normal. Measures of Central Tendency and Dispersion – Mean, Median, Mode and Standard Deviation for grouped and ungrouped frequency distribution. Simple Correlation and Regression.

References:

1. Miller & Freund's Probability and Statistics for Engineers, R.A.Johnson, Prentice Hall of India
2. Numerical Mathematical Analysis, J.B.Scarborough, Oxford and IBH Publishing Co. Pvt. Ltd.
3. Numerical Methods (Problems and Solution), Jain, Iyengar , & Jain, New Age International Publishers
4. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons
5. A First course in Probability, Sheldon Ross, Pearson

Course Name : BASIC ENVIRONMENTAL ENGINEERING & ECOLOGY					
Course Code: CHEM2001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successful completion of this course the students will be able to:

- Understand fundamental physical and biological principles that govern natural processes.
- Understand fundamental concepts from the social sciences and the humanities underlying environmental thought and governance.
- Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.
- Communicate integrated perspectives on complex environmental problems in the form of written and oral argument to both professional and lay audiences.
- Design and conduct independent research that contributes to environmental thought and/or problem solving.
- Demonstrate an in-depth understanding of one of the sub-disciplines within environmental science (i.e. biology, chemistry, or geology)
- Collect and interpret scientific data in both field and laboratory settings
- Integrate information from across the scientific disciplines and apply these concepts to complex environmental problems
- Identify the complex relationships between scientific approaches to environmental issues and political, social, economic, and ethical perspectives on the environment
- Communicate scientific information to both professional and lay audiences

Detailed Syllabus:

Module-I: [9L]

Environment & Ecology (General discussion):

Basic ideas of environment and its component 1L

Mathematics of population growth: exponential and logistic and associated problems, definition of resource, types of resource, renewable, non-renewable, potentially renewable, Population pyramid and Sustainable Development 2L

General idea of ecology, ecosystem – components, types and function. 1L

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

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphorus, Sulphur]. 2L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 1L

Module-II: [9L]

Air pollution and control:

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Acid rain: causes, effects and control. Earth's heat budget, carbon capture, carbon footprint 2L

Lapse rate: Ambient lapse rate, adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). Atmospheric dispersion, Maximum mixing depth 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN 1L

Smog: Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification 1L
Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). 2L

Module-III: [9L]

Water Pollution and Control:

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides. 2L
River/Lake/ground water pollution: River: DO, 5 day BOD test, Unseeded and Seeded BOD test, BOD reaction rate constants, COD. 1L
Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) 1L
Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] 2L
Water pollution due to the toxic chemicals effects: Lead, Mercury, Cadmium, Arsenic 1L

Noise Pollution:

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]. Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18hr Index), effective perceived noise level. Noise pollution control. 2L

Module–IV: [9L]

Land Pollution:

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes, electronic waste 2L
Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. 2L

Social Issues, Health and Environment:

Environmental disasters: Bhopal gas tragedy, Chernobyl disaster, Three Mile Island disaster, cancer and environment: carcinogens, teratogens and mutagens (general aspect) 2L
Environmental impact assessment, Environmental audit, Environmental laws and protection act of India. 1L
Energy audit, Green building, Green sources of energy, Concept of Green Chemistry, Green catalyst, Green solvents (replacement of VOC) 2L

References:

1. Masters, G. M., “Introduction to Environmental Engineering and Science”, Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., “Environmental Chemistry”, New Age International.
3. Asim K. Das, Environmental Chemistry with Green Chemistry, Books and Allied P. Ltd
4. S. C. Santra, Environmental Science, New Central Book Agency P. Ltd
5. GourKrishna Das Mahapatra, Basic Environmental Engineering and Elementary Biology, Vikas Publishing House P. Ltd.

Course Name : DATA STRUCTURE AND BASIC ALGORITHMS					
Course Code: CSEN2001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Learning outcome:

Ideally this course should act as a primer/pre-requisite for CS 503 (Design and Analysis of Algorithms). On completion of this course, students are expected to be capable of understanding the data structures, their advantages and drawbacks, how to implement them in C, how their drawbacks can be overcome and what the applications are and where they can be used. Students should be able to learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the running time) or for better memory utilization, based on the priority of the implementation. Detailed time analysis of the graph algorithms and sorting methods are expected to be covered in CS503 but it is expected that the students will be able to understand at least the efficiency aspects of the graph and sorting algorithms covered in this course. The students should be able to convert an inefficient program into an efficient one using the knowledge gathered from this course.

Detailed Syllabus:

Module–I: [8L] Linear Data Structure I

Introduction: Why we need data structure? 2L

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.
Algorithms and programs, basic idea of pseudo-code.Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.

Array: 2L

Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials.

Linked List: 4L

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

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

Stack and Queue: 5L

Stack and its implementations (using array, using linked list), applications.
Queue, circular queue, deque. Implementation of queue- both linear and circular (using array, using linked list), applications.Implementation of deque- with input and output restriction.

Recursion: 2L

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

Module-III: [13L] Nonlinear Data structures

Trees: 9L

Basic terminologies, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree. Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only).

Graphs: 4L

Graph representations/storage implementations – adjacency matrix, adjacency list,
Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS)

Module-IV: [12L] Searching, Sorting,Hashing:

Sorting Algorithms: 7L

Bubble sort, insertion sort, shell sort, selection sort, merge sort, quicksort, heap sort, radix sort.

Searching: 2L
Sequential search, binary search, Interpolation Search
Hashing: 3L
Hashing functions, collision resolution techniques (Open and closed hashing).

References:

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

Course Name : DIGITAL ELECTRONICS					
Course Code: INFO2101					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

3(a) **Assess** the utility of combinational logic circuit and sequential logic circuit.

3(b) **Develop** Boolean expression **applying** the knowledge of logic gates and De Morgan's theorem.

3(c) **Design** logic circuits of corresponding Boolean function **applying** the minimization technique of Karnaugh map Quine-Mc Cluskey methods and MOD-N counter.

- **Compare** between different types of Flip Flops.

3(d) **Apply** their knowledge of number system to convert a number of any given base to another number of required base.

3(e) **Describe** different types of counters such as Ring Counter, Jhonson counter.

3(f) **Explain** A/D and D/A conversion techniques.

Detailed Syllabus:

Module-I: [7L]

Number Systems: Review of number systems, BCD codes and arithmetic, Gray code, self-complimenting codes, Error detection and correction principles.

Digital Circuits: Switching algebra & simplification of Boolean expressions. De Morgan's Theorem. Implementations of Boolean expressions using logic gates.

Module-II: [14L]

Combinational Logic Circuit: Combinational circuit analysis and synthesis, Techniques for minimization of Boolean functions such as Karnaugh map Quine-Mc Cluskey methods. Multiplexers, de-multiplexers, encoders, decoders, comparators, adder, BCD. Parity generators and checker.

Sequential Logic Circuit: Need for sequential circuits, Binary cell, Latches and flip-flops. RS, JK,Master-Slave JK, D & T flip flops.

Module-III: [8L]

Synchronous Sequential Circuit: Registers (SISO, SIPO, PIPO, PISO), Ring counter, Johnson counter, Basic concept of Synchronous and Asynchronous counters ,Shift register, Design of Mod N Counter, Timing issues in synchronous circuits.

Module-IV: [7L]

A/D and D/A conversion techniques – Basic concepts A/D: successive approximation. Logic families-TTL, ECL, MOS and CMOS - basic concepts.

Fundamentals of Asynchronous Sequential circuits. Analysis and design of Asynchronous Sequential circuits. Pulse mode and Fundamental-mode Circuits.

References:

1. Donald D.Givone, ―Digital Principles and Design‖, Tata McGraw Hill, 2002.
2. Morris Mano, ―Digital design‖, Prentice Hall of India ,Third Edition.
3. William I. Fletcher, ―An Engineering approach to Digital Design‖, Prentice Hall of India, 2009.
4. Zvi Kohavi, ―Switching and Finite Automata Theory‖, Tata Mc Graw Hill, second edition.
5. A. Ananda Kumar, ―Switching Theory and Logic Design‖, Prentice Hall of India ,2009.
6. C.H.Roth, ―Fundamentals of Logic Design‖, Thomson, 2000

Course Name : COMPUTER ORGANIZATION					
Course Code: INFO2102					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

- **Justify** the necessity of using pipeline architecture over non pipeline architecture.
- **Compare** between different page replacement algorithms.
- **Design** memory unit with the help of decoder, multiplexer, and register.
- **Construct** ALU considering basic arithmetical problems (addition, subtraction, multiplication, division) and logical problems.
- **Design** 4 bit ripple carry adder and carry look ahead adder.
- **Formulate** different solution strategy for different type of instructions.

3(g) **Analyze** the difference between Von Neuman architecture and Havard architecture.

3(h) **Demonstrate** different mapping techniques (Associative, direct, set associative).

3(i) **Define** stored program concept.

Detailed Syllabus:

Module-I: [8L]

Introduction to Computers:

Basic of Computer, Von Neumann and Harvard Architecture, Computer Organization Vs. Computer Architecture.

Instruction format, Addressing Modes.

Module-II: [12L]

Computer Arithmetic:

Addition & Subtraction with Signed-Magnitude, Half Adder, Full Adder Ripple carry adder, Carry look-ahead adder, Multiplication Algorithm, Division Algorithm, Floating point number representation, IEEE 754 standard, ALU design.

Module-III: [10L]

Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory, Data path design for read/write access, Address Space and Memory Space, Associative Memory, Page Table, Page Replacement.

Module-IV: [6L]

Input Output Organization:

Modes of transfer, Concept of handshaking, interrupt.

Pipelining:

Basic concept, Different types of pipeline, and Different types of Hazards.

References:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Hayes J. P., “Computer Architecture &Organisation”, McGraw Hill,
3. Hamacher, “Computer Organisation”, McGraw Hill,
4. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,

Course Name : : NUMERICAL AND STATISTICAL METHODS LABORARY					
Course Code: MATH2012					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**2**	**2**	**1**

After successful completion of this course the students will be able to:

- Reproduce customized programs to solve problems based on Numerical Methods.
- Develop algorithms to handle large systems of equations appearing in physical and engineering problems.

Detailed Syllabus:

Development of computer programs in C for the following problems:

1. Regula-Falsi Method
2. Newton-Raphson Method
3. Gauss-elimination Method
4. Gauss-Seidel Method
5. Newton's Forward Interpolation
6. Lagrange's Interpolation
7. Trapezoidal and Simpson's $1/3^{rd}$ rule
8. Euler's and Modified Euler's Method
9. Runge-Kutta method of 4^{th} order
10. Computation of Mean, Median, Mode and Standard Deviation for grouped and ungrouped frequency distribution
11. Computation of Correlation coefficient and Regression equation for Bivariate data.

Course Name : PHYSICS II LABORATORY					
Course Code: PHYS2011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

Course Outcome:

After taking this course, which is a laboratory paper students will be able to apply theoretical knowledge of electricity and magnetism, quantum physics and semiconductor physics to perform various experiments that will help them determine some very important material constants viz. dielectric constant, Hall coefficient, band gap of semiconductors etc., as well as some universal constants of great importance like Stefan's constant, Planck's constant etc. They will develop skills of result analysis and graph plotting along with operational skills of the different experimental apparatus.

Detailed Syllabus:

Group 1: Experiments on Electricity and Magnetism

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

Group 2: Quantum Physics

6. Determination of Planck's constant.
7. Determination of Stefan's radiation constant.
8. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
9. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

Group 3: Modern Physics

10. Determination of Hall co-efficient of semiconductors.
11. Determination of band gap of semiconductors.
12. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

Note: A candidate is required to perform at least 5 experiments taking one from each group.
Emphasis should be given on the estimation of error in the data taken.

Course Name : DATA STRUCTURES LABORATORY					
Course Code: CSEN2011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

Corse Outcome:

Ideally this course should act as a primer/pre-requisite for CS 503 (Design and Analysis of Algorithms). On completion of this course, students are expected to be capable of understanding the data structures, their advantages and drawbacks, how to implement them in C, how their drawbacks can be overcome and what the applications are and where they can be used. Students should be able to learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the running time) or for better memory utilization, based on the priority of the implementation. Detailed time analysis of the graph algorithms and sorting methods are expected to be covered in CS503 but it is expected that the students will be able to understand at least the efficiency aspects of the graph and sorting algorithms covered in this course. The students should be able to convert an inefficient program into an efficient one using the knowledge gathered from this course.

Detailed Syllabus:

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem.
3. Evaluation of expressions operations on Multiple stacks & queues.
4. Implementation of linked lists: inserting, deleting, inverting a linked list.
5. Implementation of stacks & queues using linked lists:
6. Polynomial addition, Polynomial multiplication.
7. Sparse Matrices: Multiplication, addition.
8. Recursive and Non-recursive traversal of Trees.
9. Threaded binary tree traversal.
10. DFS and BFS.
11. Application of sorting and searching algorithms.

Course Name : DIGITAL ELECTRONICS & COMPUTER ORGANIZATION LABORATORY					
Course Code: INFO2112					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

- **Analyze** the utility of vertical expansion of RAM and Horizontal expansion of RAM.
- A**pply** their knowledge of basic gates, Multiplexer to **design** adder, subtractor, Flip Flop, encoder, decoder.
- **Design** and **explain** the use of 16 bit odd even parity checker/generator using IC74180.

Detailed Syllabus:

1. Realization of AND, OR, NOT, NAND, XOR gates using respective chips. Design AND, OR gates using basic design elements (Diod, Resistance, Transistor etc.)
2. Implementation of AND, OR, NOT, XOR gates using NAND Gate as a Universal Gate. Realize the following equation using only minimum number of NAND gates.
   Y= AB'C'+A'BC
3. Design Half Adder & Full Adder Circuits using basic Gates.
4. Design Half Subtractor & Full Subtractor Circuits using basic Gates.
5. Design Adder-Subtractor Composite unit using 1 bit Full Adder Chip (LS 7483).
6. Design and implementation of 16 bit odd/even parity checker / generator using IC74180.
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147
8. Realization of 4:1 & 2:1 MUX Chips. Implement a 8:1 MUX using 4:1 MUXs.
9. Design S-R, D, J-K Flipflop.
10. Design and implementation of 3-bit synchronous up/down counter
11. Horizontal expansion of RAM.
12. Vertical expansion of RAM.

2nd Year 2nd Semester:

Course Name : INDIAN CULTURE & HERITAGE					
Course Code: HMTS2002					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**0**	**2**	**1**

Detailed Syllabus:

Module-I:

Indian Religion &Philosophy

1. Orthodox Indian Philosophy:
2. Unorthodox Indian philosophy:
3. Essentials of Hinduism
4. An overview of Jainism, Buddhism, Sikhism, Islam, Christianity religions

Module-II:

Values and Personality

1. Aspects of Indian Values
2. Essentials of Personality Building
3. Ethics at work place
4. Aspects of Leadership qualities

Module-III:

Indian Scriptures

1. Selections from the Vedas
2. Select verses from Upanishad
3. An overview of Gita
4. XVIth chapter of Gita

Module-IV:

Indian Psychology

1. Aspects of Yoga Philosophy
2. Mind and its workings according to Yoga
3. Law of Karma
4. Selections from Manusmriti

References:

1. Indian Philosophy by S.C. Chatter and D. M. Dutta, Calcutta University Press
2. Spiritual Heritage of India, Swami Prabhavananda, Sri Ramakrishna Math, Chennai
3. Raja Yoga by Swami Vivekananda, Advaita Ashrama, Mayavati
4. Vedic Selection, Calcutta University Press
5. Gita by Swami Swarupananda, Advaita Ashrama, Kolkata
6. Upanishads by any press
7. Carving a Sky (MSS) by Samarpan
8. Essentials of Hinduism (MSS) by Samarpan
9. The Call of the Vedas — Bharatiya Vidya Bhavan

Course Name : GRAPH THEORY AND ALGEBRAIC STRUCTURES					
Course Code: MATH2203					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

After successful completion of this course the students will be able to:

1. **Conceive** basic knowledge on Graph Theory and Abstract Algebra which is the prerequisite of different topics of Computer Science and Information Technology, e.g. Information Theory, Cryptography, Algorithms, Networking etc.
2. **Apply** algebraic thinking which is deeply embedded in the design of programming languages.

***Detailed Syllabus*:**

Module-I: [12L]

*Graph Theory***:**

Tree, Binary Tree, Spanning Tree, Walk, Path, Cycle, Hamiltonean Graph ,The Travelling Salesman Problem, Euler Graph, The Chinese Postman Problem , Planar Graph, Euler's Formula for Planar Graph and Related Problems, Matchings and Augmenting Paths, Hall's Marriage Theorem and Related Problems, Vertex and Edge Colouring, Chromatic Number and Polynomial.

Module-II: [12L]

Group Theory I:

Cartesian product, Binary operation, Composition Table. Group, Elementary theorems on groups, Quasi group and Klein's 4 group. Permutations, Product of permutations, Group property of permutations, Cyclic permutation , Transposition , Even and Odd permutations, Proposition regarding permutations , Alternating Groups , Dihedral groups. Discussion on some physical examples e.g. the motion group of a cube.

Module-III: [12L]

Group Theory II:

Order of an element of a group , Properties of the order of an element of a group, Subgroups, some basic theorems on subgroups, Cyclic group , Cosets , Lagrange's theorem, Fermat's Little Theorem(statement only). Normal subgroup, some basic theorems on Normal subgroup, Quotient group, some applications in algebraic coding theory e.g. Block codes, Linear codes , Coset decoding etc.

Module-IV: [12L]

Morphisms, Ring and Field:

Homomorphism and Isomorphism of groups, some basic theorems. Rings , some elementary properties of a ring, Ring with unity , Characteristic of a ring, Ring with zero divisors, Subring, Integral domain, Field , Division Ring or Skew Field.(Emphasis should be given on examples and elementary properties.)

References:

1. Higher Algebra, S.K.Mapa, Sarat Book Distributors
2. Advanced Higher Algebra, J.G. Chakravorty and P.R. Ghosh, U.N. Dhur and Sons
3. A First course in Abstract Algebra, J.B.Fraleigh, Narosa
4. Algebra, M.Artin, Pearson
5. Discrete Mathematics and its Applications, Kenneth H Rosen, McGraw Hill
6. Discrete Mathematics For Computer Scientists And Mathematicians, Joe R. Mott , Abraham Kandel and Theodore P. Baker, Prentice-Hall Of India
7. Introduction to Graph Theory and Applications, F. Harary, Addison Wesley Publishing Company
8. Topics in Algebra, I.N.Herstein, Wiley India
9. Advanced Algebra, Samuel Barnard and James Mark Child, Macmillian

Course Name : SWITCHING THEORY & AUTOMATA					
Course Code: INFO2201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

3(a) **Define** a system and recognize the behavior of a system as well as will be able to minimize a system and compare different systems.

3(b) **Convert** Finite Automata to regular expression and check equivalence between regular linear grammar and FA.

3(c) **Minimize** context free grammar and to check equivalence of CFL and PDA

3(d) **Design** Turing Machine

Detailed Syllabus:

Module-I: [11L]

Fundamentals:

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

Finite state machine:

Definitions, capability & state equivalent, kth- equivalent concept 2L

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

Merger graph, Merger table, Compatibility graph 2L

Finite memory definiteness, testing table & testing graph. 2L

Information lossless and Inverse machine 2L

Module-II: [13L]

Deterministic finite automaton and non deterministic finite automaton. 1L

Transition diagrams and Language recognizers. 1L

Finite Automata:

NFA with Î transitions - Significance, acceptance of languages. 1L

Conversions and Equivalence:

Equivalence between NFA with and without λ-transitions. NFA to DFA conversion. 4L

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

Regular Language :

Regular sets 1L

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

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

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

Module-III: [11L]

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

Equivalence between regular linear grammar and FA. 1L

Inter conversion, Context free grammar. 1L

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

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

Normal forms for Context Free Grammars. 2L

Chomsky normal form and Greibach normal form. 2L

Pumping Lemma for Context Free Languages. 1L

Enumeration of properties of CFL (proofs omitted). Closure property of CFL, Ogden's lemma & its applications 1L

Module-IV: [8L]

Push Down Automata:

Push down automata, definition.	1L
Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence.	1L
Equivalence of CFL and PDA, interconversion. (Proofs not required).	1L
Introduction to DCFL and DPDA.	1L

Turing Machine :

Turing Machine, definition, model	1L
Design of TM, Computable functions	1L
Universal Turing Machine, Halting problem (proofs not required)	2L

References:

1. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D., Pearson education.
2. "Theory of Computer Science ", Automata Languages and computation", Mishra and Chandrashekaran, 2nd edition, PHI.
3. "Formal Languages and Automata Theory", C.K.Nagpal, Oxford
4. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill
5. "Introduction to Computer Theory", Daniel I.A. Cohen, John Wiley
6. "Introduction to languages and the Theory of Computation", John C Martin, TMH
7. "Elements of Theory of Computation", Lewis H.P. & Papadimitrou C.H. Pearson, PHI.
8. "An Introduction to Formal Languages and Automata", Peter Linz, Jones & Bartlett Learning

Course Name : DESIGN & ANALYSIS OF ALGORITHMS					
Course Code: INFO2202					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

1. **Demonstrate** how the worst-case time complexity of an algorithm is defined and compare the efficiency of algorithms using asymptotic complexity;
2. **Argue** the correctness of algorithms using inductive proofs and invariants.
3. **Explain** the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
4. **Describe** the (divide-and-conquer, Dynamic programming and Greedy) paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize the above algorithms and analyze them.
5. **Explain** what amortized running time is and what it is good for. Explain what an approximation algorithm is, and the benefit of using approximation algorithms.

Detailed Syllabus:

Module-I: [9L]

Introduction: 3L

Properties of an algorithm, Patterns in algorithm, Time and Space Complexity, Different Asymptotic notations – their mathematical significance, The Master theorem, Generating Functions.

Divide and Conquer: 2L

Basic method, Binary Search, Merge Sort, Quick Sort and their complexity

Matrix Manipulation Algorithm: 1L

Strassen's matrix manipulation algorithm

Heapsort: 2L

Heaps, Maintaining the heap property, Building a heap, The heapsort algorithm, Priority queues

Lower Bound Theory: 1L

O(nlgn) bound for comparison sort. Set manipulation algorithm like UNION-FIND.

Module-II: [12L]

Graph traversal algorithm: 5L

Introduction of Graph, Breadth First Search(BFS), Depth First Search(DFS), Best First Search, Bidirectional Search

Network Flow: 3L

Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

Backtracking: 4L

Basic method, 8 queens problem, Graph coloring problem.

Module-III: [12L]

Greedy Method: 4L

Basic method, Fractional Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm.

Dynamic Programming: 8L

Basic method, All pair shortest paths, Single source shortest path, Matrix Chain Manipulation, Travelling salesperson problem

Module-IV: [8L]

Branch and Bound: 2L

Basic method, 15 puzzles problem

Notion of NP-completeness: 3L

P class, NP class, NP hard class, NP complete class – their interrelationship, Cook's theorem (Statement only), Satisfiability problem, Clique decision problem, Non-deterministic Algorithm

Approximation Algorithms: 3L

Necessity of approximation scheme, Polynomial time approximation schemes, Travelling salesman problem.

Reference:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms"
2. A. Aho, J.Hopcroft and J.Ullman "The Design and Analysis of Algorithms"
3. D.E.Knuth "The Art of Computer Programming"
4. Jon Kleiberg and Eva Tardos, "Algorithm Design"
5. K.Mehlhorn , "Data Structures and Algorithms" - Vol. I & Vol. 2.
6. S.Baase "Computer Algorithms"
7. E.Horowitz and Shani "Fundamentals of Computer Algorithms"
8. E.M.Reingold, J.Nievergelt and N.Deo- "Combinatorial Algorithms- Theory and Practice", Prentice Hall, 1997

Course Name : INFORMATION THEORY & CODING					
Course Code: INFO2203					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

Detailed Syllabus:

Module I: [14 L]
*Source Coding:*Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.
*Channel Capacity and Coding:*Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

Module II: [15 L]
*Linear And Block Codes For Error Correction:*Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.
Cyclic Codes: Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

Module III : [8 L]
*BCH Codes:*Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.

Module IV : [8 L]
*Convolutional Codes :*Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

References:

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

Course Name : OBJECT ORIENTED PROGRAMMING					
Course Code: INFO2204					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

(1) Design an Object Oriented software system.

(2) Arrange real world entity to sketch (architecture) for real life problems (UML) and will be able to generalize the problems into number of objects. Finally test, debug and solve them separately.

(3) Reduce the complexity of procedural language by using package, Inheritance.

(4) Implement some user-friendly GUI interface support application.

Detailed Syllabus:

Module-I: [6L]

Properties of object oriented programming language, Major and minor elements, Object, Class, relationships among objects. Aggregation, Association, using, Generalization, meta-class. Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism

Module-II: [16L]

Class & Object proprieties: 8L

Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts, concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.

Reusability properties: 8L

Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages. Implementation of different relationships in OOPs.

Module-III: [6L]

Exception handling and I/O: 6L

Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes.

Input Output stream structure, Wrapper class, File copy programming using command line arguments.

Module-IV: [10L]

Multithreading and Applet Programming: 10L

Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads. Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets.

References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

Course Name : LANGUAGE PRACTICE LABORATORY					
Course Code: HMTS2011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

Detailed Syllabus:

Module-I:

Formal verbal communication:

- Introduction to formal verbal communication, Interpersonal Skills & Public Speaking: Building Positive Relationships, Focusing on Solving Problems, Time Management, Dealing with Criticism: Offering Constructive Criticism, Responding to Criticism – Managing Conflict: Approaches to Conflict, Resolving Conflict
- Conversational skills in the business scenario: One-to-one and Group communication, Gender and Culture Sensitivity, Etiquette, Sample Business Conversation, Telephonic Conversation

Module-II:

Presentation skills

- Speech Purposes - General: Informative Speeches, Persuasive Speeches, Entertaining Speeches, Methods of Speaking: Speaking from a Manuscript, Speaking from Memory, Impromptu Delivery, Extemporaneous Delivery, Analyzing the Audience, Nonverbal Dimensions of Presentation
- Organizing the Presentation: the Message Statement, Organizing the Presentation: Organizing the Speech to Inform, The Conclusion, Supporting Your Ideas – Visual Aids: Designing and Presenting Visual Aids, Selecting the Right Medium, Post- presentation Discussion

Module-III:

Group Discussion

- Introduction to Group Communication

Factors in Group Communication, Status – Group Decision Making: Reflective Thinking, Brainstorming, Body Language, Logical Argument, The Planning Process, Strategies for Successful GDs, Role of Social Awareness (Newspapers, Magazines, Journals, TV News, Social Media), Practice GDs

Module-IV:

Job Application and Personal Interview

- Job Application Letter: Responding to Advertisements and Forced Applications, Qualities of Well-Written Application Letters: The You-Attitude, Length, Knowledge of Job Requirement, Reader-Benefit Information, Organization, Style, Mechanics – Letter Plan: Opening Section, Middle Section, Closing Section
- Resume and CV: Difference, Content of the Resume – Formulating Career Plans: Self Analysis, Career Analysis, Job Analysis, Matching Personal Needs with Job Profile – Planning your Resume – Structuring the Resume: Chronological Resume, The Functional Resume, Combination Chronological and Functional Resume – Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honours and Achievements, Personal Profile, Special Interests, References

Interviewing

Types of Interviews, Format for Interviews: One-to-one and Panel Interviews, Employment Interviews, Frequently Asked Questions, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews

Marks: 100
Module I- 20 marks
Module II- 30 marks
Module III- 20 marks
Module IV- 30 marks

References:

1. Carter, R. And Nunan, D. (Eds), The Cambridge guide to Teaching English to Speakers of Other Languages, CUP, 2001
2. Edward P. Bailey, Writing and Speaking At Work: A Practical Guide for Business Communication, Prentice Hall, 3rd Ed., 2004
3. Munter, M., Guide to Managerial Communication: Effective Business Writing and Speaking, Prentice Hall, 5th Ed., 1999
4. Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011

Course Name : DESIGN & ANALYSIS OF ALGORITHMS LABORATORY					
Course Code: INFO2212					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:
(1) Analyze a problem and design a solution for the problem, following an algorithmic design paradigm.
(2) Reconstruct the solution to a problem to achieve optimum solution in terms of time complexity and memory utilization.
(3) Implement, empirically compare, and apply fundamental algorithms and data structures to real-world problems

Detailed Syllabus:
Programming Language used: C
Lab :1 : Divide and Conquer :
Implement Binary Search using Divide and Conquer approach
Implement Merge Sort using Divide and Conquer approach

Lab :2 : Divide and Conquer :
Implement Quick Sort using Divide and Conquer approach
Find Maximum and Minimum element from a array of integer using Divide and Conquer approach

Lab :3 : Dynamic Programming :
Find the minimum number of scalar multiplication needed for chain of matrix

Lab :4 : Dynamic Programming :
Implement all pair of Shortest path for a graph (Floyed- Warshall Algorithm)
Implement Traveling Salesman Problem

Lab :5 : Dynamic Programming :
Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford Algorithm)

Lab :6 : Brunch and Bound :
Implement 15 Puzzle Problem

Lab :7 : Backtracking :
Implement 8 Queen problem

Lab :8 : Backtracking (implement any one of the following problem):
Graph Coloring Problem
Hamiltonian Problem

Lab :9 : Greedy method(implement any one of the following problem) :
Knapsack Problem
Job sequencing with deadlines

Lab :10 : Greedy method (implement any one of the following problem) :
Minimum Cost Spanning Tree by Prim's Algorithm
Minimum Cost Spanning Tree by Kruskal's Algorithm

Lab :11 : Graph Traversal Algorithm :
Implement Breadth First Search (BFS)
Implement Depth First Search (DFS)

Course Name : OBJECT ORIENTED PROGRAMMING LABORATORY					
Course Code: INFO2214					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

- **Analyze** a problem and design a solution for the problem, following an algorithmic design paradigm.
- **Reconstruct** the solution to a problem to achieve optimum solution in terms of time complexity and memory utilization.
- **Implement**, empirically compare, and apply fundamental algorithms and data structures to real-world problems.

Detailed Syllabus:

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

Heritage Institute of Technology

Anandapur, Kolkata - 700107

Structures of Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Year: 3rd Year

Document Release Month & Year: June 2017

3rd Year 1st Semester:

Course Name : Economics for Engineers					
Course Code: HMTS3101					
Contact hrs per week:	L	T	P	Total	Credit points
	3	0	0	3	3

Detailed Syllabus:

Module 1:

Market: Meaning of Market, Types of Market, Perfect Competition, Monopoly, Monopolistic and Oligopoly market.

The basic concept of economics – needs, wants, utility.

National Income-GDP, GNP. Demand & Supply, Law of demand, Role of demand and supply in price determination, Price Elasticity.

Inflation: meaning, reasons, etc. **(6L)**

Module 2:

Business: Types of business, Proprietorship, Partnership, Joint-stock company, and cooperative society – their characteristics.

Banking: role of commercial banks; credit and its importance in industrial functioning. Role of central bank: Reserve Bank of India.

International Business or Trade Environment. **(4L)**

Module 3:

Financial Accounting-Journals. Ledgers, Trial Balance, Profit & Loss Account, Balance Sheet.

Financial Statement Analysis (Ratio and Cash Flow analysis). **(8L)**

Module 4:

Cost Accounting- Terminology, Fixed, Variable and Semi-variable costs. Break Even Analysis. Cost Sheet. Budgeting and Variance Analysis. Marginal Cost based decisions. **(6L)**

Module 5:

Time Value of Money: Present and Future Value, Annuity, Perpetuity.Equity and Debt, Cost of Capital. **(4L)**

Module 6:

Capital Budgeting: Methods of project appraisal - average rate of return - payback period - discounted cash flow method: net present value, benefit cost ratio, internal rate of return.

Depreciation and its types, Replacement Analysis, Sensitivity Analysis. **(8L)**

Evaluation: Max marks-100

Internal Test-30

Semester Test-70

References:

1. R. Narayanswami, *Financial Accounting- A Managerial Perspective*. Prentice-Hall of India Private Limited. New Delhi
2. Horne, James C Van, *Fundamentals of Financial Management*. Prentice-Hall of India Private Limited, New Delhi
3. H. L. Ahuja., *Modern Economic Theory*. S. Chand. New Delhi.
4. Newman, Donald G., Eschenbach, Ted G., and Lavelle, Jerome P. *Engineering Economic Analysis*. New York: Oxford University Press. 2012.

Course Name : Operating Systems Concepts					
Course Code: INFO3101					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

(1) Analyze and differentiate between different types of operating systems (namely, batch, multi-programmed, time-sharing, real-time, distributed, parallel processing system) based on their application domains and evolution.

(2) Demonstrate and describe system operations, internal structure of computer system and operating system.

(3) Design multiprocessing and multithreading environments based on inter-process/thread communication and synchronization.

(4) Compare the different level of memory (Primary memory, cache, virtual memory, secondary storage) and how they are correlated to improve the performance of the system.

(5) Demonstrate the operations of IO devices and how they are governed by the operating system

(6) Discuss the activity and impact of threat, virus, worm and how the system could be protected from them.

Detailed Syllabus:

Module - I (10L)

Introduction [4L] : Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.

System Structure[3L] : Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, and system calls.

Process and Threads (3L) :

Processes [1L]: Concept of processes, operations on processes.

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

Module - II (14L)

Process Scheduling(2L): Process scheduling, co-operating processes, inter process communication.

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

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

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

Module III (11L)

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

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

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

Module IV(12L)

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

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

Protection & Security [4L]

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

References:

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

Course Name : Computer Architecture					
Course Code: INFO3102					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Review of basic computer architecture, Quantitative techniques in computer design, measuring and reporting performance.

(2) Classify different kinds of pipeline, pipeline hazards and suggesting suitable remedial techniques to handle the hazards. Discussing different kinds of parallel architectures (Flynn's Classification), types of Multiprocessor architectures (UMA, NUMA, COMA and NORMA), types of Inter connection (Bus, Hypercube and Omega) network and Memory Consistency models. Explaining the concepts of Centralized shared memory architecture and Distributed shared memory architecture.

(3) Compute performance parameters of pipelines (Speed-up, Efficiency and Throughput) and deduce derivations to demonstrate the performance parameters when branching effect is introduced. Pipeline optimization techniques needs to be illustrated. Preparing numerical module based on pipeline concepts.

(4) Differentiate between different Memory technologies (Primary, Secondary and Cache) and helping students to compute different kinds of numerical based on the memory technologies.

(5) Collecting knowledge about Superscalar, Super pipelined and VLIW processor architectures, Array and vector processors. Constructing the concepts of ILP.

(6) Comparing different techniques of ILP (Loop Unrolling, Dynamic Scheduling and Software Pipelining) and concluding with concepts of Data Flow architecture, RISC, CISC and Systolic architecture

Detailed Syllabus:

Module – 1: [12 L]

Introduction: Review of basic computer architecture (Revisited), Quantitative techniques in computer design, measuring and reporting performance. (4L)

Pipelining: Basic concepts, Instruction pipeline, Arithmetic pipeline, processor pipeline, Data hazards, Control hazards and Structural hazards, Techniques for handling hazards, Static scheduling vs Dynamic scheduling, Pipeline optimization technique. (8L)

Module – 2: [8L]

Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Mapping and management techniques, Memory replacement policies.

Module – 3: [8L]

Instruction-level parallelism: Basic concepts, techniques for increasing ILP, Superscalar, Super-pipelined and VLIW processor architectures. Array and vector processors. Design of Control Unit.

Module – 4: [12 L]

Multiprocessor architecture: Taxonomy of parallel architectures; Centralized shared- memory architecture, Memory consistency models, Interconnection networks. Distributed shared-memory architecture. Cluster computers. (8L)

Non von Neumann architectures: Data flow computers, RISC and CISC architecture, Systolic architectures. (4L)

References:

1) Advanced Computer Architecture by Kai Hwang.
2) Computer Architecture: A Quantitative approach- Patterson and Hennessy.
3) Computer Architecture and Parallel processing- Hwang and Briggs.
4) Computer Architecture by T.K.Ghosh.

Course Name : Software Engineering & Project Management					
Course Code: INFO3103					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1. At the end of the course student should gather the knowledge of the system development lifecycle;
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, health and manufacturability.
3. Acquire Knowledge of the principles of object-oriented software construction.
4. Acquire knowledge to manage a project including planning, scheduling and risk assessment.

Detailed Syllabus:

Module-I: [10L]

Principles and Motivations:

Definitions and need for engineered approach to software development; software Development process models from the points of view of technical development and project management: waterfall, rapid prototyping, incremental development, spiral model.

Design of Software Systems: System Design: Context diagram and DFD, Cohesion, Coupling, Problem Partitioning, Top-Down And Bottom-Up design; Decision tree, decision table and structured English; Functional vs. Object- Oriented approach.

Module-II: [10L]

Software Testing:

Testing Levels of Testing, Black Box Testing ,White Box Testing ,Integration Testing ,System Testing, Validation Testing ,Test case Specification, Reliability Assessment, Validation & Verification Metrics, Monitoring & Control ,Case Tools ,Classification ,Features ,Strengths And Weaknesses; Icase; CASE Standards.Formal Methods of Software Development.

Module-III: [10L]

Software Project Management:

Principles of software projects management; organizational and team structure; project planning; project scheduling, project initiation and project termination; technical, quality, and management plans; Software Quality Assurance, Software Configuration Management ,Risk analysis and Management ,project control; cost estimation methods - function points and COCOMO.

Module-IV: [10L]

Object Modeling and Design:

UML Fundamentals, Structural Diagram, Behavioral Diagram, Classes, objects, relationships, key abstractions, class diagrams, message, Sequence diagrams, use cases, use case diagrams, activity diagrams, States, Events, Actions, State Chart Diagram.

References:

1. Roger pressman; software engineering - a practitioner's approach, McGraw hill, New York.
2. Ian sommerville; software engineering, addison-wesley publishing company, England
3. Pankaj Jalote; an integrated approach to software engineering, Narosa publishing House, New Delhi.
4. Grady Booch, James Rumbaugh, Ivar Jacobson, the unified modeling language User guide, Pearson education, New York

Course Name : DBMS					
Course Code: INFO3104					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

1. **Evaluation:-** Justify the need of DBMS over traditional file system and analyze the overall database description, at three levels, namely, internal, conceptual, and external levels.

2. **Evaluation:** Deduce the constraints , i.e., the candidate keys, superkeys, that exists in a given real world problem and design the entity relationship diagram to graphically represent entities and their relationships to each other, typically used in computing in regard to the organization of data within databases or information systems

3. **Synthesis :** Formulate a mathematical tool using relational algebra that operates on one or more relational tables and outputs a relational table as result, and design a normalized Database based on real-world situations, maintaining all constraints and manipulate database relations using SQL and PL/SQL

4. **Evaluation:** Prove if a schedule A is conflict serializable with schedule B then it is also view serializable with schedule B but vice versa is not true.

5. **Evaluation :** Compare the number of block access required for searching a particular record in a data file having (primary index , secondary index, multilevel index.).

Detailed Syllabus:

Module 1: Introduction and Conceptual Modeling [7L]

Database Model, Schema and architecture : [2L]

Concept & Overview of database and DBMS, Advantages of using DBMS approach, Database Users , Database Administrator, Database applications. Data Models and its categories, Schema, Instances, Database Languages, Three Schema architecture of DBMS, Data independence, Centralized and client server architecture for DBMS. Classification of DBMS. Introduction to big data.

Entity-Relationship Model : [5L]

Basic concepts, Design Issues, Cardinality, SuperKeys, Candidate keys, Entity types, Entity sets, attributes and keys. Relationship types, Relationship sets, Attributes of relationship types, Weak Entity Sets , ER diagram design issues, Extended E-R modeling: generalization, specialization, aggregation.

Module 2 :Relational Model: Languages and query processing [13L]

Introduction to relational model: [1L]

Concepts of domains, attributes, tuples, relations. Transformation of ERD model to relational model.

Relational Algebra and Calculus: [5L]

Operators in relational algebra: select, project, rename, cartesian product, different types of join, Division,Intersect, Union, Minus. Tuple relational calculus, Domain relational calculus.

Introduction to Database languages [4L]

SQL: Concept of DDL, DML, DCL,TCL,DQL. Query structure, concept of subquery, group functions. View. PL/SQL basic structure, Control structure, Cursor,Triggers.

Module 3 : Relational Database Design [13L]

Database integrity : [1L]

Domain constraints, entity integrity, referential integrity constraints. Concept of null and not null constraint

Functional Dependencies: [3L]

Basic concept of functional dependency, Axioms, Closure, Attribute closure, Equivalent set of FD, Cover, Canonical cover.

Normalization : [8L]

Concept of Super keys, Candidate keys. Determining candidate keys from FD. Different anomalies in designing a Database. First, second and third normal form, Boyce-Codd Normal Form, Nomalization using multi-valued depedencies and join dependency. Dependency preservation, Lossless decomposition.

Module 4 : Transaction Processing , Data Storage [13L]

Transaction processing concepts [8L]

Transaction properties, states, serial vs. concurrent execution, Serializability, Concurrency control techniques, and Recovery Management

File Organization & Index Structures [5L]

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 .

References:

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

Course Name : Communication Theory					
Course Code: INFO3131					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) The students will have concepts about communication – wireless and line.
(2) Will be able to differentiate between AM, FM.
(3) Will form ideas about data rate, bandwidth, and channel.
(4) Will practically see and measure the key parameters like deviation, clock rate etc.

Detailed Syllabus:

Module1: [Elements of communication system] [12]

The elements of a communication system, origin of noise and its effect, Importance of SNR in system design. Basic principle of linear (AM) modulation, Generation of AM waves, Demodulation of AM wave. Basic principle of nonlinear (FM, PM) modulation. Generation of FM waves. Demodulation of FM waves. Sampling theorem, sampling rate, impulse sampling, reconstruction from samples, Aliasing. Analog pulse modulation-PAM (natural & flat topped sampling), PWM, PPM. Basic concept of Pulse code modulation, Block diagram of PCM, Multiplexing-TDM, FDM.

Module2: [Digital transmission] [7]

Concept of Quantization & Quantization error, Uniform quantizer, Non-uniform quantizer, A-law and μ-law. Encoding, coding efficiency. Line coding & properties, NRZ & RZ, AMI, Manchester coding, PCM, DPCM. Base band pulse transmission, Matched filter, error rate due to noise, Nyquist criterion for distortion-less base band binary transmission, Signal power in binary and digital signal.

Module3: [Digital carrier modulation & demodulation technique] [10]

Bit rate, Baud rate, Information capacity, Shanon's limit, Introduction to the different digital modulation techniques-ASK, FSK, PSK, BPSK, QPSK. Introduction to QAM, Basic concept of Delta modulating, Adaptive delta modulation. Introduction to the concept DPCM. Basic concept of spread spectrum modulation.

Module4: [Introduction to coding theory] [6]

Introduction, News value & Information content, Entropy, Mutual information, Information rate, Shanon-Fano algorithm for encoding, Shanon's theorem- source coding theorem. Basic principle of Error control & coding.

References:

1. An Introduction to Analog and Digital communication, Simon Haykin, Wiely India.
2. Analog communication system, P. Chakrabarti, Dhanpat Rai & Co.
3. Principle of digital communication, P. Chakrabarti, Dhanpat Rai & Co.
4. Modern Digital and Analog Communication systems, B.P. Lathi, Oxford University press

Course Name : Compiler Design					
Course Code: INFO3132					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Describe the theory and practice of compilation, in particular the lexical analysis, syntax, and semantic analysis, code generation and optimization phases of compilation.

(2) Create lexical rules and grammars for a programming language.

(3) Use Flex or similar tools to create a lexical analyzer and Yacc/Bison tools to create a parser.

(4) Design a compiler for a concise programming language.

(5) Implement a lexer without using Flex or any other lexer generation tools.

(6) Implement a parser such as a bottom-up SLR parser without using Yacc/Bison or any other compiler-generation tools.

(7) Implement semantic rules into a parser that performs attribution while parsing.

Detailed Syllabus:

Module I: [9L]

Introduction to Compiling *[3L]*

Compilers, Analysis of the source program, The phases of the compiler, Cousins of the compiler.

Lexical Analysis *[6L]*

The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, 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).

Module II: [14L]

Syntax Analysis *[9L]*

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 directed translation *[5L]*

Syntax director definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.

Module III: [13L]

Type checking *[4L]*

Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions

Run time environments *[5L]*

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 code generation *[4L]*

Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Module IV: [9L]

Code optimization *[5L]*

Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization.

Code generations *[4L]*

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

References:

1. Aho, Sethi, Ullman - "Compiler Principles, Techniques and Tools" – Pearson Education.
2. Holub - "Compiler Design in C" - PHI.

Course Name : Discrete Mathematics					
Course Code: INFO3133					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

This course introduces the applications of discrete mathematics inthe field of computer science. It covers sets, logic, provingtechniques, combinatorics, functions, relations, graph theory and algebraic structures. These basic concepts of sets, logic functionsand graph theory are applied to Boolean Algebra and logicnetworks, while the advanced concepts of functions and algebraicstructures are applied to finite state machines and coding theory.

Detailed Syllabus:

Module I [10L]:
Introduction to Propositional Calculus: Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Biconditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related examples.

Module II [10L]:
Theory of Numbers: Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples; Congruences, Residue classes of integer modulo and its examples. Order, Relation and Lattices: POSET, Hasse Diagram, Minimal , Maximal, Greatest and Least elements in a POSET, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices.

Module III [10L]:
Counting Techniques: Permutations, Combinations, Multinomial Theorem, Binomial coefficients, Pigeon- hole Principle, Principles of inclusion and exclusions; Recurrence relations: Formulation/Modelling of different counting problems in terms of recurrence relations, Solution of linear recurrence relations with constant coefficients (upto second order) by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method.; Ramsey Problem on Counting techniques.

Module IV [6L]:
Dual Graph and its construction, Planar Graph & Testing for Planarity of a Graph, Cut Set & Cut Vertices; Graph Coloring: Chromatic Numbers and its bounds, Independence and Clique numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring Matchings: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems.

References:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. J.L. Mott, A. kandel and T. P. Baker: Discrete Mathematics for Computer Scientist, reston, Virginia, 1983.
3. C. L. Liu: Elements of Discrete Mathematics, 2nd ed., McGraw Hill, New Delhi, 1985.
4. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI.
5. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
6. N. Deo :Graph Theory with Applications to Engineering and Computer Science, Prentice Hall, Englewood Cliffs,1974.
7. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH
8. J.K. Sharma, Discrete Mathematics, Macmillan
9. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
10. R. A. Brualdi: Introductory Combinatorics, North Holland, New York, 1977.
11. F. S. Roberts: Applied Combinatorics, Prentice Hall, Englewood Cliffs, NJ, 1984.
12. Reingold et al.: Combinatorial Algorithms: Theory and Practice, Prentice Hall, Englewood Cliffs,1977.
13. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
14. Douglas B. West, Introduction to graph Theory, PHI

Course Name : UNIX & Operating Systems Laboratory					
Course Code: INFO3111					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) Develop shell scripts to manage the system memory, user, files, and devices.

(2) Develop multi-processing and multi-threading environment capable of performing multiple tasks or sub-tasks simultaneously.

(3) Apply system calls and signals for user defined purposes

(4) Design a synchronized multi-threaded system capable of resource sharing

(5) Develop C programs to share information between two process using concepts of IPC.

Detailed Syllabus:

1. Managing Unix/Linux Operating System [8P]:
Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.

2. **Process [4P]:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.

3. **Signal [4P]:** signal handling, sending signals, signal interface, signal sets.

4. **Semaphore [6P]:** programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5. **POSIX Threads [6P]:** programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)

6. **Inter-process communication [6P]:** pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO), message passing & shared memory(IPC version V).

References:

1. Behrouz A. Forouzan, Richard F. Gilberg, UNIX and Shell Programming, Thomson, 2003.
2. Brian W. Kernighan, Rob Pike, The UNIX Programming Environment, PHI, 1996.
3. K. Srirengan, Understanding UNIX, PHI, 2002.
4. Sumitabha Das, Your UNIX- The Ultimate Guide, TMGH, 2002.
5. Sumitabha Das, UNIX Concepts and Applications, Second Edition, TMGH, 2002.

Course Name : Computer Architecture Laboratory					
Course Code: INFO3112					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) Discuss HDL introduction and explain the working of VHDL Simulator.

(2) Demonstration of the following Lab Assignments are undertaken in the lab:

Adder (Full & Half), Subtractor (Full & Half), Code Conversion (Binary to Gray & Gray to Binary), Decoder (3:8), Mux (4:1 & 8:1), Flip-flops (T, SR, JK & D), ALU design (8 bit), and Asynchronous Binary Up/Down Counter.

(3) Designing Truth table, KMap and Timing Diagram for all lab assignments.

Detailed Syllabus:

Lab 1: Data flow approach:

Write vhdl code for and, or, not, nand, xor, xnor, nor gates using data flow approach.

Lab 2: Behavioral flow approach:

Write vhdl code for and, or, not, nand, xor, nor, xnor gates using behavioral flow approach.

Lab 3: Adder and subtractor:

Write vhdl code for half adder, full adder, half subtractor and full subtractor using data flow approach & behavioral approach.

Lab 4: Structural approach:

Write vhdl code for half adder, full adder, half subtractor and full subtractor using structural approach.

Lab 5: Array:

Write vhdl code to implement 2's complement and excess three of a four bit number using array.

Lab 6: Binary-gray converter:

Write vhdl code for binary to gray code and vice-versa by data flow approach & behavioral approach.

Lab 7: Decoder and multiplexer:

Write vhdl code to implement 3-8 line decoder and 2:1 mux using data flow approach & behavioral approach.

Lab 8: Flipflop:

Write vhdl codes for d-flipflop, t-flipflop and sr-flipflop using data flow approach and behavioral approach.

Lab 9: ALU design:

Design and implement 4 bit alu and 8 bit alu using behavioral approach.

Lab 10: Counter and seven segment display:

Write vhdl code for asynchronous binary up/down counter.

Write vhdl code for bcd up/down counter

Write vhdl code for seven segment display.

Course Name : Software Engineering & Project Management Laboratory					
Course Code: INFO3113					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

1. Ability to design the document according to functionality
2. Ability to learn the object oriented design.
3. Develop software applications in a development environment that makes use of commonly supported tools.
4. Develop and apply testing strategies for software applications;

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

Detailed Syllabus:

1. Preparation of requirement document for proposed project in standard format.

2. Project Schedule preparation using tools like MSProject.Generation of Gnatt chart from schedule.Prepare Project Management Plan in standard format.
3. Draw DFD and ERD and prepare Functional Design Document using LibreOffice.
4. Draw Class diagram,Use Case Diagram,Sequence diagram ,Activity Diagram and prepare Object Oriented Design Document using tools like Dia.
5. Design Test Script/Test Plan(both Black box and WhiteBox approach) for a small component of the proposed project.
6. Generate Test Result and perform defect root cause analysis using Pareto or Fishbone diagram.

Following projects can be used as dummy projects:

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

Course Name : DBMS Laboratory					
Course Code: INFO3114					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	3	3	2

After successfully completing this course the students will be able to:

1. Analyze. design and implement business problems as practiced in industry.
2. Familiarize with popular RDBMS software tools like Oracle.
3. Familiarize with administrative and security aspects of database.
4. Implement management principles / practices for handling projects under various business constraints.
5. To apply appropriate methodologies, techniques and software for designing and conducting experiments in order to analyze and interpret data using suitable data mining paradigms

Detailed Syllabus:

Structured Query Language

1.Introduction to server architecture

2.Creating database objects

- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Column Aliases
- DROP, ALTER statements
- Creating an object structure from another existing structure

3. Table and Record Handling

- INSERT statement
- DELETE, UPDATE, TRUNCATE statements
- Populating data from other tables using insert and select together

4. Retrieving Data from a Database

The SELECT statement

- Using the WHERE clause
- Using Logical Operators in the WHERE clause
- Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING
- Clause
- Using Aggregate Functions
- Combining Tables Using JOINS
- Subqueries

5. Database Management

Creating Views

Creating Database Users

Granting and revoking Priviledges (GRANT, REVOKE)

Granting object priviledges

Basics of Programming Language/Structured Query Language (PL/SQL)

- Conditional /Iterative Statements
- Introduction to Functions and Stored procedures
- Exception Handling
- Cursor and its application
- Triggers

3rd Year 2nd Semester:

Course Name : Principles of Management					
Course Code: HMTS3201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**0**	**2**	**2**

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module I
Self-Growth

i) Self Growth- Maslow's Hierarchy of Needs Theory
ii) Anger, Stress & Time Management- Theories and application
iii) SWOT Analysis

Module II
Stepping Up

i)Growth & Environment
ii)Competitive Spirit
iii)Responsibility Factor

Module III
Professional Communication

i) Impression Management- theory on social psychology
ii) Employability Quotient
iii) Cross-cultural communication

Module IV
Leadership & Team Playing

i) Leadership & Team Playing: Theories, Styles, Stages
ii) Motivation, Negotiation Skills, Conflict Management
iii) Planning & Envisioning: Initiative and Innovation in the Work Environment- De Bono's Six

Thinking Hats

Evaluation:

Max.Marks-100(sessional)
25 marks/ module

Methodology: Assignment and project

References:

1. Personality Development and Soft Skills by Barun K. Mitra, Oxford University, 2011
2. Soft Skills: An Integrated Approach to Maxmise Personality by Gajendra Singh Chauhan and Sangeeta Sharma, Wiley, 2016
3. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh, Pearson, 2010

Course Name : Data Warehousing & Data Mining					
Course Code: INFO3201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Discuss the role of data warehousing and enterprise intelligence in industry and government.

(2) Summaries the dominant data warehousing architectures and their support for quality attributes.

(3) Recognize and describe at least three computational approaches to data clustering, taking cognizance of the contribution of paradigms from the fields of Artificial Intelligence and Machine learning.

(4) Compare and contrast the dominant data mining algorithms.

(5) Construct a lightweight prototype or simulation that supports the concept of data mining.

(6) Analyze the results generated from the constructed artifact to determine if patterns of clusters were detected in the data sets.

(7) Demonstrate an appreciation of the importance of paradigms from the fields of Artificial Intelligence and Machine Learning to data mining.

Detailed Syllabus:

Module I [10]

Introduction: Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema.

Data Marts: Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

Online Analytical Processing: OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Microstrategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema; OLAP tools.

Designing the Data Warehouse: Star Schemas, Dimensional Modeling, Metadata, Data Warehouse Design Examples.

Module II [8]

Data Mining: Definitions; KDD (Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in industry.

Association Rules: A priori algorithm, Partition algorithm, Dynamic inset counting algorithm, FP – tree growth algorithm; Generalized association rule.

Module III [9]

Classification methods: Bayesian Classification, Neural Network, CBR, Genetic Algorithms.

Clustering Techniques: Clustering paradigm, Partition algorithms, K means, Fuzzy C menas CLARANS; Hierarchical clustering, DBSCAN; Categorical clustering, STIRR, ROCK.

Decision Trees: Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

Module IV [9]

Web Mining: Web content Mining, Web structure Mining, Web usage Mining, Link Analysis Text Mining.

Big Data Handling: Introduction, Challenges, data storage (Hadoop), retrieval (Script languages) and computing for Big Data (Map reduces)

Dimensionality Reduction: PCA, Supervised Dimension Reduction.

References:

1. Prabhu: Data Warehousing –Concepts, Techniques, products, application; PHI.
2. K. Pujari : Data Mining Techniques, Universities Press.
3. Alex Berson and Stephen J Smith: Data Warehousing, Data Mining and OLAP, TMH.
4. Anahory: Data Warehousing in the real world, Pearson Education.
5. Dunham: Data Mining Introductory & Advanced Topic, Pearson Education.
6. Foster Provost & Tom Fawcett: Data Science for Business: What you need to know about data mining and data-analytic thinking, O'Reilley.
7. Russell Jurney: Agile Data Science: Building Data Analytics Applications with Hadoop, O'Reilley.
8. Tom White: Hadoop: The Definitive Guide, O'Reilley.
9. Srinath Perera: Instant MapReduce Patterns - Hadoop Essentials How-to, Packt Publication

Course Name : Computer Network					
Course Code: INFO3202					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Analyze the pieces of hardware (hub, bridge, switch, router) to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.

(2) Specify and identify importance of existing protocols (DNS, DHCP, FTP, WWW, HTTP) are running in application layer.

(3) Compare the various techniques (open loop and close loop) are used for congestion control and quality of service (traffic scheduling and shaping).

(4) Analyzing why network needs flow control and error control and how subneting is used to divide the large network.

(5) Evaluate the performance of the different routing protocol (RIP, OSPF) based on routing cost, convergence rate and complexity to find the shortest path.

Detailed Syllabus:

Module – I [10L]

Introduction: Data communications, Direction of data flow - Simplex, Half-duplex, Full-duplex, Topology – Bus, Ring, Mesh. Star & Hybrid, Types of Network - LAN, MAN 7 WAN, Protocols, Reference models – OSI & TCP/IP reference model & comparative study.

Physical Layer: Transmission media - Guided & Unguided, Switching – Circuit, Packet & Message, Telephone Network, Network Devices: Repeaters, Hubs, Bridges, Switches, Router and Gateway.

Data link Layer: Types of Errors, Error Detection – Parity, CRC & Checksum, Error Correction – Hamming Code,

Module – II [10L]

Data link Layer: Flow Control – Stop-n-Wait & Sliding Window Protocol, ARQ Techniques – Stop-n-Wait, Go-Back- N & Selective Repeat, Framing, Bit & Byte Oriented Protocol, HDLC, Point to Point Protocol (PPP), Token Ring, FDDI and Ethernet Protocols, Reservation, Polling, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA

Module – III [10L]

Network Layer: Internet Protocol (IP), IPv4 vs IPv6, ARP & RARP, IP Addressing – Classful & Classless, Subnetting, VLSM, CIDR. Routing - Techniques, Static, Dynamic & Default Routing, Unicast Routing Protocols - RIP, OSPF, BGP.

Module – IV [10L]

Transport Layer: Process to Process delivery; UDP; TCP; Congestion Control - Open Loop, Closed Loop, Quality of service, Techniques to improve QoS - Leaky bucket & Token bucket algorithm.

Application Layer Protocols: DNS, SMTP, FTP & DHCP.

References:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education
4. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
5. Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

Course Name : Advanced Java & Web Technology					
Course Code: INFO3203					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1) Analyze and apply several kind of client side scripting (e.g : HTML, CSS and JavaScript).
2) Analyze and apply server side scripting using JSP..
3) Practice EJB, RMI and XML to implement J2EE at application level.

Detailed Syllabus:

Module-I: [8L]

*Static Web Pages:*Web Pages - types and issues, tiers; comparisons of Microsoft and java technologies, WWWBasic concepts, web client and web server, http protocol (frame format), universal resource locator (URL), HTML different tags, sections, image & pictures, listings, tables, frame, frameset, form.

*Dynamic Web Pages:*The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.

*Active Web Pages:*Need of active web pages; java applet life cycle, Java Swing.

Module-II: [7L]

*Java Script:*Data types, variables, operators, conditional statements, array object, date object, string object.

*Java Servlet:*Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.

Module-III: [12L]

*JSP:*JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement.

Module-IV: [13L]

*J2EE:*An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI, JNI.

XML: Extensible Markup Language (XML), basics of XML, elements and attributes, document type definition, XML parsers, sequential and tree approach.

References:

1. Web Technologies - Godbole A. S. & Kahate A., TMH.
2. Web Technology & Design - Xavier C., New Age Publication.
3. Java Server Programming, J2EE edition. (VOL I and VOL II); WROX publishers

Course Name : E-Commerce & ERP					
Course Code: INFO3231					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Convert an e-commerce based business model into a live e-commerce system.
(2) Choose right kind of hardware and software platforms for the e-commerce system they are building.
(3) Evaluate and justify the system by testing it from different aspects.
(4) Understand the importance of 'integration' of different systems within an organization
(5) Understand the basic concepts of ERP systems for manufacturing or service companies, and the differences among MRP, MRP II, and ERP systems
(6) Employ the thinking in ERP systems: the principles of ERP systems, their major components, and the relationships among these components
(7) Define the major ERP components, including material requirements planning, master production scheduling, and capacity requirements planning
(8) Realize the importance of project management in an ERP implementation project
(9) Understand what to expect, and not to expect, from a consultant implementing an ERP system

Detailed Syllabus:

Module 1:
Electronic Commerce: Overview, Definitions, Advantages & Disadvantages of E – Commerce, Drivers of E – Commerce, Myths, Dot Com Era,E-business.
Technologies :Relationship Between E – Commerce & Networking, Different Types of Networking For E – Commerce, Internet, Intranet & Extranet, EDI Systems, Wireless Application Protocol: Defn. Hand Held Devices, Mobility &Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce .
Electronic Data Interchange (EDI): Meaning, Benefits, Concepts, Application, EDI Model, EDIFACT standard, Internet EDI

Module 2:
Business Models of e – commerce: Model Based On Transaction Type, Model B ased On Transaction Party - B2B, B2C, C2B, C2C, E – Governance, m-commerce.
E – strategy: Overview, Strategic Methods for developing E – commerce.
B2B E-commerce: Collaborative Commerce
Supply Chain Management: E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution (SCE), SCE - Framework, effect of different technologies on Supply Chain Mnagement.

Module 3:
E – Payment Mechanism: Payment through card system, E – Cheque, E – Cash, E – Payment Threats & Protections.
E – Marketing: Home –shopping, E-Marketing, Tele-marketing
Risk of E – Commerce: Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures.

Module 4:
Enterprise Resource Planning (ERP): Features, capabilities and Overview of Commercial Software, re-engineering work processes for IT applications, Business Modules: Finance, Manufacturing (Production), Human Resources, Materials Management, QualityManagement, Sales&Distribution ERP Package,
ERP Market: ERP Market Place, SAP AG, PeopleSoft, BAAN, JD Edwards, Oracle Corporation

ERP-Present and Future: Enterprise Application Integration (EAI), ERP and E-Commerce, ERP and Internet, Future Directions in ERP

References:

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
3. E-Commerce through ASP by W Clarke- BPB
4. Enterprise Resource Planning – A Managerial Perspective by D P Goyal, Tata McGraw Hill Education, 2011
5. Enterprise Resource Planning by Ashim Raj Singla, Cengage Learning, 2008

Course Name : Computer Graphics & Multimedia					
Course Code: INFO3232					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Demonstrate activities and applications of device dependant and independent color models, image representation techniques (raster and random graphics), activities of active and passive graphics devices and computer graphics software.

(2) Compare effectiveness of DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm, Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method.

(3) Implement 2D and 3D transformation techniques (translation, rotation, scaling, shearing, reflection)

(4) Analyze and implement curve and surface representation techniques using Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves algorithms

(5) Describe hidden surface representation using Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal – geometry

(6) Demonstrate activities and applications of device dependant and independent color models, image representation techniques (raster and random graphics), activities of active and passive graphics devices and computer graphics software.

(7) Compare between image (.bmp, .jpg, .gif, .tiff), audio (.wav, .midi, .mp3), text (.txt, .doc, .pdf) and video (.mpeg, .wmv, .swf) formats according to their way of representing data, merits and demerits.

(8) Demonstrate image, video, text analysis tools and techniques.

Detailed Syllabus:

Module I (8 Lectures)

Introduction to computer graphics & graphics systems, Overview & use of computer graphics & Multimedia, Image, Image Processing, representing pictures, preparing, presenting & interacting with pictures for presentations, Visualization & image processing; Color Models, lookup table, Histogram; Image representing hardwares: Cathod Ray Tube, LCD & LED Display devices, Scanner, Digital Camera. Gamma, Interlacing, properties of display devices, different image formats.

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.

Module II (10 Lectures)

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.

Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method

Overview of 3D Transformation and Viewing

Module III (8 Lectures)

Curves [3L]: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces [3L]: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal -

geometry.
Color & shading models [2L]: Light & color model; interpolative shading model; Texture.

Module IV (10 Lectures)
Text: Different types of text representation, Hypertext, text representation formats.
Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI
Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture
Animation: Techniques of 2D & 3D animation, formats of Animation
Image and Video Database:Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing.

References:

1) Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2) Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3) D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH
4) Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
5) Fred Halsall , Multimedia Communications , Pearson Ed.
6) Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.
7) Ranjan Parekh, "Principles of Multimedia", TMH

Course Name : System Software and Administration					
Course Code: INFO3233					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter, debugger how linker and loader create an executable program from an object module created by assembler and compiler.

(2) To understand the various phases of compiler and compare its working with assembler.

(3) Use multiple computer system platforms, and understand the advantages of each.

(4) Protect and secure users' information on computer systems.

(5) Install and manage disks and file systems.

Detailed Syllabus:

Module – I [10L]

System Software:

Assemblers - General design procedures, Design of two pass assemblers, Cross Assemblers, Macro Processors – Features of a macro facility, (macro instruction arguments, conditional macro expansion, macro calls within macros), Implementation of a restricted facility - A two pass algorithm; Macro Assemblers.

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.

Module - II [10]

System Administration - Duties of the Administrator, Administration tools, Overview of permissions.

Processes - Process status, Killing processes, process priority.

Starting up and Shut down - Peripherals, Kernel loading, Console, The scheduler, init and inittab file, Run-levels, Run level scripts.

Managing User Accounts - Principles, password file, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users.

Managing Unix File Systems - Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making filesystems, Superblock, I-nodes, Filesystem checker, Mounting filesystems, Logical Volumes, Network Filesystems, Boot disks

Module – III [10]

Configuring the TCP/IP Networking - Kernel Configuration; Mounting the /proc Filesystem, Installing the Binaries, Setting the Hostname, Assigning IP Addresses, Creating Subnets, Writing hosts and networks Files, Interface Configuration for IP, ifconfig, netstat command, Checking the ARP Tables; Name service and resolver configuration.

TCP/IP Firewall - Methods of Attack, Firewall, IP Filtering, A Sample Firewall Configuration using iptables.

Module IV [10]

IP Accounting - Configuring the Kernel for IP Accounting, Configuring IP Accounting, Using IP Accounting Results IP Masquerade and Network Address Translation, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade.

The Network Information System - Getting Acquainted with NIS, NIS Versus NIS+ , The Client Side of NIS, Running an NIS Server, NIS Server Security**.**

Network file system - Preparing NFS, Mounting an NFS Volume, The NFS Daemons, The exports File.

System Backup & Recovery - Log files for system and applications; Backup schedules and methods (manual and automated).

References:

1. L.L. Beck – "System Software " (3 rd Ed.)- Pearson Education
2. Michel Ticher – "PC System Programming" , Abacus.
3. Kirch – " Linux network Administrator's guide (2 nd Ed.)" – O'Rielly
4. Maxwell – "Unix system administration" – TMH
5. Limoncelli –"The Practice of System & Network Administration"-Pearson

Course Name : Artificial Intelligence					
Course Code: INFO3241					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Define the different problems of AI , different search techniques, Heuristic search strategies, Adversarial search technique etc.

(2) Analyze the behavior of intelligent agents, the nature of environment, and the structure of agents and then differentiate among different intelligent agents: goal based agents, utility based agents, learning agents.

(3) Solving problems by Searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search etc.

(4) Compare among different Heuristic search strategies: Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, constraint satisfaction problems.

(5) Differentiate between Heuristic search strategies and Adversarial Search strategies.

(6) Construct different planning technique: Goal stack planning, Hierarchical planning, other planning technique

(7) Discuss different Forms of learning: inductive learning, Learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning

Detailed Syllabus:

Module-I: [10L]

Introduction:

Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents: Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Module-II: [10L]

Search techniques: Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies: Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, constraint satisfaction problems, local search for constraint satisfaction problems. Adversarial search: Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning.

Module-III: [10L]

Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. Using predicate logic: Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules:

Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge. Probabilistic reasoning: Representing knowledge in an uncertain domain, Fuzzy sets & fuzzy logics.

Module-IV: [10L]

Planning: Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques. Expert Systems: Representing and using domain knowledge, expert system shells, knowledge acquisition. Basic knowledge of programming language like Prolog & Lisp.

References:

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

Course Name : Wireless & Mobile Computing					
Course Code: INFO3242					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1. Identify the basic concept of wireless networks;
2. Analyse traffic theories, mobile radio propagation, channel coding, and cellular concepts;
3.Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks;
4. Classify network protocols, ad hoc and sensor networks, wireless MANs, LANs and PANs.

Detailed Syllabus:

Module-I: [8L]

Fundamentals of wireless communication and computer networking: Electromagnetic spectrum; Characteristics of wireless channel; Modulation techniques; Multiple access techniques; Voice coding; Computer network architectures (reference models)

Module-II: [14L]

Fundamentals of wireless LANs, PANs, WANs, MANs and Wireless Internet: IEEE 802.11, HIPERLAN standards; Bluetooth; HomeRF; Cellular concept and architecture; First, second, and third generation cellular networks; Wireless in local loop systems, standards, and future trends; Mobile IP; TCP over wireless; Wireless application protocol; Optimizing Web over wireless.

Module-III: [8L]

Ad hoc wireless networks: Issues and challenges in infrastructure-less networks; MAC protocols; Routing protocols; Multicast routing protocols; Transport and security protocols; Quality of service provisioning; Energy management.

Module-IV: [10L]

Hybrid wireless networks and wireless sensor networks: Architectures and routing protocols for hybrid wireless networks; Load balancing schemes; Pricing schemes for multi-hop wireless networks; Issues and challenges in wireless sensor networks: Architectures and routing protocols; MAC protocols; Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

Recent advances in wireless networks: Wide Band (UWB) communication; Issues and challenges in UWB communication; Applications of UWB communication; Wireless Fidelity (Wi-Fi) systems; Issues in Wi-Fi Systems.

References:

1. Kaveh Pahlavan, Prashant Krishnamoorthy, Principles of Wireless Networks, - A united approach – Pearson Education.
2. Jochen Schiller, Mobile Communications, Person Education.
3. Wang and H.V.Poor, Wireless Communication Systems, Pearson education.
4. M.Mallick, Mobile and Wireless design essentials, Wiley Publishing Inc.
5. P.Nicopolitidis, M.S.Obaidat, G.I. papadimitria, A.S. Pomportsis, Wireless Networks, John Wiley & Sons.
6. T. S. Rappaport, "Wireless Communications: Principles & Practice," Prentice-Hall.

7. Feng Zhao, Leonidas Guibas ,"Wireless Sensor Networks :An Information Processing Approach",Elsivier.
8. C. Siva Ram Murthy, B.S. Manoj ," Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Education

Course Name : Pattern Recognition					
Course Code: INFO3243					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

(1) Analyze classification problem probabilistically and estimate classifiers (bayesian, kNN, ANN, K-means) performance.

(2) Design and compare the machine learning models (nearest-neighbor rule, linear discriminant functions, NN and SVM) and which model is appropriate for a problem or why it is not appropriate.

(3) Analyze the performance of different clustering algorithm (k-means, Fuzzy C means and EM) on big data set based on isclassification rate.

Detailed Syllabus:

Module – I [10L]

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Metric and Non-Metric Proximity Measures: Distance between Pattern Collections.

Bayes Decision Theorem: Bayes Classifier, Linear and non-linear Discrimination functions, Minimum error rate classification, Error probability.

Module – II [10L]

Parameter Estimation: Maximum-Likelihood estimation, Gaussian mixture models, Expectation-maximization method, Bayesian estimation, Hidden Markov model

Nonparametric Techniques: Parzen-window method, Nearest Neighbor method

Module – III [10L]

Nonlinear Classifier: Learning - Supervised and Unsupervised, Perceptron, Decision Tree.

Clustering: Process, Algorithms (basic hierarchical, Agglomerative, Partitional, K-means and Fuzzy C-means)

Module – IV [10L]

Feature selection: class Separability Measures – Divergence, Chernoff Bound & Bhattacharyya Distance, Scatter Matrices, Dimensionality reduction, similarity measures, feature selection criteria and algorithms, principal component analysis.

References:

1. R. O. Duda, P. E. Hart and D. G. Stork: Pattern Classification, 2nd ed., Wiley.
2. J. T. Tou and R. C. Gonzalez: Pattern Recognition Principles, Addison-Wesley, London.
3. Christopher M. Bishop, Neural Networks for Pattern Recognition, Oxford University Press.
4. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer.

Course Name : Data Analysis Laboratory					
Course Code: INFO3211					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) Demonstrate the importance of preprocessing the given datasets.

(2) Design and implement classification algorithm to classify given problems using modern tools.

(3) Design and implement clustering algorithm to group the given attributes in a datasetusing modern tools.

(4) Demonstrate to find association rules for the given datasetsusing modern tools.

(5) Develop skills to design data warehouse for an enterprise.

Detailed Syllabus:

Introduction:

Setting up R and/or python with NumPy, mlpy/mdp.

Assignment 1:

Based on Data Acquisition, Cleaning and feature extraction. Obtain a dataset which has features in text instead of numbers. Generate a csv from it which contains only numeric fields.

Assignment 2:

K-Means on a dataset: Observe the effects on variation of the number of centroids and different centroid selection algorithms.

Assignment 3:

Creating a perceptron and learning until stability; learn different other models of pf ANN

Assignment 4+5:

Using libSVM dataset: Compare libsvm values (obtained using libsvm's exe distributed free on the site) against your own SVM. (In the industry, DA is used mainly to generate reports. Hence it is very essential to understand how comparative charts are created and read)

Assignment 6:

Hadoop Set-up for big data.

Course Name : Computer Network Laboratory					
Course Code: INFO3212					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) Develop the C programs to send the message among the computers using datagram and internet socket.

(2) Compare the time complexity of the stop-n-wait, go-back-N and selective repeat ARQ.

Detailed Syllabus:

1. NIC Installation & Configuration
2. TCP/UDP Socket Programming – Introduction
3. Sockets – Operation, Socket types, Domains, Closing Sockets
4. Client/Server Models - Usage
5. Connection Based Services - Client and Server actions
6. Connectionless Services - Client and Server actions
7. Access Network Database - Host Information, Network Information, Protocol Information

Course Name : Advanced Java & Web Technology Laboratory					
Course Code: INFO3213					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

1) Experiment and analyze several kind of client side scripting (e.g : HTML,XML, and JavaScript) and server side scripting (e.g : Servlet and JSP) languages.

2) Practice and apply EJB, RMI and XML to implement J2EE application.

Detailed Syllabus:

1. HTML
2. CSS [Inline, External]
3. JavaScript Control Structure JavaScript Events and Functions
4. JavaScript Validation and implementation in HTML Form
5. Servlet
6. JSP
7. JDBC for Database Connectivity using JSP
8. Java Applet and its implementation through JSP
9. Java Bean Creation
10. Basic Concepts of EJB and RMI and its implementation by creating Bean
11. XML Document Creation, DTD, Schema

Course Name : E-Commerce & ERP Laboratory					
Course Code: INFO3236					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) Create web pages using HTML, DHTML and Cascading Styles sheets.
(2) Create dynamic web pages using JavaScript and VBScript.
(3) Create interactive web applications using ASP.NET.
(4) Build web applications using PHP.
(5) Integrate standard database applications like Oracle, SQL Server to a web site.
(6) Convert an e-commerce based business model into a live e-commerce system.
(7) Choose right kind of hardware and software platforms for the e-commerce system they are building.
(8) Evaluate and justify the system by testing it from different aspects.

Detailed Syllabus:

1. Following E-Commerce experiments are to be implemented using either VB, ASP, SQL or JAVA, JSP, SQL.

2. Creating E-Commerce Site: Designing and maintaining WebPages. Advertising in the Website, Portals.

3. E-Commerce Interaction : Comparison Shopping in B2C, Exchanges Handling in B2B, Interaction Examples: Virtual Shopping Carts.

4. E-Commerce Applications : Online Store, OnlineBanking, Credit Card Transaction Processing

Course Name : Computer Graphics & Multimedia Laboratory					
Course Code: INFO3237					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) Apply the concept of Scan conversion algorithms to draw geometrical without help of graphics.h
(2) Compare efficiency of different computer graphics algorithms.
(3) Apply and Combine different Adobe Photoshop tools to edit images.
(4) Design Animation videos using Adobe Flash software.
(5) Develop web pages using HTML, DHTML and Java Script

Detailed Syllabus:

1) Implementation of line drawing algorithms
2) Implementation of circle & ellipse drawing algorithms
3) Implementation of area filling algorithms
4) Implementation of 2D transformation algorithms
5) Implementation of line clipping algorithms
6) Familiarization of image editing softwares and performing image editing using them
7) Familiarization of animation softwares and creating 2D animations using them
8) Web page design using HTML
9) Use of CSS and Java Script in Web designing

Course Name : System Software and Administration Laboratory					
Course Code: INFO3238					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

After successfully completing this course the students will be able to:

(1) To understand and configure different servers in linux system.
(2) Use multiple computer system platforms, and understand the advantages of each.
(3) configure firewall to Protect and secure users' information on computer systems.
(4) Install and manage disks and file systems.

Detailed Syllabus:

1. Packet Monitoring software - tcpdump, snort, ethereal, Trace route, Ping, Finger, Nmap
2. Server configuration - FTP, DHCP, NFS, NIS, SMTP, DNS, SAMBA
3. IP Accounting
4. Firewalls, Security and Privacy - iptables
5. System Startup and Operation
6. Disk Partitioning and Filesystem Installation
7. Filesystem and Device Manipulation
8. Process and Log Analysis
9. Startup Scripts and Configuration Files
10. User/Group Security and Permissions
11. Backup
12. Scheduling Maintenance Functions
13. Implement assembly language instructions using C.

Course Name : Personality Development					
Course Code: HMTS3221					
Contact hrs per week:	L	T	P	Total	Credit points
	1	0	0	1	1

Detailed Syllabus:

Module 1

Self-Growth:

i) Self Growth- Maslow's Hierarchy of Needs Theory
ii) Anger, Stress & Time Management- Theories and application
iii) SWOT Analysis

Module II

Stepping Up:

i)Growth & Environment
ii)Competitive Spirit
iii)Responsibility Factor

Module III

Professional Communication:

i) Impression Management- theory on social psychology
ii)Employability Quotient
iii)Cross-cultural communication

Module IV

Leadership & Team Playing:

i) Leadership & Team Playing: Theories, Styles, Stages
ii) Motivation, Negotiation Skills, Conflict Management
iii) Planning & Envisioning: Initiative and Innovation in the Work Environment- De Bono's Six Thinking Hats

Evaluation:

Max.Marks-100(sessional)
25 marks/ module

Methodology: Assignment and project

Suggested Reading

1. Personality Development and Soft Skills by Barun K. Mitra, Oxford University, 2011
2. Soft Skills: An Integrated Approach to Maxmise Personality by Gajendra Singh Chauhan and Sangeeta Sharma, Wiley, 2016
3. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh, Pearson, 2010

Heritage Institute of Technology

Anandapur, Kolkata - 700107

Structures of Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Year: 4th Year

Document Release Month & Year: June 2017

4th Year 1st Semester:

Course Name : INTERNET TECHNOLOGY					
Course Code: INFO4101					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module I-[10L]

Overview of JavaScript:

What is JavaScript? Brief history. Common use-cases. Runtime environments. ECMA Script standards. Basic syntax, Arrays and Objects, Functions, Document Object Model, String interpolation, let and const, Arrow functions, Destructuring , Symbol, Maps and Sets, for-of , Spread operator , Classes , Promises , Module loaders, Typed Arrays.

Module II-[10L]

jQuery :

Overview of jQuery. Cross-browser compatibility. The $ function object. Element selectors. Tree traversal. Node creation, insertion, modification and deletion. Getting and setting attributes, styles and class. Wrapping and unwrapping DOM raw objects. The chaining pattern, Event handling. bind and unbind. Keyboard and mouse events. Event delegation and bubbling. Animation. AJAX with jQuery

Javascript Context, Closures & Higher-order Functions:

Object method invocation, implicit parameter variable, Event handlers and callbacks, Usage of call and apply, Binding context, new keyword. Lexical scope, Inner functions, Closure scope, Functors. Simulation of private object properties. Simulation of namespaces. Functional programming. Referential transparency. Iteration over collections without loops. Implementation of map, reduce, find, filter.

Module III-[10L]

TypeScript : Introduction to TypeScript, From TS to JS, Types and Type Inference, Classes, Interfaces, Modules, Internal Modules, External Modules, TypeScript Definition files (TSD)

Node.js & Backbone.js : Server-side scripting. Threaded vs event-based server models. Working with callbacks. The Express web framework, Backbone.js

TBD & HTML 5 APIs: Anatomy of a javascript module, design, layout and components of a typical javascript library ,HTML 5 APIs

d3.js : Data visualization. Drawing graphics using SVG. Selections with select and selectAll. Adding and deleting elements with enter and exit, Binding data with data, Animation with transition.

Module IV-[10L]

MVC and Angular in HTML: Angular, MVC, MVW, Survey

Angular Form: Controllers, ng-model, Survey, Testing Controllers

Angular Services: Services, Survey, Testing Services

Angular Directives: Directives, Survey

Angular Routes: $http, Routes

References:

1. JavaScript: The Good Parts by Douglas Crockford, O'Reilly Media
2. JavaScript: The Definitive Guide by David Flanagan, O'Reilly Media
3. Dive Into HTML5 by Mark Pilgrim
4. Learning Advanced Javascript by John Resig by Apress
5. Angular JS by Green and Brad, O'Reilly
6. Professional AngularJS by Valeri Karpov, Diego Netto (WROX)

Course Name : IMAGE PROCESSING					
Course Code: INFO4102					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

1) Compare the performance of the Roberts, Sobel and Prewitt edge detection operators.
2) Design the different spatial domain filters such as max, min, median and box filter.
3) Evaluate the performance of different transforms like DFT, DCT and DWT.
4) Describe the image formation model in digital computer.
5) Find the distance between two pixels using Euclidean Distance, City-block distance and Chessboard distance.

Detailed Syllabus:

Module-I: [9L]

Introduction: Overview of Image Processing, Application area of image processing, Digital Image Representation, Sampling & quantization. Spatial and Intensity resolution, interpolation, Relationship between pixels – Neighbors, Adjacency, connectivity, Regions, Boundaries and Distance,

Image Enhancement in Spatial Domain: Image Quality and Need for image enhancement, Intensity transformation – negative, log, power-law and contrast stretching (linear and non-linear) Histogram based techniques, Spatial Filtering concepts, Spatial Convolution and Correlation, Image smoothing and Sharpening spatial filters,

Module – II: [9L]

Image Enhancement in Frequency Domain: Properties of 1-D and 2-D Discrete Fourier Transform (DFT), Basic of filtering in the frequency domain. Image smoothing and sharpening in frequency domain.

Image Restoration: Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only – spatial filtering, Periodic noise and band – pass and band reject filtering.

Module – III: [10L]

Image Compression: coding redundancy, Image compression model, Compression Methods – Huffman coding, Arithmetic coding, LZW coding, Run-length coding, Predicative coding and Vector quantization

Module – IV: [10L]

Image Segmentation: Introduction, Detection of Discontinuities, Point Detection, Line Detection and Edge Detection, Thresholding – Local, Global, Optimum, Multiple and Variable, Hough Transforms, Principle of region – growing, splitting and merging.

References:

1. Rafael C. Gonzalez, Richard E woods, Digital Image Processing, Pearson.
2. Rafael C. Gonzalez, Richard E woods, Digital Image Processing Using MATLAB, Gatesmark Publishing.
3. Anil K Jain, „"Fundamentals of Digital Image Processing", Pearson.
4. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
5. Bhabatosh Chanda, Dwijesh Dutta Majumder, Digital Image Processing and Analysis, Prentice Hall of India

Course Name : DISTRIBUTED OPERATING SYSTEM					
Course Code: INFO4141					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1) Find out the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
2) Understand key mechanisms and models for distributed systems including logical clocks, causality, vector timestamps, distributed hash tables, consistent global states, election algorithms, distributed mutual exclusion, consistency, replication, fault tolerance, distributed deadlocks, recovery, agreement protocols
3) Learn how to design and implement distributed algorithms
4) Practice with mechanisms such as client/server and P2P algorithms, remote procedure call (RPC/RMI), multicasting
5) Exposed to various areas of research in distributed systems.
6) Learn to design the fault tolerant distributed systems.

Detailed Syllabus:

Module-I: [9L]

Introduction to Distributed System: Introduction, Examples of distributed system, Resource sharing, Challenges

Operating System Structures: Review of structures: monolithic kernel, layered systems, virtual machines. Process based models and client server architecture; The micro-kernel based client-server approach.

Communication: Inter-process communication , Remote Procedure Call, Remote Object Invocation, Tasks and Threads. Examples from LINUX, Solaris 2 and Windows NT.

Module-II: [10L]

Theoretical Foundations: Introduction. Inherent Limitations of distributed Systems. Lamport's Logical clock. Global State: Chandy Lamport's Global State Recording Algorithm

Distributed Mutual Exclusion: Classification of distributed mutual exclusion algorithm. NonToken based Algorithm:Lamport's algorithm,Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm. A comparative performance analysis of different algorithms w.r.t Response time, Synchronoization delay, Message traffic, Universal prformance bound.

Distributed Deadlock Detection: Deadlock handling strategies in distributed systems . Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, edge chasing, global state detection algorithm.

Module-III: [10L]

Protection and Security: Requirements for protection and security regimes. The access matrix model of protection. System and user modes, rings of protection, access lists, capabilities. User authentication, passwords and signatures. Use of single key and public key encryption.

Distributed file systems: Issues in the design of distributed file systems: naming, writing policiy, Cache consistency, Availability, Scalability and Semantics. Use of the Virtual File System layer. Case Studies: Sun NFS, The Sprite File System, CODA, The x-Kernel Logical File System.

Module-IV: [7L]

Distributed Shared Memory: Architecture and motivations. Algorithms for implementing DSM: The Central-Server Algorithm, The MigrationAlgorithm, The Read-Replication Algorithm, The Full-Replication Algorithm. Memory Coherence. Case Studies: IVY, Clouds.

Distributed Scheduling: Issues in Load Distributing: Load, Classification of Load Distribution, Load Balancing vs Load Sharing, Preemptive vs Nonpreemptive; Components of a load distribution; Stability.

References:

1. Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems Principles and Paradigms, PHI
2. Singhal Mukesh & Shivaratri N. G., Advanced Concepts in Operating Systems, TMH
3. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 199
4. Tanenbaum, A. S. Modern Operating Systems, 2ndEdition (ISBN 0-13-031358-0), Prentice Hall 2001.
5. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.
6. Silberschatz, A., Galvin, P. and Gagne, G., Appl ied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.
7. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201- 61918-0), Addison Wesley 2001.

Course Name : CYBER LAW & SECURITY POLICY					
Course Code: INFO4142					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1) Defining the concept of Cybercrime, Forgery, Hacking, Software Piracy and Network Intrusion.
2) Discuss the concept of Cyber Stalking and different methods of Active attack and Passive attack with examples.
3) Analyze the security challenges posted by mobile devices, Explain the attacks on mobile/Cell phones and Differentiate between different viruses on laptop. Explain the concepts of Trojan Horses, Backdoors, DOS & DDOS attacks, SQL injection and Buffer Overflow.
4) Compare different methods of Phishing, ID Theft and Discuss Digital Forensics analysis with guidelines of Cell phone forensics.

Detailed Syllabus:

Module-I: [10L]
***Introduction of Cybercrime*:** What is cybercrime? Forgery, Hacking, Software Piracy, Computer Network intrusion
Category of Cybercrime: How criminals plan attacks, Passive attack, Active attacks, Cyberstalking.

Module – II: [10L]
Cybercrime Mobile & Wireless devices: Security challenges posted by mobile devices, Cryptographic security for mobile devices, Attacks on mobile/cell phones, Keyloggers & Spywares, Virus& Worms, Hacking and Phishing.

Module-III: [10L]
Tools and Methods used in Cyber crime: Proxy servers, password checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection, Buffer over flow.

Module-IV: [10L]
***Phishing & Identity Theft*:** Phishing methods, ID Theft; Online identity method.
***Digital Forensic*:** Introduction to Digital Forensic, Steps of Forensic investigation, Tools for Digital forensic analysis and Organizational guidelines for Cell phone Forensics.

References:
1. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.

Course Name : FUNDAMENTALS OF CLOUD COMPUTING					
Course Code: INFO4143					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:
learn cloud computing models, techniques, and architectures. Cloud computing has evolved as a very important computing model, which enables information, software, and other shared resources to be provisioned over the network as services in an on-demand manner. Students will be exposed to the current practices in cloud computing. Topics may include distributed computing models and technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), virtualization, security and privacy issues, performance and systems issues, capacity planning, disaster recovery, challenges in implementing clouds, data centers, cloud hosted applications, and other advanced and research topics in cloud computing.

Detailed Syllabus:

Module-I: [7 L]

Overview of Computing Paradigm: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing

Introduction to Cloud Computing: Cloud Computing definition, Deployment Models: private, public, hybrid, community cloud. Service Models: IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds

Module-II: [13 L]

Cloud Virtualization: Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM). Resource Virtualization: Server, Storage, Network

Cloud Computing Architecture: Assumptions, Recommendations and fundamental requirements for cloud application architecture. SOA for cloud applications. Open-Source Eucalyptus Cloud Architecture.

Module-III: [11 L]

Service Management in Cloud Computing: IT Infrastructure Library based Service Management: Service Strategy, Service Design, Service Transition, Service Operation, Continual Service Improvement Concept of SLA. SLA aspects and requirements

Cloud Risk and Security: Type of Risk in cloud, Risk management, cloud security services(Confidentiality, Integrity, Availability), application security in IaaS, PaaS, SaaS environment.

Module-IV: [11 L]

Cloud Cost: Direct and Indirect Cost, Chargeback Models, Methodology, Tools and Solution

Cloud Applications: Microsoft Cloud Services, Google cloud Applications, Amazon Cloud Services, Mobile Cloud

References:

1. *Cloud Computing Black Book,* Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah, *dreamtech Press*
2. *Cloud Computing A practicle approach for learning and implementation,* A. Srinivasan, J. Suresh, *Pearson*
3. *Cloud Computing Bible,* Barrie Sosinsky, *Wiley-India,* 2010
4. *Cloud Computing: Principles and Paradigms,* Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Wile,* 2011
5. *Cloud Computing: Principles, Systems and Applications, Editors:* Nikos Antonopoulos, Lee Gillam, *Springer,* 2012
6. *Cloud Security: A Comprehensive Guide to Secure Cloud Computing,* Ronald L. Krutz, Russell Dean Vines, *Wiley-India,* 2010

Course Name : VLSI Design Automation					
Course Code: ECEN4181					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module-I: [12L]

VLSI Circuits & Physical Layout:

Unit1: MOS Transistor Characteristics, MOS as Digital Switch, NMOS Logic Family, CMOS Logic Family, CMOS Inverter Characteristics (VTC), Inverter Delay & Noise, NAND and NOR gates, Complex Logic Circuits, Pass Transistor Logic & Transmission Gate, CMOS Sequential Circuits, CMOS D-Latch and D-Flip-Flop

Unit2: CMOS Cross Section, Layout and Mask layers, Inverter Layout, Lambda Rule vs Micron Rule, Std Cell Layout Topology, Stick Diagram, Euler Path Algorithm, Layout Legging.

Module-II: [8L]

VLSI Design Methodology:

Unit1: Moore's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI, GSI), Technology growth and process Node

Unit2: Full Custom Design, Std Cell based Semi Custom Design, Gate Array Design, PLD, FPGA: CLB, LUT, MUX, VLSI Design Cycle, Y-Chart.

Module-III: [8L]

EDA Tools: High level Synthesis and HDL:

Unit1: High level Synthesis EDA Flow, Control and Data Flow Graph, Scheduling, Allocation, Binding, RTL

Unit2: Why HDL ? Frontend Design Flow using HDL (Behavioral, RTL and Gate Level), Verilog Modeling: Behavioral, Data-Flow, Structural and Mixed, Test Bench, FSM

Example: Mealy Machine and Moore Machine. Pipeline Example.

Module-IV: [12L]

EDA Tools: Logical Synthesis and Physical Design Automation:

Unit1: Combinational Logic Optimization: BDD: Binary Decision Diagram, OBDD, ROBDD, Technology Mapping: Pattern DAG, Subject DAG, Sequential Logic Optimization

Unit2: Physical Layout Automation EDA Flow, Partitioning: KL Algorithm, Floor-planning cost function, Placement, Detailed Routing: Channel Routing, Horizontal Constraint Graph, Vertical Constraint Graph, Cyclic Constraint, Left-edge Algorithm, Global Routing: Steiner Tree, Maze Routing.

References:

1. Principles of CMOS VLSI Design, A Systems Perspective, Author: Neil Weste, Kamran Eshraghian, Addison Wesley, 2 nd Edition, 2000
2. Algorithms for VLSI Physical Design Automation, Author: N. Sherwani, KLUWER ACADEMIC PUBLISHERS (3 rd edition)
3. CMOS Digital Integrated Circuits, Analysis and Design, Author: Sung-Mo Kang, Yusuf Leblebici, Tata McGraw Hill (3 rd Edition), 2006
4. CMOS VLSI Design, A Circuits and Systems Perspective (3rd Edition) Author: Neil Weste, David Harris, Ayan Banerjee. Pearson, 2011
5. Digital Integrated Circuit, Design Perspective, Author: .M. Rabaey, Prentice-Hall
6. VLSI Design and EDA TOOLS, Author: Angsuman Sarkar, Swapnadip De, Chandan Kumar Sarkar, SCITECH PUBLICATIONS (India) Pvt. Ltd., 2011
7. Algorithms for VLSI Design Automation, Author: Gerez, Wiley, 2011

Course Name: OPERATIONS RESEARCH AND OPTIMIZATION TECHNIQUES					
Course Code: MATH4181					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module-I: [10L]

Linear Programming Problem (LPP)-I

Formulation of an LPP; Graphical Method of solution of an LPP; Convex Combination and Convex Set; Convex Hull and Convex Polyhedron; Canonical and Standard form of an LPP; Basic Solution of a system of linear equations; Simplex Method; Big-M Method; Concept of Duality; Mathematical formulation of duals; Dual Simplex Method.

Module-II: [10L]

Linear Programming Problem (LPP)-II and Game Theory

Transportation Problems (TP) ; Representation of Transportation Problems as LPP; Methods of finding initial basic feasible solution of TP: North-West Corner Rule, Matrix Minima Method, Vogel's Approximation Method; Optimality test of the basic feasible solution; Assignment Problems; Hungarian Method; Travelling Salesman Problem. Strategies; The Minimax and Maximin Criterion; Existence of Saddle Point; Games without a Saddle Point; Mixed Strategies; Symmetric Games; Dominance Principle; Two-Person Zero-Sum Game; Graphical Method of Solution; Algebraic Method of Solution.

Module-III: [10L]

Non-Linear Programming Problem (NLPP)-I

Single-variable Optimization; Multivariate Optimization with no constraints: Semidefinite Case, Saddle Point; Multivariate Optimization with Equality Constraints: Method of Lagrange Multipliers; Multivariable Optimization with inequality constraints: Kuhn-Tucker Conditions.

Module-IV: [10L]

Non-Linear Programming Problem (NLPP)-II

Unimodal Function; Elimination Methods: Interval Halving Method, Fibonacci Method, Golden Section Method; Interpolation Methods: Quadratic Interpolation Methods; Cubic Interpolation Method, Newton Method, Quasi- Newton Method, Secant Method.

References:

1. Linear Programming and Game Theory by J. G. Chakraborty and P. R. Ghosh, Moulik Library.
2. Operations Research by Kanti Swarup, P. K. Gupta and Man Mohan, S. Chand and Sons.
3. Engineering Optimization by S. S. Rao, New Age Techno Press.
4. Algorithms for Minimization without Derivative by R. P. Brent, Prentice Hall.

Course Name : INTRODUCTION TO EMBEDDED SYSTEM					
Course Code: AEIE4182					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1. Acquire knowledge in the area of embedded system using AVR microcontroller.
2. Justify the selection criteria of microcontrollers needed to adopt in industrial environment for a particular application.
3. Explain the role of operating system in various embedded systems used in industrial applications.
4. Do interfacing of peripherals with AVR microcontrollers and their programming.

Detailed Syllabus:

Module-I: [10L]

Introduction to an embedded system

Different types of microcontrollers: embedded microcontrollers, introduction to AVR, PIC, ARM and Arduino based systems; processor Architectures: Harvard V/S Princeton, CISC Vs RISC; microcontroller memory types; microcontroller features: clocking, input/output pins, interrupts, timers and peripherals.

Module-II: [10L]

Overview of AVR microcontroller

Introduction to AVR (ATmega 328p-pu) microcontrollers, architecture and pipelining, program memory considerations, addressing modes, CPU registers, ADC registers, instruction set, simple operations, basics of communication, overview of RS232, I^2C Bus, UART, USB, ATmega 328p-pu connections to RS-232, ATmega 328p-pu serial communication programming, ATmega 328p-pu interrupts, programming of timer interrupts, programming of external hardware interrupts, programming of the serial communication interrupts, interrupt priority in the ATmega 328p-pu

Module-III: [8L]

Embedded operating systems

Operating system basics, types of operating systems, tasks, process and threads, Multiprocessing and multitasking, task scheduling. task communication: shared memory, message passing, remote procedure call and sockets, task synchronization: task communication/synchronization issues, task synchronization techniques, device drivers, how to choose an RTOS.

Module-IV: [8L]

Hardware Interfacing and Programming with ATmega 328p

Interfacing of LCD, interfacing with analog sensors (i.e LM35, ADXL 335 accelerometer), interfacing of stepper motor, interfacing with a keyboard and MPU6050 (MEMS Accelerometer and Gyroscope) using I^2C bus.

References:

1. Elliot Williams,"*AVR Programming: Learning to Write Software for Hardware*", Maker Media, Incorporated, 2014
2. Raj Kamal, "*Embedded Systems*", TMH, 2004.
3. Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, "*The AVR Microcontroller and Embedded Systems: Using Assembly and C*"; Pearson, 2014.
4. Dhananjay Gadre, "*Programming and Customizing the AVR Microcontroller*"; McGraw Hill Education, 2014.
5. Silberschatz Galvin Gagne, "Operating System Concepts", WILEY, 2014

Course Name : INTERNET TECHNOLOGY LABORATORY					
Course Code: INFO4111					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**2**

After successfully completing this course the students will be able to:

Detailed Syllabus:

- JavaScript
- jQuery
- Javascript Context, Closures & Higher-order Functions
- TypeScript
- Node.js & Backbone.js
- TBD & HTML 5 APIs
- d3.js
- Modularization (RequireJS)
- Testing and TDD/BDD (Jasmine)
- Test Running (Karma)
- NPM and Task Running (Gulp)
- Dependency Management (Bower)
- MVC and Angular in HTML
- Angular Forms
- Angular Services
- Angular Directives
- Angular Routes
- Node and APIs
- Node Express

References:

1. Angular JS by Green and Brad, O'Reilly
2. Professional AngularJS by Valeri Karpov, Diego Netto (WROX)
3. JavaScript: The Good Parts by Douglas Crockford, O'Reilly Media
4. JavaScript: The Definitive Guide by David Flanagan, O'Reilly Media

Course Name : IMAGE PROCESSING LABORATORY					
Course Code: INFO4112					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**2**

After successfully completing this course the students will be able to:

1) Apply different MATLAB library functions such as imread, imresize, size, imshow, fft and imhist to process an image.
2) Develop different image processing algorithms like filtering, noise removal and segmentation in MATLAB language.
3) Evaluate the performance of the spatial mask based on their size (3x3, 5x5, 7x7)

Detailed Syllabus:

1. Introduction – MATLAB image processing toolbox
2. Transformation – negative, log, power-law
3. contrast stretching - linear and non-linear
4. Histogram of an image and Histogram Equalization
5. Spatial Filters – Box, mean, max and median etc.
6. Fourier Transformation of an image
7. Implement high-pass, low-pass and band-pass filters
8. Remove the noise from the input images
9. Point Detection, Line Detection and Edge Detection
10. Thresholding – Local, Global, Optimum, Multiple and Variable,
11. Implement region growing, splitting and merging algorithms.
12. Project on image processing

4th Year 2nd Semester:

Course Name: ORGANIZATIONAL BEHAVIOR					
Course Code: HMTS4201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**0**	**2**	**2**

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module-I: [5L]
Introduction to Organizational Behaviour-Concept, Importance, Challenges and Opportunities (1L)
Personality-Meaning of Personality, Personality Determinants and Traits, Psychoanalytic Theory, Argyris Immaturity to Maturity Continuum Impact on organization.(2L)
Attitude-Concept, Components, Cognitive Dissonance Theory, Attitude Surveys. (2L)

Module-II: [6L]
Perception- Concept, Nature and Importance, Process of Perception, Factors influencing perception, Perceptual Selectivity, Shortcuts to Judge Others: Halo Effect, Stereotyping, Projection and Contrast Effects, Impact on Organization. (2 L)
Motivation-Definition, Theories of Motivation-Maslow's Hierarchy of Needs Theory,McGregor's TheoryX&Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.(4L)

Module-III: [8L]
Leadership-Concept, Leadership Styles, Theories-Behavioural Theory: Ohio Studies, Michigan Studies, Blake & Mouton Managerial Grid; Contingency Theory: Fielder Theory. (4L)
Group Behaviour: Definition, Characteristics of Group, Types of Groups: Formal & Informal; Stages of Group Development, Group Decision making, Group Decision MakingVs Individual Decision Making. (4L)

Module-IV: [5L]
Organizational Design-Various organizational structures and their pros and cons.
Concepts of organizational climate and culture, Organizational Politics-Concept, Factors influencing degree of Politics (2L)
Conflict management- Concept,Sources of conflict, Stages of conflictprocess, Conflict resolution techniques,Tools-Johari Window to analyse and reduce interpersonal conflict, Impact on organization. (3L)

Evaluation:
Max. Marks-100
Internal Test-30
Semester End Test-70

Suggested Readings:

1. Organization Behaviour by Stephen Robbins
2. Organization Behaviour by Luthans
3. Organization Behaviour by L.M. Prasad
4. Organization Behaviour: Text, Cases &Games by AswathappaK.

Course Name: PARALLEL COMPUTING					
Course Code: INFO4241					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module-I: [8L]
Foundations Of Parallel Programming: Introduction.-Parallel Processing Environment- Pipelining and Data Parallelism, Scalability, Flynn's Taxonomy
Parallel Algorithms: Structure, cost, Analysis ;Elementary Algorithms: Broadcast, Prefix sums, All sums, Algorithms on Selection problem, Merging-Odd-even merging network, CREW Merging, N-ary searching Matrix Transposition ,Matrix Multiplications- 2D Mesh SIMD ,Hypercube SIMD, Shuffle-Exchange SIMD models.

Module-II: [8L]
Analytical modeling of program performance: speedup, efficiency, scalability, cost optimality
Linear system of equations: Gaussian Elimination, Gauss-Seidel algorithm, Jacobi algorithm
Sorting: Enumeration sort, Odd-even transposition sort, Bitonic merge, Ellis's Algorithm

Module-III: [9L]
Message Passing Paradigm: Basic MPI programming – MPI_Init and MPI_Finalize - message passing – MPI_Send and MPI_Recv - message matching - remote memory access – dynamic process management – MPI for grids – performance evaluation of MPI programs
Shared Memory Paradigm: ***OPENMP***
Basic OpenMP constructs – scope of variabls – reduction clause – parallel for directive – loops in OpenMP – scheduling loops – synchronization in OpenMP – Case Study: Producer-Consumer problem – cache issues – threads safety in OpenMP – OpenMP best practices

Module-IV: [9L]
Shared Memory Paradigm: PTHREADS
Basics of Pthreads – thread synchronization – critical sections – busy-waiting – mutexes -
Semaphores – barriers and condition variables – read-write locks – Caches, cache coherence and false sharing – thread safety – Pthreads case study
Graphical Processing Paradigms: OPENCL
Introduction to OpenCL – OpenCL programming examples – Programs and Kernels – Buffers and Images – Event model – OpenCL case study

References:

1. Parallel Computing –Theory and Practice -Michael J. Quinn (McGraw Hill Inc.)
2. Design and Analysis of Parallel Algorithms- S.G. Akl (PH)

Course Name: NATURAL LANGUAGE PROCESSING					
Course Code: INFO4242					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

1. Learn the techniques in natural language processing.
2. Be familiar with the natural language generation.
3. Be exposed to machine translation.
4. Understand the information retrieval techniques.

Detailed Syllabus:

Module-I: [13L]
Overview and language modeling [6L]
Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval.
Word level and syntactic analysis [7L]
Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.
Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

Module-II: [11L]
Semantic analysis and discourse processing
Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation.
Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.

Module-III: [12L]
Natural language generation and machine translation
Natural Language Generation: Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG.
Machine Translation: Problems in Machine Translation- Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

Module-IV: [12L]
Information retrieval and lexical resources
Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – evaluation
Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

References:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.
3. James Allen, "Natural Language Understanding", 2nd edition, Benjamin /Cummings publishing company, 1995.

Course Name: CRYPTOGRAPHY & NETWORK SECURITY					
Course Code: INFO4243					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

1) Defining the concepts of Network security and identifying different types of attack on Network security. Recall the principles of security.
2) Classify different kinds of Substitution techniques and Transposition techniques and discuss the concepts of Symmetric key cryptography and Asymmetric key cryptography. Explaining in detail DES, RSA, IDEA and RC5 algorithm.
3) Prepare and practice numerical module based on DES and RSA. Illustrating the concept of SSL,PGP, PEM, Authentication token and Digital Signature. Explain Message Digest and Hash function in accordance with the prescribed syllabus.
4) Analyze Certificate based Authentication, Biometric Authentication and differentiate between different types of Authentication tokens.
5) Explain concepts of Firewall (including types of Firewall), DMZ Network and comparing between different Firewall Configurations.

Detailed Syllabus:

Module-I: [10L]

Network Security and Cryptography- Concepts and Techniques

Need for Security, Security approaches, Principles of Security, Types of attack on security. Introduction to cryptography, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Type of attacks on encrypted text, Symmetric & Asymmetric key Cryptography.

Module-II: [10L]

Symmetric Key Algorithms

Algorithm types & Modes, Overview of Symmetric Key Cryptography, Diffie-Hellman key exchange algorithm, Digital Envelope, DES(Data Encryption Standard) algorithm & its variant, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.

Module-III: [10L]

Asymmetric Key Algorithms, Digital Signature and User Authentication

Overview of Asymmetric key Cryptography, RSA algorithm, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required), HMAC algorithm. Authentication Basics, Password, Authentication Token, Certificate based Authentication and Biometric Authentication.

Module-IV: [10L]

Electronic mail security, SSL and Firewall

Basics of mail security, PEM, PGP, S/MIME, Secure Socket Layer (SSL) protocol. Introduction to Firewall, Types of firewall, Firewall Configurations and DMZ Network.

References:

1. “Cryptography and Network Security”, William Stallings, 2nd Edition, Pearson Education Asia
2. “Network Security private communication in a public world”, C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.
4. “Network Security Essentials: Applications and Standards” by William Stallings, Pearson.
5. “Designing Network Security”, Merike Kaeo, 2nd Edition, Pearson Books
6. “Building Internet Firewalls”, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly
7. “Practical Unix & Internet Security”, Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

Course Name: SOFT COMPUTING					
Course Code: INFO4244					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

After successfully completing this course the students will be able to:

1) Identify the Intractable problems like NP – complete, NP- hard problems and reproduce the optimal solution instead Optimum.
2) Determine the complexity of computation and reduce the complexity to interpret the real problems.
3) Assemble different techniques to sketch a hybrid system for better result.
4) Able to interpret the problem in terms time and space.
5) Justify the optimal solution and able to predict the running time of the program.

Detailed Syllabus:

Module-I: [9L]

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Genetic algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Multi-objective Genetic Algorithm (MOGA).

Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm

Module-II: [8L]

Fuzzy sets and Fuzzy logic systems:

Classical Sets and Fuzzy Sets and Fuzzy relations: Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations.

Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods.

Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods.

Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication

Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules

Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances

Module-III: [9L]

Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm,Linear separability, Hebb's learning rule/Delta rule, ADALINE, MADALINE

Introduction of MLP: Different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA, Hopfield/ Recurrent network, configuration, stability constraints

Module-IV: [9L]

Associative Memory and characteristics, limitations and applications. Hopfield v/s Boltzman machine.

Adaptive Resonance Theory: Architecture, classifications, Implementation and training.

Applications of Neural Networks: Pattern Recognition and classification

Other Soft Computing Approaches: Ant Colony Optimization (ACO) and Particle Swarm Optimization (PSO)

Hybrid Approaches: Nuro-Fuzzy modeling, ANN-GA Modeling

References:

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
4. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

Course Name: CONTROL SYSTEMS & APPLICATIONS					
Course Code: AEIE 4282					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1. Develop mathematical model of physical and simulated systems.
2. Investigate the time and frequency response of systems and calculate performance indices.
3. Analyze stability of linear systems using different available methods.
4. Understand the concept and utility of control action and its usage.

Detailed Syllabus:

Module-1: [10L]

Concepts of control systems: open loop and closed loop control systems, effect of feedback in control system; mathematical model of physical system - differential equation representation of physical systems, transfer function models, block diagram models, signal flow graphs, standard test signals, concept of system sensitivity.

Module-II: [6L]

Time response analysis:- transient response of first order and second order with standard test signals, steady state error coefficients, effect of pole –zero addition in system response; time domain performance criteria.

Module- III: [12L]

Stability analysis: concept of stability, Routh stability criterion, root locus technique - root locus construction rules, stability analysis from root locus plot.

Introduction to frequency domain analysis: Bode plot - minimum and non minimum phase system, concept of phase margin and gain margin, procedure for drawing bode plots, ***assessment of relative stability:*** *G*ain margin and phase margin .

Module –IV: [10L]

Models of control devices and systems: dc servomotors, ac servomotors, dc motor speed and position control, synchro.

Basic control actions: introduction to conventional controllers (P, PI, PD and PID) and application.

References:

1. Nagrath I. J. and Gopal M., Control System Engineering, 5th Ed., New Age International Private Ltd. Publishers.
2. Kuo B. C., Automatic Control Systems, 8th Ed., Wiley India
3. Ogata K., Modern Control Engineering, 4th Ed., Pearson Education.
4. Dorf R. C. and Bishop R. H., Modern Control Systems; Pearson Education.
5. Norman S. N., Control Systems Engineering, 4th Ed., Wiley India.
6. B.W. Bequette, Process Control Modeling, Design and Simulation, Prentice Hall of India, New Delhi.

Course Name: COMPUTATIONAL BIOLOGY					
Course Code: BIOT4281					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

Detailed Syllabus:

Module-I: [10L]
Introduction to Biomolecules
Introduction to biochemistry and molecular biology; Biomolecules: structure, function and metabolic pathways.

Module-II: [10L]
Scope of Computational Biology
Definition of computational biology; origin and development of computational biology; Nature and Types of biological data; Data Structures: Sequences (GENbank files), Secondary structures, Super-secondary structures (Motifs), Tertiary structures (Pubchem and PDB structure files); Interaction Networks, Photographic Data: Fingerprints (DNA and MS), Microarray data; Biological databases.

Module-III: [10L]
Preferred Algorithms, Programming languages and Operating systems
Principles of Pattern recognition: Use of Hidden Markov Model and Artificial Neural Networks in computational biology; Significance of Python and C/C++; Operating system: Bio-Linux (Selected Bioinformatics packages)

Module-IV: [10L]
Applications of Computational biology
Molecular Modeling and Dynamics: introduction to Open MM library; GROMACS as an example of GUI in the public domain; computer based drug design (public domain and proprietary); Mathematical modeling of cell growth kinetics; Embedded systems for computational biology: High throughput data collection, processing and analysis; LC-MS, DNA microarrays and other applications (e.g. mobile microscopy and high throughput micro-PCR); Systems biology and Metabolic Engineering.

References:

1. Introduction to Bioinformatics, by Arthur M. Lesk (International Fourth Edition) (2014)..Oxford University Press.
2. Essential Bioinformatics, by Jin Xiong, Cambridge University Press (2006).
3. Biochemistry: Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, 7th edition, Academic Press.
4. Introduction to Bioinformatics: T K Attwood, D J Parry-Smith and S. Phukan (2008) Pearson.
5. Fundamentals of Database Systems, 5th Edition, R. Elmasri and S.B. Navathe (2009)
6. Bioinformatics-A Machine Learning Approach- By Baldi and Brunak, 2nd Edition (2006), John Wiley Inc.
7. Dynamics of Proteins and Nucleic Acids: J. Andrew McCammon and Stephen C. Harvey, Cambridge University Press (1998).
8. Molecular Modelling: Principles and Applications-2nd Edition, Andrew R. Leach-Pearson (2016)
9. Molecular Modelling and Drug Design-K.Anand Solomon-1st edition (2011)-MJP Publishers.

Course Name: CELLULAR & SATELLITE COMMUNICATION					
Course Code: ECEN4281					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

Detailed Syllabus:

Available in B. Tech. in ECE Syllabus

Detailed Syllabus

of

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4th Year 1st Semester:

Course Name : CYBER CRIME & CYBER SECURITY					
Course Code: INFO4181					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1) Defining the concept of Cybercrime, Forgery, Hacking, Software Piracy and Network Intrusion.
2) Discuss the concept of Cyber Stalking and different methods of Active attack and Passive attack with examples.
3) Analyze the security challenges posted by mobile devices, specify the attacks on mobile/Cell phones and differentiate between different viruses on laptop. Outline the concepts of Trojan Horses, Backdoors; DOS & DDOS attacks; SQL injection and Buffer Overflow.
4) Compare different methods of Phishing and ID Theft. Explain Homograph attack, Spear Phishing, Whaling and Geotagging.

Detailed Syllabus:

Module - I: [7L]

Introduction of Cybercrime: Cybercrime- Definition & Concepts, Cybercriminals, Classification of Cybercrimes.

Category of Cybercrime: How criminals plan attacks? Passive attack, Active attacks, Cyberstalking.

Module - II: [8L]

Cybercrime Mobile & Wireless devices: Techniques of Credit card Fraud, Security challenges posted by mobile devices, Cryptographic security for mobile devices, Attacks on mobile/cell phones, Keyloggers & Spywares, Virus & Worms.

Module - III: [10L]

Tools and Methods used in Cyber crime: Stages of Network attack, Proxy servers & Anonymizers, Strong, Weak & Random password, Trojan Horse and Backdoors; DOS & DDOS attacks, Blended Threat and PDoS attack.

Module - IV: [10L]

Phishing & Identity Theft: Phishing methods, Phishing Techniques, Homograph attack, Spear Phishing & Whaling, Phishing Scams ID Theft: Types & Techniques, Geotagging.

References:

1. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.

Course Name : CLOUD COMPUTING					
Course Code: INFO4182					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:
learn cloud computing models, techniques, and architectures. Cloud computing has evolved as a very important computing model, which enables information, software, and other shared resources to be provisioned over the network as services in an on-demand manner. Students will be exposed to the current practices in cloud computing. Topics may include distributed computing models and technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), virtualization, security and privacy issues, performance and systems issues, capacity planning, disaster recovery, challenges in implementing clouds, data centers, cloud hosted applications, and other advanced and research topics in cloud computing.

Detailed Syllabus:

Module-I: [7L]
Overview of Computing Paradigm: Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing
Introduction to Cloud Computing: Cloud Computing, Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages
Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing

Module-II: [11L]
Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services
Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS)
Deployment Models: Public cloud, Private cloud. Hybrid cloud, Community cloud
Infrastructure as a Service(IaaS): Introduction to IaaS, IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM)
Resource Virtualization: Server, Storage, Network, Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing (storage as a service), Examples: Amazon EC2, Renting, EC2 Compute Unit, Platform and Storage, pricing, customers

Module-III: [11L]
Platform as a Service(PaaS): Introduction to PaaS, What is PaaS, Service Oriented Architecture (SOA)
Cloud Platform and Management: Computation, Storage, Examples: Google App Engine, Microsoft Azure
Software as a Service(SaaS): Introduction to SaaS, Web services. Web 2.0, Web OS

Module-IV: [12L]
Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing
Cloud Security: Infrastructure Security, Network level security, Host level security, Application level security: Data security and Storage, Data privacy and security Issues: Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

References:

1. *Cloud Computing Bible,* Barrie Sosinsky, *Wiley-India,* 2010
2. *Cloud Computing: Principles and Paradigms,* Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Wile,* 2011
3. *Cloud Computing: Principles, Systems and Applications, Editors:* Nikos Antonopoulos, Lee Gillam, *Springer,* 2012
4. *Cloud Security: A Comprehensive Guide to Secure Cloud Computing,* Ronald L. Krutz, Russell Dean Vines, *Wiley-India,* 2010

4th Year 2nd Semester:

Course Name: FUNDAMENTALS OF CRYPTOGRAPHY					
Course Code: INFO4281					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	3

After successfully completing this course the students will be able to:

1) Defining the concepts of Network security and identifying different types of attack on Network security. Recall the principles of security.
2) Classify different kinds of Substitution techniques and Transposition techniques and discuss the concepts of Symmetric key cryptography and Asymmetric key cryptography. Explaining in detail DES, RSA and IDEA algorithm.
3) Prepare and practice numerical module based on DES and RSA. Illustrating the concept of SSL, PEM, Authentication token and Digital Signature. Explain Message Digest and Hash function in accordance with the prescribed syllabus.
4) Analyze Certificate based Authentication, Biometric Authentication and differentiate between different types of Authentication tokens.
5) Explain concepts of Firewall (including types of Firewall), DMZ Network and comparing between different Firewall Configurations.

Detailed Syllabus:

Module-I: [7L]
Cryptography- Concepts and Techniques: Introduction to cryptography, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Type of attacks on encrypted text, Symmetric & Asymmetric key Cryptography and Digital envelope.

Module-II: [8L]
Symmetric Key Algorithms: Algorithm types & Modes, Overview of Symmetric Key Cryptography, Diffie-Hellman key exchange algorithm, DES (Data Encryption Standard) algorithm & its variant, IDEA(International Data Encryption Algorithm) algorithm.

Module-III: [10L]
Asymmetric Key Algorithms, Digital Signature and User Authentication: Overview of Asymmetric key Cryptography, RSA algorithm, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required), HMAC algorithm. Authentication Token, Certificate based Authentication and Biometric Authentication.

Module-IV: [8L]
Electronic mail security, SSL and Firewall: PEM, Secure Socket Layer (SSL) protocol. Introduction to Firewall, Types of firewall, Firewall Configurations and DMZ Network.

References :

1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson Education Asia
2. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.
4. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson
5. "Designing Network Security", Merike Kaeo, 2nd Edition, Pearson Books
6. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly
7. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

Course Name: SOFT COMPUTING APPLICATIONS					
Course Code: INFO4282					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

After successfully completing this course the students will be able to:

1) Identify the Intractable problems like NP – complete, NP- hard problems and reproduce the optimal solution instead Optimum.
2) Determine the complexity of computation and reduce the complexity to interpret the real problems.
3) Assemble different techniques to sketch a hybrid system for better result.
4) Able to interpret the problem in terms time and space.
5) Justify the optimal solution and able to predict the running time of the program.

Detailed Syllabus:

Module-I: [8L]

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Genetic algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross-over & mutation operator, Schema Theorem, Multi-objective Genetic Algorithm (MOGA).

Applications of Genetic Algorithm: genetic algorithms in search and optimization

Module-II: [8L]

Fuzzy sets and Fuzzy logic systems: Classical Sets, Fuzzy Sets and Fuzzy relations: Properties and operations on Classical sets, Fuzzy set and fuzzy relations.

Membership functions: Features of membership functions, standard forms and boundaries, different fuzzification methods.

Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, De-fuzzification methods.

Module-III: [9L]

Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication

Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances

Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Hebb's learning rule/Delta rule, ADALINE, MADALINE

Module-IV: [9L]

Introduction of MLP: Different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA, Hopfield/ Recurrent network, configuration, stability constraints, XOR network.

Adaptive Resonance Theory: Architecture, classifications, Implementation and training.

Applications of Neural Networks: Pattern Recognition and classification

References:

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
4. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.