Computer Science and Engineering

B. Tech Course

July, 2018

(Last updated: June 2019)

PART I: COURSE STRUCTURE

FIRST YEAR

FIRST SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CHEM1001	Chemistry I	3	1	0	4	4
2	MATH1101	Mathematics I	3	1	0	4	4
3	ELEC1001	Basic Electrical Engineering	3	1	0	4	4
Total Theory			**9**	**3**	**0**	**12**	**12**
B. Laboratory							
1	CHEM1051	Chemistry I Lab	0	0	3	3	1.5
2	ELEC1051	Basic Electrical Engineering Lab	0	0	2	2	1
3	MECH1052	Engineering Graphics & Design Lab	1	0	4	5	3
Total Practical			**1**	**0**	**9**	**10**	**5.5**
Total of Semester without Honours			**10**	**3**	**9**	**22**	**17.5**
C. Honours							
1	HMTS1011	Communication for Professionals	3	0	0	3	3
2.	HMTS1061	Professional Communication Lab	0	0	2	2	1
Total Honours			**3**	**0**	**2**	**5**	**4**
Total of Semester with Honours			**13**	**3**	**11**	**27**	**21.5**

SECOND SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	PHYS1001	Physics I	3	1	0	4	4
2.	MATH1201	Mathematics II	3	1	0	4	4
3.	CSEN1001	Programming for Problem Solving	3	0	0	3	3
4.	HMTS1201	Business English	2	0	0	2	2
Total Theory			**11**	**2**	**0**	**13**	**13**
B. Laboratory							
1.	PHYS1051	Physics I Lab	0	0	3	3	1.5
2.	CSEN1051	Programming for Problem Solving lab	0	0	4	4	2
3.	MECH1051	Workshop / Manufacturing Practice	1	0	4	5	3
4.	HMTS1251	Language Lab	0	0	2	2	1
Total Practical			**1**	**0**	**13**	**14**	**7.5**
Total of Semester without Honours			**12**	**2**	**13**	**27**	**20.5**
C. Honours							
1	ECEN1011	Basic Electronics	3	0	0	3	3
2.	ECEN1061	Basic Electronics Lab	0	0	2	2	1
Total Honours			**3**	**0**	**2**	**5**	**4**
Total of Semester with Honours			**15**	**2**	**15**	**32**	**24.5**

SECOND YEAR
THIRD SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	CSEN2101	Data structure & Algorithms	4	0	0	4	4
2.	CSEN2102	Discrete Mathematics	4	0	0	4	4
3.	ECEN2101	Analog Circuits	3	0	0	3	3
4.	ECEN2104	Digital Logic	3	0	0	3	3
5.	HMTS2001	Human Values and Professional Ethics	3	0	0	3	3
Total Theory			**17**	**0**	**0**	**17**	**17**
B. Laboratory							
1.	CSEN2151	Data structure & Algorithms lab	0	0	3	3	1.5
2.	CSEN2152	Software Tools Lab	0	0	3	3	1.5
3.	ECEN2154	Digital Logic Lab	0	0	2	2	1
Total Practical			**0**	**0**	**8**	**8**	**4**
Total of Semester without Honours			**17**	**0**	**8**	**25**	**21**
C. Honours							
1	MATH2111	Probability and Statistical Methods	4	0	0	4	4
Total Honours			**4**	**0**	**0**	**4**	**4**
Total of Semester with Honours			**21**	**0**	**8**	**29**	**25**

FOURTH SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	CSEN2201	Design & Analysis of Algorithms	4	0	0	4	4
2.	CSEN2202	Computer Organization and Architecture	4	0	0	4	4
3.	CSEN2203	Operating Systems	3	0	0	3	3
4.	MATH2201	Mathematics-III Algebraic Structures	4	0	0	4	4
5.	AEIE2205	Microprocessors and Microcontroller	2	0	2	2	2
6.	EVSC2016	Environmental Sciences (MANDATORY)	2	-	-	2	-
Total Theory			**19**	**0**	**0**	**19**	**17**
B. Laboratory							
1.	CSEN2251	Design & Analysis of Algorithms lab	0	0	3	3	1.5
2.	CSEN2252	Computer Architecture lab	0	0	2	2	1
3.	CSEN2253	Operating Systems lab	0	0	3	3	1.5
4.	AEIE2255	Microprocessors & Microcontroller Lab	0	0	2	2	1
Total Practical			**0**	**0**	**10**	**10**	**5**
Total of Semester			**19**	**0**	**10**	**29**	**22**

THIRD YEAR

FIFTH SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	CSEN3101	Database Management Systems	4	0	0	4	4
2.	CSEN3102	Formal Language & Automata Theory	4	0	0	4	4
3.	CSEN3103	Object Oriented Programming	4	0	0	4	4
4.	ECEN3106	Electronic Design Automation	2	0	0	2	2
5.	CSEN3131-CSEN3140	Professional Elective - I	3	0	0	3	3
	CSEN3131 CSEN3132 CSEN3133 CSEN3134 CSEN3135	Computer Graphics & Multimedia Artificial Intelligence Web Technologies Graph Algorithms Big Data					
Total Theory			**17**	**0**	**0**	**17**	**17**
B. Laboratory							
1.	CSEN3151	Database Management Systems lab	0	0	3	3	1.5
2.	CSEN3153	Object Oriented Programming lab	0	0	3	3	1.5
3.	ECEN3156	Electronic Design Automation lab	0	0	2	2	1
Total Practical			**0**	**0**	**8**	**8**	**4**
Total of Semester without Honours			**17**	**0**	**8**	**25**	**21**
C. Honours							
1	MATH3111	Operations Research and Optimization techniques	4	0	0	4	4
Total Honours			**4**	**0**	**0**	**4**	**4**
Total of Semester with Honours			**21**	**0**	**8**	**29**	**25**

THIRD YEAR

SIXTH SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	CSEN3201	Complier Design	4	0	0	4	4
2.	CSEN3202	Computer Networks	4	0	0	4	4
3.	HMTS3201	Economics for Engineers	3	0	0	3	3
4.	CSEN3231- CSEN3240	Professional Elective-II	3	0	0	3	3
	CSEN3231 CSEN3232 CSEN3233 CSEN3234 CSEN3235	Advanced Operating System Advanced Java Programming Data Mining & Knowledge Discovery Computational Geometry Cloud Computing					
5.		Open Elective-I	3	0	0	3	3
	AEIE3221 ECEN3221 ECEN3222 MATH3221 MATH3223	Introduction to Sensors Analog and Digital Communication Designing with Processors and Controllers Computational Mathematics Scientific Computing					
6.	INCO3016	Constitution of India/ Essence of Indian Traditional Knowledge	2	-	-	2	-
Total Theory			**19**	**0**	**0**	**19**	**17**
B. Laboratory							
1.	CSEN3251	Complier Design lab	0	0	3	3	1.5
2.	CSEN3252	Computer Networks lab	0	0	3	3	1.5
Total Practical			**0**	**0**	**6**	**6**	**3**
C. Sessional							
1	CSEN3293	Term Paper and Seminar	0	0	4	4	2
Total Seminar			**0**	**0**	**4**	**4**	**2**
Total of Semester			**19**	**0**	**10**	**29**	**22**

FOURTH YEAR

SEVENTH SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	HMTS4101	Principles of Management	3	0	0	3	3
2.	CSEN4131-CSEN4140	Professional Elective-III	3	0	0	3	3
	CSEN4131 CSEN4132 CSEN4133 CSEN4134 CSEN4135	Soft Computing Cryptography & Network Security Image Processing Approximation Algorithms Information Retrieval					
3.		Open Elective-II	3	0	0	3	3
	AEIE4121 AEIE4122 CHEN4121 CHEN4122 ECEN4121 ECEN4122 PHYS4121	Instrumentation and Telemetry Linear Control Systems and Applications Industrial Total Quality Management Industrial Pollution Control Software Defined Radio Error Control Coding Quantum Physics					
4.		Open Elective-III	3	0	0	3	3
	AEIE4127 MATH4122 BIOT4123 CHEN4123 ECEN4126 ECEN4127	Introduction to Embedded System Advanced Linear Algebra Biosensor Statistical Methods in Design of Experiments Ad Hoc Networks and Security Challenges Introduction to VLSI Design					
Total Theory			**12**	**0**	**0**	**12**	**12**
B. Sessional							
1	CSEN4191	Industrial Training / Internship	-	-	-	-	2
2.	CSEN4195	Project-I	0	0	8	8	4
Total Sessional			**0**	**0**	**8**	**8**	**6**
Total of Semester without Honours			**12**	**0**	**8**	**20**	**18**
C. Honours							
1	CSEN4111	Machine Learning	4	0	0	4	4
Total Honours			**4**	**0**	**0**	**4**	**4**
Total of Semester with Honours			**16**	**0**	**8**	**24**	**22**

FOURTH YEAR

EIGHTH SEMESTER

A. Theory							
Sl.	**Code**	**Subject**	**Contacts Periods/ Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	CSEN4231-CSEN4240	Professional Elective-IV	3	0	0	3	3
	CSEN4231 CSEN4232 CSEN4233 CSEN4234 CSEN4235 CSEN4236	Distributed Algorithms Mobile Computing Pattern Recognition Computational Complexity Social Network Analysis Computer Vision					
2.	CSEN4241-CSEN4250	Professional Elective-V	3	0	0	3	3
	CSEN4241 CSEN4242 CSEN4243 CSEN4244 CSEN4245 CSEN4246	Distributed Databases Natural Language Processing Parallel Algorithms Real Time & Embedded System Quantum Computing Robotics					
3.		Open Elective-IV	3	0	0	3	3
	AEIE4221 AEIE4222 BIOT4221 BIOT4222 CHEN4221 CHEN4222 ECEN4222	Process Instrumentation Medical Instrumentation Computational Biology Non-conventional Energy Nanotechnology Introduction to Solar and Wind Technology Optical Fiber Communication					
Total Theory			**9**	**0**	**0**	**9**	**9**
B. Sessional							
1	CSEN4295	Project-II	0	0	16	16	8
2.	CSEN4297	Comprehensive Viva-voce	-	-	-	-	1
Total Sessional			**0**	**0**	**16**	**16**	**9**
Total of Semester			**9**	**0**	**16**	**25**	**18**

Open Electives to be offered by Computer Science and Engineering department for Non-departmental students:

Offered in Semester	Name of Subject	Subject Code
Open Elective I (Semester 6)	Fundamentals of RDBMS	CSEN3221
Open Elective II (Semester 7)	Fundamentals of Operating Systems	CSEN 4121
Open Elective III (Semester 7)	Intelligent Web and Big Data	CSEN4126
Open Elective IV (Semester 8)	Basics of Mobile Computing	CSEN4221

Honours Course for B. Tech Computer Science & Engineering Students:

Sl. No.	**Semester**	**Paper Code**	**Course Title**	**Contact Hours / Week**			**Credit Points**
				L	**T**	**P**	
	1st	HMTS1011	Communication for Professionals	3	0	0	3
		HMTS1061	Professional Communication Lab	0	0	2	1
	2nd	ECEN1011	Basic Electronics	3	0	0	3
		ECEN1061	Basic Electronics lab	0	0	2	1
	3rd	MATH2111	Probability and Statistical Methods	4	0	0	4
	5th	MATH3111	Operations Research and Optimization techniques	4	0	0	4
	7th	CSEN4111	Machine Learning	4	0	0	4
	Total						**20**

Credit Summary for B Tech Programme with effect from 2018-2019

Sl. No.	Course Type	Credit
1.	Humanities and Social Sciences including Management Courses	12
2.	Basic Science Courses	23
3.	Engineering Science Courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer, etc.	29
4.	Professional Core Courses	52
5.	Professional Elective Courses relevant to chosen Specialization / Branch	15
6.	Open Subjects – Electives from other Technical and/or Emerging Subjects	12
7.	Project Work, Seminar and Internship in industry or elsewhere	17
8.	Mandatory Courses (Non-credit) [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]	0
	Total	**160**
9	Honours Courses	20
	Grand Total	**180**

Definition of Credit (as per AICTE):

- 1 Hour Lecture (L) per Week = 1 Credit
- 1 Hour Tutorial (T) per Week = 1 Credit
- 1 Hour Practical (P) per Week = 0.5 Credits
- 2 Hours Practical (Lab) per Week = 1 Credit

Range of Credits (as per AICTE):

- ✓ A total of 160 credits will be necessary for a student to be eligible to get B Tech degree.
- ✓ A student will be eligible to get B Tech degree with Honours if he/she completes an additional 20 credits. These could be acquired through various Honours Courses offered by the respective departments.
- ✓ A part or all of the above additional credits may also be acquired through MOOCs. Any student completing any course through MOOC will have to submit an appropriate certificate to earn the corresponding credit.
- ✓ For any additional information, the student may contact the concerned HODs.

PART II: DETAILED SYLLABUS

Syllabus of 1st semester:

Course Name : Chemistry-I					
Course Code: CHEM1001					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course outcomes:

The subject code CHEM1001 corresponds to chemistry theory classes for the first year B. Tech students, which is offered as Engineering Chemistry and is common for all branches of engineering subjects. The course provides basic knowledge of theory based subjects like quantum mechanics, thermodynamics, reaction dynamics, electrochemistry, structure and reactivity of molecules. The course outcomes of the subject are

1. Knowledge of understanding the operating principles and reaction involved in batteries and fuel cells and their application in automobiles as well as other sectors to reduce environmental pollution.
2. An ability to analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.for engineering applications.
3. Have knowledge of synthesizing nano materials and their applications in industry, carbon nano tube technology is used in every industry now-a-days.
4. Understanding of bulk properties and processes using thermodynamic considerations.
5. Elementary knowledge of IR, UV, NMR and X-ray spectroscopy is usable in structure elucidation and characterisation of various molecules.
6. Knowledge of electronic effect and stereochemistry for understanding mechanism of the major chemical reactions involved in synthesis of various drug molecules.

MODULE 1

Atomic structure and Wave Mechanics:

Brief outline of the atomic structure, Duel character of electron, De Broglies's equation, the Heisenberg uncertainty principle, brief introduction of quantum mechanics, the Schrodinger wave equation, Hermitian operator, solution of the Schrodinger equation for particle in a one dimensional box, interpretation of the wave function Ψ, concept of atomic orbital. 3L

Thermodynamics:

Carnot cycle, 2nd law of thermodynamics, entropy, Clausius inequality, free energy and work function, Clausius Clapeyron Equation, Chemical Potential, Activity and Activity coefficient. Gibbs Duhem Relation. 4L

Spectroscopic Techniques & Application

Electromagnetic spectrum: EMR interaction with matter - absorption and emission of radiation.
Principle and application of UV- visible and IR spectroscopy
Principles of NMR Spectroscopy and X-ray diffraction technique 3L

MODULE 2

Chemical Bonding

Covalent bond, VSEPR Theory, hybridization, molecular geometries, Dipole moment, Intermolecular forces, V.B. and M.O. Theory and its application in Homo and Heteronuclear diatomic molecules, Band theory of solids, Pi-molecular orbitals of ethylene and butadiene. 5L

Periodicity

Effective nuclear charge, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro-negativity, inert pair effect. 3L

Ionic Equilibria

Acid Base Equilibria, Salt Hydrolysis and Henderson Equation, Buffer solutions, pH indicator, Common ion Effect, Solubility product, Fractional Precipitation . 2L

MODULE 3

Conductance

Conductance of electrolytic solutions, Strong and Weak electrolytes, effect of temperature and concentration. Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Application of conductance Acid-base and precipitation titration. **3L**

Electrochemical Cell

Thermodynamic derivation of Nernst equation, Electrode potential and its application to predict redox reaction; Standard Hydrogen Electrode, Reference electrode, cell configuration, half cell reactions, evaluation of thermodynamic functions; Reversible and Irreversible cells; Electrochemical corrosion.
Electrochemical Energy Conversion: Primary & Secondary batteries, Fuel Cells. **4L**

Reaction dynamics

Rate Laws, Order & Molecularity; zero, first and second order kinetics. Pseudo-unimolecular reaction, Arrhenius equation.
Mechanism and theories of reaction rates (Transition state theory, Collison theory).
Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). **3L**

MODULE 4

Stereochemistry

Representations of 3- dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. **4L**

Structure and reactivity of Organic molecule

Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion, free radicals, aromaticity. **3L**

Organic reactions and synthesis of drug molecule (4 lectures)

Introduction to reaction mechanisms involving substitution, addition, elimination and oxidation- reduction reactions.
Synthesis of commonly used drug molecules. **3L**

TEXT BOOKS

1. Atkins' Physical Chemistry, P.W. Atkins (10th Edition)
2. Organic Chemistry, I. L. Finar, Vol-1 (6th Edition)
3. Engineering Chemistry, Jain & Jain,(16th Edition)
4. Fundamental Concepts of Inorganic Chemistry, A. K. Das, (2nd Edition)
5. Engineering Chemistry -I, Gourkrishna Dasmohapatra, (3rd Edition)

REFERENCE BOOKS

1. General & Inorganic Chemistry, R. P. Sarkar
2. Physical Chemistry, P. C. Rakshit, (7th Edition)
3. Organic Chemistry, Morrison & Boyd , (7th Edition)
4. Fundamentals of Molecular Spectroscopy, C.N. Banwell, (4th Edition)
5. Physical Chemistry, G. W. Castellan, (3rd Edition)
6. Basic Stereo chemistry of Organic Molecules, Subrata Sen Gupta, (1st Edition)

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

Course Outcomes:

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

1. Apply the concept of rank of matrices to find the solution of a system of linear simultaneous equations.
2. Develop the concept of eigen values and eigen vectors.
3. Combine the concepts of gradient, curl, divergence, directional derivatives, line integrals, surface integrals and volume integrals.
4. Analyze the nature of sequence and infinite series
5. Choose proper method for finding solution of a specific differential equation.
6. Describe the concept of differentiation and integration for functions of several variables with their applications in vector calculus.

Module I: [10L]

Matrix: Inverse and rank of a matrix; Elementary row and column operations over a matrix; System of linear equations and its consistency; Symmetric, skew symmetric and orthogonal matrices; Determinants; Eigen values and eigen vectors; Diagonalization of matrices; Cayley Hamilton theorem; Orthogonal transformation.

Module II: [10L]

Vector Calculus: 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.

Infinite Series: Convergence of sequence and series; Tests for conver gence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test(statements and related problems on these tests), Raabe's test; Alternating series; Leibnitz's Test (statement, definition); Absolute convergence and Conditional convergence.

Module III: [10L]

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher orders: General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods, Method of variation of parameters, Cauchy-Euler equations.

Module IV: [10L]

Calculus of functions of several variables: 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.

Multiple Integration: Concept of line integrals, Double and triple integrals. Green's Theorem, Stoke's Theorem and Gauss Divergence Theorem.

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2000.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. K. F. Riley, M. P. Hobson, S. J. Bence. Mathematical Methods for Physics and Engineering, Cambridge University Press, 23-Mar-2006.
6. S. L. Ross, Differential Equations", Wiley India, 1984.
7. G.F. Simmons and S.G. Krantz, Differential Equations, McGraw Hill, 2007.
8. Vector Analysis (Schaum's outline series): M. R. Spiegel, Seymour Lipschutz, Dennis Spellman (McGraw Hill Education)
9. Engineering Mathematics: S. S. Sastry (PHI)
10. Advanced Engineering Mathematics: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition.
11. Linear Algebra (Schaum's outline series): Seymour Lipschutz, Marc Lipson (McGraw Hill Education)

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

Course Outcomes:

After attending the course, the students will be able to

1. Analyse DC electrical circuits using KCL, KVL and network theorems like Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.
2. Analyse DC Machines; Starters and speed control of DC motors.
3. Analyse magnetic circuits.
4. Analyse single and three phase AC circuits.
5. Analyse the operation of single phase transformers.
6. Analyse the operation of three phase induction motors.

Module-I:

DC Network Theorem: Kirchhoff's laws, Nodal analysis, Mesh analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star-Delta conversion. [6L]

Electromagnetism: Review of magnetic flux, Force on current carrying conductors, Magnetic circuit analysis, Self and Mutual inductance, B-H loop, Hysteresis and Eddy current loss, Lifting power of magnet. [5L]

Module-II

AC single phase system: Generation of alternating emf, Average value, RMS value, Form factor, Peak factor, representation of an alternating quantity by a phasor, phasor diagram, AC series, parallel and series-parallel circuits, Active power, Reactive power, Apparent power, power factor, Resonance in RLC series and parallel circuit. [10L]

Module-III

Three phase system: Generation of three-phase AC power, Balanced three phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams, power measurement by two wattmeter method. [4L]

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. [7L]

Module-IV

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, Introduction to three phase transformer. [6L]

Three-phase induction motor: Concept of rotating magnetic field, Principle of operation, Construction, Equivalent circuit and phasor diagram, torque-speed/slip characteristics. [4L]

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: Chemistry –I Lab					
Course Code: CHEM1011					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**3**	**3**	**1.5**

Course outcomes:

The subject code CHEM1051 corresponds to chemistry laboratory classes for the first year B. Tech students. This course enhances the students' experience regarding handling of various chemicals along with various laboratory equipments. Hands on experiments increase the depth of knowledge that is taught in the theory classes as well as it increases research aptitude in students because they can see the direct application of theoretical knowledge in practical field. The course outcomes of the subject are

1. Knowledge to estimate the hardness of water which is required to determine the usability of water used in industries.
2. Estimation of ions like Fe2+, Cu2+ and Cl- present in water sample to know the composition of industrial water.
3. Study of reaction dynamics to control the speed and yield of various manufactured goods produced in polymer, metallurgical and pharmaceutical industries.
4. Handling physico-chemical instruments like viscometer, stalagmometer, pH-meter, potentiometer and conductometer.
5. Understanding the miscibility of solutes in various solvents required in paint, emulsion, biochemical and material industries.
6. Knowledge of sampling water can be employed for water treatment to prepare pollution free water.

List of Experiments:

1. Estimation of iron using KMnO4 self indicator.
2. Iodometric estimation of Cu2+.
3. Determination of Viscosity.
4. Determination of surface tension.
5. Adsorption of acetic acid by charcoal.
6. Potentiometric determination of redox potentials.
7. Determination of total hardness and amount of calcium and magnesium separately in a given water sample.
8. Determination of the rate constant for acid catalyzed hydrolysis of ethyl acetate.
9. Heterogeneous equilibrium (determination of partition coefficient of acetic acid in n-butanol and water mixture).
10. Conductometric titration for the determination of strength of a given HCl solution against a standard NaOH solution.
11. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
12. Determination of chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

Reference Books:

1. Vogel's Textbook of Quantitative Chemical Analysis-G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney.
2. Advanced Practical Chemistry- S. C. Das
3. Practicals in Physical Chemistry- P. S. Sindhu

Course Name: BASIC ELECTRICAL ENGINEERING LABORATORY					
Course Code: ELEC1051					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**2**	**2**	**1**

Course Outcomes:

The students are expected to

1. Get an exposure to common electrical apparatus and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the application of common electrical measuring instruments.
4. Understand the basic characteristics of different electrical machines.

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 Graphics & Design					
Course Code: MECH 1052					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	1	**0**	**4**	**5**	**3**

Course Outcomes:

After going through the course, the students will be able

1. To understand the meaning of engineering drawing.
2. To have acquaintance with the various standards (like lines, dimensions, scale etc.) and symbols followed in engineering drawing.
3. To represent a 3-D object into 2-D drawing with the help of orthographic and isometric projections.
4. To read and understand projection drawings.
5. To draw the section view and true shape of a surface when a regular object is cut by a section plane.
6. To use engineering drawing software (CAD).

Lecture Plan (13 L)

1. Importance and principles of engineering drawing (1 L)
2. Concepts of Conic sections and Scale (1 L)
3. Introduction to concept of projection (Projections of points, lines and surfaces) (4 L)
4. Definitions of different solids and their projections (1 L)
5. Section of solids and sectional view (1 L)
6. Isometric projection (2 L)
7. Introduction to CAD (2 L)
8. Viva Voce (1 L)

Detailed contents of Lab hours (52 hrs)

Module 1: Introduction to Engineering Drawing covering,
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lines, lettering & dimensioning, Conic section like Ellipse (General method only); Involute; Scales – Plain, Diagonal.
(4 hrs + 4 hrs)

Module 2: Orthographic Projections covering,
Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina. (4 hrs+4 hrs + 4 hrs)

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views. (4 hrs + 4 hrs)

Module 4: Sections and Sectional Views of Right Angular Solids covering,
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids. (4 hrs)

Module 5: Isometric Projections covering,
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. (4 hrs + 4 hrs)

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids. (4 hrs)

Module 7: Customization & CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; (2 hrs)
Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation. (2 hrs)

Module 8: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame. (4 hrs)

References:

1. Bhatt, N.D., Panchal V.M. & Ingle P.R., (2014) "Elementary Engineering Drawing" ; Charotan Publishing House
2. Narayana, k.L. and Kannaaiah P "Engineering Graphics"; TMH
3. Lakshminarayanan, V. and Vaish Wanar, R.s "Engineering Graphics" Jain Brothers.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.
5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, TMH Publications.

Course Name : COMMUNICATION for PROFESSIONALS					
Course Code: HMTS1011					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

Course Outcomes:

Students will be able to:

1. Write business letters and reports
2. Communicate in an official and formal environment.
3. Effectively use the various channels of communication at work place.
4. Use language as a tool to build bridges and develop interpersonal relations in multi-cultural environment.
5. Learn to articulate opinions and views with clarity.
6. Use various techniques of communicationfor multiple requirements of globalized workplaces.

Module- I (9hrs.)

Introduction to Linguistics

- Phonetics- Vowel and Consonant Sounds (Identification & Articulation)
- Word- stress, stress in connected speech
- Intonation (Falling and Rising Tone)
- Voice Modulation
- Accent Training
- Vocabulary Building
- The concept of Word Formation
- Root words from foreign languages and their use in English
- Acquaintance with prefixes and suffixes from foreign languages in Englishto formderivatives
- Synonyms, Antonyms and standard abbreviations

Module- II (10hrs.)

Communication Skills

- 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- III (10hrs.)

Professional Writing Skills

- Letter Writing : Importance, Types , Process, Form and Structure, Style and Tone
- Proposal Writing: Purpose,Types of Proposals, Structure of Formal Proposals.
- Report Writing: Importance and Purpose, Types of Reports, Report Formats, Structure of Formal Reports, Writing Strategies.

Module- IV (10hrs.)

Communication skills at Work

- Communication and its role in the workplace
- Benefits of effective communication in the workplace
- Common obstacles to effective communication
- Approaches and Communication techniques for multiple needs at workplace: persuading, convincing, responding, resolving conflict, delivering bad news, making positive connections,
- Identify common audiences and design techniques for communicating with each audience

References:

1 Kumar,S. &Lata, P. Communication Skills, OUP, New Delhi2011

2 Rizvi,Ashraf,M. Effective Technical Communication, Mc Graw Hill Education(India) Pvt. Ltd..Chennai,2018

3 Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011

Course Name : Professional Communication Lab					
Course Code: HMTS1061					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**0**	**2**	**1**

Course Outcomes:

Students will be able to

1. Communicate in an official and formal environment.
2. Effectively communicate in a group and engage in relevant discussion.
3. Engage in research and prepare presentations on selected topics.
4. Understand the dynamics of multicultural circumstances at workplace and act accordingly.
5. Organize content in an attempt to prepare official documents .
6. Appreciate the use of language to create beautiful expressions

Module- I (4hrs)

Techniques for Effective Speaking
Voice Modulation: Developing correct tone
Using correct stress patterns: word stress, primary stress, secondary stress
Rhythm in connected speech

Module- II (6hrs.)

Effective Speaking and Social awareness
The Art of Speaking

- Encoding Meaning Using Nonverbal Symbols
- How to Improve Body Language
- Eye Communication, Facial Expression, Dress and Appearance
- Posture and Movement, Gesture, Paralanguage
- Encoding meaning using Verbal symbols: How words work and how to use words
- Volume, Pace, Pitch and Pause
- Cross-Cultural Communication : Multiple aspects/dimensions of culture
- Challenges of cross-cultural communication
- Improving cross-cultural communication skills at workplace.

Module- III (6hrs)

- Group Discussion:Nature and purpose
- Characteristics of a successful Group Discussion
- Group discussion Strategies: Getting the GD started, contributing systematically, moving the discussion along, promoting optimal participation, Handling conflict, Effecting closure.

Module- IV (10hrs.)

Professional Presentation Skills

- Nature and Importance of Presentation skills
- Planning the Presentation: Define the purpose, analyze the Audience, Analyze the occasion and choose a suitable title.
- Preparing the Presentation: The central idea, main ideas, collecting support material, plan visual aids, design the slides
- Organizing the Presentation: Introduction-Getting audience attention, introduce the subject, establish credibility, preview the main ideas, Body-develop the main idea, present information sequentially and logically, Conclusion-summaries, re-emphasize, focus on the purpose, provide closure.
- Improving Delivery: Choosing Delivery methods, handling stage fright
- Post-Presentation discussion: Handling Questions-opportunities and challenges.

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. R. Anand, Job Readiness For IT & ITES- A Placement and Career Companion, , McGraw Hill Education.2015
5. Malhotra, A.,Campus Placements, McGraw Hill Education.2015

Syllabus of 2nd semester:

Course Name : Physics-I					
Course Code: PHYS1001					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcomes:

1. To develop basic understanding of the modern science to the technology related domain.
2. Analytical & logical skill development through solving problems.
3. To impart idea of concise notation for presenting equations arising from mathematical formulation of physical as well as geometrical problems percolating ability of forming mental pictures of them.
4. Imparting the essence and developing the knowledge of controlling distant object like satellite, data transfer through optical fiber, implication of laser technology, handling materials in terms of their electrical and magnetic properties etc.
5. To understand how the systems under force field work giving their trajectories which is the basic of classical Field theory.
6. To impart basic knowledge of the electric and magnetic behavior of materials to increase the understanding of how and why electronic devices work.

Module 1 : Mechanics (7+5)= 12L

Elementary concepts of grad, divergence and curl. Potential energy function; F=-grad V, Equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, Curl of a force field; Central forces ; conservation of angular momentum; Energy equation and energy diagrams; elliptical, parabolic and hyperbolic orbit; Kepler Problem; Application : Satellite manoeuvres .

Non-inertial frames of reference; rotating coordinate system; five term acceleration formula- centripetal and coriolis accelerations; applications: Weather system, Foucault pendulum.

Module 2 : Optics = (4 +3+ 5) = 12 L

Oscillatory Motion**:**

Damped harmonic motion – Over damped, critically damped and lightly damped oscillators; Forced oscillation and resonance. Electrical equivalent of mechanical oscillator, Wave equation, plane wave solution.

Optics:

Elementary features of polarization of light waves. Double refraction, Production and analysis of linearly, elliptic and Circularly polarized light, Polaroid and application of polarizations.: Polarimeter.

Laser & Fiber Optics:

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.

Fiber optics - principle of operation, numerical aperture, acceptance angle, Single mode , graded indexed fiber.

Module 3: **Electrostatics (8+4) = 12 L**

Electrostatics in free space

Calculation of electric field and electrostatic potential for a charge distribution, Divergence and curl of electrostatic field, Laplace's and Poisson's equation for electrostatic potential. Boundary conditions of electric field and electrostatic potential. Method of images , energy of a charge distribution and its expression in terms of electric field.

Electrostatics in a linear dielectric medium

Electrostatic field and potential of a dipole, Bound charges due to electric polarization, Electric displacement, Boundary conditions on displacement, Solving simple electrostatic problem in presence of dielectric – point charge at the centre of a dielectric sphere, charge in front of dielectric slab, Dielectric slab and dielectric sphere in uniform electric field.

Module 4: **(6+3+3)= 12L**

Magnetostatics :

Biot-Savart law, divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; equation for vector potential and it's solutions for given current densities .

Magnetostatics in a linear magnetic medium:

Magnetization and associated bound currents; Auxiliary magnetic field $\vec{H}$; boundary conditions on $\vec{B}$ and $\vec{H}$. Solving for magnetic field due to simple magnet like a bar magnet; Magnetic susceptibility ; ferromagnetic , paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

Faraday's Law:

Differential form of Faraday's law expressing curl of electric field in terms of time derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi static approximation. Energy stored in a magnetic field.

Books of reference :

1. Optics – Eugene Hecht Pearson Education India Private Limited
2. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
3. Waves and Oscillations by N.K. Bajaj
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
5. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
6. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
7. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
8. Optics, Ghatak, McGraw Hill Education India Private Limited
9. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – C.L.Arora

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

Course Outcomes:

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

10. Demonstrate the knowledge of probabilistic approaches to solve wide range of engineering problem.
11. Recognize probability distribution for discrete and continuous variables to quantify physical and engineering phenomenon.
12. Develop numerical techniques to obtain approximate solutions to mathematical problems where analytical solutions are not possible to evaluate.
13. Analyze certain physical problems that can be transformed in terms of graphs and trees and solving problems involving searching, sorting and such other algorithms.
14. Apply techniques of Laplace Transform and its inverse in various advanced engineering problems.
15. Interpret differential equations and reduce them to mere algebraic equations using Laplace Transform to solve easily.

Module I: [10L]

Basic Probability: Random experiment, Sample space and events, Classical and Axiomatic definition of probability, Addition and Multiplication law of probability, Conditional probability, Bayes' Theorem, Random variables, General discussion on discrete and continuous distributions, Expectation and Variance, Examples of special distribution: Binomial and Normal Distribution.

Module II: [10L]

Basic Numerical Methods: Solution of non-linear algebraic 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, Matrix Inversion Method. Solution of Ordinary differential equations: Euler's Method, Modified Euler's Method, Runge-Kutta Method of 4th order.

Module III: [10L]

Basic Graph Theory: Graph, Digraph, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Sub-graph, Walk, Path, Circuit, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph, Dijkstra's Algorithm for shortest path problem. Definition and properties of a Tree, Binary tree and its properties, Spanning tree of a graph, Minimal spanning tree, Determination of spanning trees using BFS and DFS algorithms, Determination of minimal spanning tree using Kruskal's and Prim's algorithms.

Module IV: [10L]

Laplace Transformation: Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. Introduction to integral transformation, Functions of exponential order, Definition and existence of Laplace Transform(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.

References:

1. Advanced Engineering Mathematics, E.Kreyszig, Wiley Publications
2. Introduction to Probability and Statistics for Engineers and Scientists, S.Ross, Elsevier
3. Introductory methods of Numerical Analysis, S.S. Sastry, PHI learning
4. Introduction to Graph Theory, D. B. West, Prentice-Hall of India
5. Engineering Mathematics, B.S. Grewal, S. Chand & Co.

Course Name: Programming for Problem Solving					
Course Code: CSEN 1001					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	3	**0**	**0**	**3**	**3**

Learning Objectives: 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.

Course Outcomes:

1. Understand and remember functions of the different parts of a computer.
2. Understand and remember how a high-level language (C programming language, in this course) works, different stages a program goes through.
3. Understand and remember syntax and semantics of a high-level language (C programming language, in this course).
4. Understand how code can be optimized in high-level languages.
5. Apply high-level language to automate the solution to a problem.
6. Apply high-level language to implement different solutions for the same problem and analyze why one solution is better than the other.

Module I: [10L]

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. Basic Concepts of Assembly language, High level language, Compiler and Assembler.

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).

Basic concepts of operating systems like MS WINDOWS, LINUX

How to write algorithms & draw flow charts.

Module II: [10L]

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.

Flow of Control:

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

Module III: [10L]

Program Structures in C

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.

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.

Module IV: [10L]
Data Handling in C
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(), fseek(), ftell();

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: BUSINESS ENGLISH					
Course Code: HMTS 1201					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	2	**0**	**0**	**2**	**2**

Course Outcomes:

The learner will

1. Acquire competence in using English language to communicate.
2. Be aware of the four essential skills of language usage-listening, speaking, reading and writing.
3. Be adept at using various modes of written communication at work.
4. Attain the skills to face formal interview sessions.

Module- I: (6hrs.)

Grammar (Identifying Common Errors in Writing)

- Subject-verb agreement
- Noun-pronoun agreement
- Misplaced Modifiers
- Articles
- Prepositions
- Redundancies

Module- II: (6hrs.)

Basic Writing Strategies

Sentence Structures

- Use of phrases and clauses in sentences
- Creating coherence
- Organizing principles –accuracy, clarity, brevity
- Techniques for writing precisely
- Different styles of writing: descriptive,narrative, expository
- Importance of proper punctuation

Module- III: (8hrs)

Business Communication- Scope & Importance

Writing Formal Business Letters:Form and Structure-Parts ofa Business letter, Business Letter Formats, Style and Tone, Writing strategies.

Organizational Communication: Agenda & minutes of a meeting, Notice, Memo, Circular

Organizing e-mail messages, E-mail etiquette.

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 of Chronological and Functional Resume, Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honors and Achievements, Personal Profile, Special Interests, References

Module- IV:(6hrs)
Writing skills

- Comprehension: Identifying the central idea, inferring the lexical and contextual meaning, comprehension passage - practice
- Paragraph Writing: Structure of a paragraph, Construction of a paragraph, Features of a paragraph, Writing techniques/developing a paragraph.
- Précis: The Art of Condensation-some working principles and strategies. Practice sessions of writing précis of given passages.
- Essay Writing:Characteristic features of an Essay, Stages in Essay writing, Components comprising an Essay, Types of Essays-Argumentative Essay, Analytical Essay, Descriptive Essays, Expository Essays, Reflective Essays

References:

1. Theories of Communication: A Short Introduction, Armand Matterlart and Michele Matterlart, Sage Publications Ltd.
2. Professional Writing Skills, Chan, Janis Fisher and Diane Lutovich. San Anselmo, CA: Advanced Communication Designs.
3. Hauppauge, Geffner, Andrew P. Business English, New York: Barron's Educational Series.
4. Kalia, S. &Agarwal,S. Business Communication,Wiley India Pvt. Ltd., New Delhi, 2015
5. Mukherjee, H.S., Business Communication- Connecting at work., , Oxford University Press.2nd Edition.2015
6. Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011.

Course Name : Physics-I lab					
Course Code: PHYS1051					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcomes:

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data.
4. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
5. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Minimum of six experiments taking at least one from each of the following four groups :

Group 1 : Experiments in General Properties of matter

1. Determination of Young's modulus by Flexure Method
2. Determination of bending moment and shear force of a rectangular beam of uniform cross- section.
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method.
5. Determination of coefficient of viscosity by Poiseulle's capillary flow method.

Group 2: Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of light by Newton's ring method.
3. Determination of wavelength of light by Fresnel's biprism method.
4. Determination of the wavelength of a given laser source by diffraction method

Group 3: Electricity & Magnetism experiments

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

Group 4: Quantum Physics Experiments

1. Determination of Planck's constant.
2. Determination of Stefan's radiation constant.
3. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
4. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum.
5. Determination of Hall co-efficient of semiconductors.
6. Determination of band gap of semiconductors.
7. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

Books of reference:

1. Optics – Eugene Hecht Pearson Education India Private Limited
2. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
3. Waves and Oscillations by N.K. Bajaj
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
5. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
6. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
7. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
8. Optics, Ghatak, McGraw Hill Education India Private Limited
9. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – C.L.Arora

Course Name: Programming for Problem Solving lab					
Course Code: CSEN 1051					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**4**	**4**	**2**

Software to be used: GNU C Compiler (GCC) with LINUX
NB: Cygwin (Windows based) may be used in place of LINUX

Course outcomes:

After completion of this course the students should be able:

1. To write simple programs relating to arithmetic and logical problems.
2. To be able to interpret, understand and debug syntax errors reported by the compiler.
3. To implement conditional branching, iteration (loops) and recursion.
4. To decompose a problem into modules (functions) and amalgamating the modules to generate a complete program.
5. To use arrays, pointers and structures effectively in writing programs.
6. To be able to create, read from and write into simple text files.

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

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

Course Name: Language Lab					
Course Code: HMTS 1251					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**2**	**2**	**1**

Course Outcomes:

The learner will

1. Acquire the techniques to become an effective listener.
2. Acquire the skill to become an effortless speaker.
3. Organize and present information for specific audience.
4. Communicate to make a positive impact in professional and personal environment.
5. Engage in research and prepare authentic, formal, official documents.
6. Acquire reading skills for specific purpose.

Module- I: (4hrs)

Listening Skills

- Principles of Listening: Characteristics, Stages.
- Types of Listening: Passive listening, Marginal or superficiallistening, Projective Listening, Sensitive or Empathetic Listening, Active or Attentive listening.
- Guidelines for Effective Listening
- Barriers to Effective Listening
- Listening Comprehension

Module- II: (8hrs)

- Interviewing
  Types of Interviews, Format for Job Interviews: One-to-one and Panel Interviews, Telephonic Interviews,Interview through video conferencing.
- Interview Preparation Techniques, Frequently Asked Questions, Answering Strategies, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews.

Module- III: (6hrs)

- Public Speaking:TheSpeech Process: The Message, The Audience, The Speech Style, Encoding, Feedback.
- Characteristics of a good speech : content and delivery, structure of a speech
- Modes of delivery in public speaking: Impromptu, Extemporaneous, Prepared or Memorized, Manuscript.
- Conversation: Types of conversation: formal and informal, Strategies for effective conversation, Improving fluency.
- Situational conversation practice: Greetings and making introductions, Asking for information and giving instructions, agreeing and disagreeing.
- Conversational skills in the business scenario: One-to-one and Group communication, Gender and Culture Sensitivity, Etiquette, Sample Business Conversation, Telephonic Conversation.

Module- IV: (8hrs)

Presentation Skills

- 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.
- Project Team/Group Presentations

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. Sen, S.,Mahendra,A. &Patnaik,P.,Communication and Language Skills, Cambridge University Press, 2015
5. Locker,Kitty O. Business and Administrative Communication McGraw-Hill/ Irwin.
6. Chaney,L.andMartin,J., Intercultural Business Communication. Prentice Hall

Course Name: Workshop /Manufacturing Practices					
Course Code: MECH 1051					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	1	**0**	**4**	**5**	**3**

Course Outcomes:

Upon completion of this course

1. The students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. The students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.
5. The students will be able to describe different components and processes of machine tools.
6. The students will be able to apply the knowledge of welding technology and they can perform arc and gas welding to join the material.

Module I-Lectures & videos: (13 hours)

Detailed contents

1. Introduction on Workshop and Safety Precautions. **(1 lecture)**
2. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
3. CNC machining, Additive manufacturing **(1 lecture)**
4. Fitting operations & power tools **(1 lecture)**
5. Electrical & Electronics **(1 lecture)**
6. Carpentry **(1 lecture)**
7. Plastic moulding, glass cutting **(1 lecture)**
8. Metal casting **(1 lecture)**
9. Welding (arc welding & gas welding), brazing **(2 lecture)**
10. Viva-voce **(1 lecture)**

Module II-Workshop Practice :(52 hours)[L : 0; T:0 ; P : 4 (2 credits)]

1. Machine shop **(12 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(4 hours)**
4. Electrical & Electronics **(4 hours)**
5. Welding shop **(Arc welding 4 hrs + gas welding 4 hrs)** **(8 hours)**
6. Casting **(4 hours)**
7. Smithy **(4 hours)**
8. Plastic moulding& Glass Cutting **(4 hours)**
9. Sheet metal Shop **(4 hours)**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Name : Basic Electronics					
Course Code: ECEN1011					
Contact hrs per week:	L	T	P	Total	Credit points
	3	0	0	3	3

Course Outcomes:

After going through this course, the students will be able to

1. Categorize different semiconductor materials based on their energy bands and analyze the characteristics of those materials for different doping concentrations based on previous knowledge on semiconductors acquired.
2. Describe energy band of P-N Junction devices and solve problems related to P-N Junction Diode both from device and circuit perspectives.
3. Design different application specific circuits associated with diodes operating both in forward and reverse bias.
4. Analyze various biasing configurations of Bipolar Junction Transistor and categorize different biasing circuits based on stability.
5. Categorize different field-effect transistors based on their constructions, physics and working principles and solve problems associated with analog circuits based on operational amplifiers.
6. Design and implement various practical purpose electronic circuits and systems meant for both special purpose and general purpose and anlayze their performance depending on the type of required output and subsequently the applied input.

Module I [10 L]

Basic Semiconductor Physics:

Crystalline materials, Energy band theory, Conductors, Semiconductors and Insulators, Concept of Fermi Energy level, intrinsic and extrinsic semiconductors, drift and diffusion currents in semiconductor

Diodes and Diode Circuits:

Formation of p-n junction, Energy Band diagram, forward & reverse biased configurations, V-I characteristics, load line, breakdown mechanisms, Zener Diode and its Application.

Rectifier circuits: half wave & full wave rectifiers: ripple factor, rectification efficiency.

Module II [8 L]

Bipolar Junction Transistors (BJT):

PNP & NPN BJT structures, current components in BJT, CE, CB, CC configurations, V-I Characteristics of CB & CE modes, regions of operation, Base width modulation & Early effect, thermal runaway, Concept of Biasing: DC load line, Q-point, basics of BJT amplifier operation, current amplification factors, different biasing circuits: fixed bias, collector to base bias, voltage divider bias.

Module III [9 L]

Field Effect Transistors (FET):

n-channel Junction Field Effect Transistor (JFET) structure & V-I characteristics.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET): enhancement & depletion type MOSFETs (for both n & p channel devices), drain & transfer characteristics.

MOSFET as a digital switch, CMOS inverter, voltage transfer characteristic (VTC), NAND & NOR gate realization using CMOS logic.

Moore's Law, evolution of process node, state of integration (SSI, MSI, LSI, VLSI, ULSI),

Classification of Integrated circuits (IC) and their applications.

Module IV [9 L]

Feedback in amplifiers :

Concept of feedback, advantages of negative feedback (qualitative), Barkhausen criteria.

Operational Amplifier:
Ideal OPAMP characteristics, OPAMP circuits: inverting and non-inverting amplifiers, Adder, Subtractor, Integrator, Differentiator, Basic Comparator.

Special Semiconductor Devices:
Light Emitting Diode (LED), Silicon Controlled Rectifier (SCR), Photodiode: Operations, characteristics & applications.

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 : Basic Electronics Laboratory					
Course Code: ECEN1061					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**2**	**2**	**1**

Course Outcomes:

1. The students will correlate theory with diode behavior.
2. They will design and check rectifier operation with regulation etc.
3. Students will design different modes with BJT and FET and check the operations.
4. They will design and study adder, integrator etc. with OP-AMPs.

List of Experiments (from)

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multi-meters etc.
2. Familiarization 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 Differentiators.

Syllabus of 2nd year – 2rd semester:

Subject Name: Data Structures & Algorithms					
Paper Code: CSEN 2101					
Contact hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	4	**0**	**0**	**4**	**4**

Pre-requisites: Introduction to Computing, Mathematics, Set Theory

Course objectives:
The objective of this course is to present the different types of primitive data structures to the students, make them understand about the time and space complexities for manipulating such data structures and explain the applications where they could be used. Primitive data structures can further be used to create more sophisticated data structures that are more useful for specific types of algorithms. The course should also enable the students to understand, apply, analyze and evaluate different types of algorithms.

Course outcomes:
1. Understand and remember the basics of data structures and how time complexity analysis is applicable to different types of algorithms.
2. Understand the significance and utility of different data structures and the context of their application. (For example, the queue in front of ticket counters uses first-in-first-out paradigm in a linear data structure)
3. Apply different types of data structures in algorithms and understand how the data structures can be useful in those algorithms.
4. Analyze the behavior of different data structures in algorithms. (For example, given an algorithm that uses a particular data structure, how to calculate its space and time complexity.)
5. Evaluate solutions of a problem with different data structures and thereby understand how to select suitable data structures for a solution. (For example, what are the different ways to find the second largest number from a list of integers and which solution is the best.)
6. Evaluate different types of solutions (e.g. sorting) to the same problem.

Module -I. [8L] Linear Data Structures I
Introduction (2L):
Why do we need data structure?
Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.
Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – Big O, Ω, Θ 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 Structures 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. Applications - The Tower of Hanoi, Eight Queens Puzzle (Concept of Backtracking).

Module -III. [14L] Nonlinear Data Structures

Trees (9L):

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

Graphs (5L):

Graph definitions and Basic concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, complete graph, simple path, simple cycle).

Graph representations/storage implementations – adjacency matrix, adjacency list, Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications.

Module - IV. [11L] Searching, Sorting

Sorting Algorithms (6L):

Bubble sort and its optimizations, Cocktail Shaker Sort, Insertion sort, Selection sort, Quicksort (Average Case Analysis not required), Heap sort (concept of max heap, application – priority queue), Counting Sort, Radix sort.

Searching (2L):

Sequential search, Binary search, Interpolation search.

Hashing (3L):

Hashing functions, collision resolution techniques (Open and closed hashing).

Recommended books:

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

Subject Name: Discrete Mathematics					
Paper Code : CSEN 2102					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcomes:

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

1. Interpret the problems that can be formulated in terms of graphs and trees.
2. Explain network phenomena by using the concepts of connectivity, independent sets, cliques, matching, graph coloring etc.
3. Achieve the ability to think and reason abstract mathematical definitions and ideas relating to integers through concepts of well-ordering principle, division algorithm, greatest common divisors and congruence.
4. Apply counting techniques and the crucial concept of recurrence to comprehend the combinatorial aspects of algorithms.
5. Analyze the logical fundamentals of basic computational concepts.
6. Compare the notions of converse, contrapositive, inverse etc in order to consolidate the comprehension of the logical subtleties involved in computational mathematics

Module I: [10L]

Graph Theory: Tree, Binary Tree, Spanning Tree. Walk, Path, Cycle, Hamiltonian Graph, The Travelling Salesman Problem, Euler Graph, The Chinese Postman Problem. Planar Graph, Euler's Formula for Planar Graph and Related Problems. Examples of Non-Planar Graphs. Kuratowski's Theorem. Matching and Augmenting Paths, Hall's Marriage Theorem and Related Problems. Vertex Colouring, Chromatic Polynomials.

Module II: [10L]

Number Theory: Well Ordering Principle, Principle of Mathematical Induction, Divisibility theory and properties of divisibility, Fundamental Theorem of Arithmetic, Euclidean Algorithm for finding greatest common divisor (GCD) and some basic properties of GCD with simple examples, Congruence, Residue classes of integer modulo n $(\mathbb{Z}_n)$ and its examples.

Module III: [10L]

Combinatorics: Counting Techniques: Permutations and Combinations, Distinguishable and Indistinguishable Objects, Binomial Coefficients, Generation of Permutations and Combinations, Pigeon-hole Principle, Generalized Pigeon-Hole Principle, Principle of Inclusion and Exclusion, Generating Functions and Recurrence Relations: Solving Recurrence Relations Using Generating Functions and other Methods, Divide-and-Conquer Methods, Formulation and Solution of Recurrence Relations in Computer Sorting, Searching and other Application Areas.

Module IV: [10L]

Propositional Calculus: Propositions, Logical Connectives, Truth Tables, Conjunction, Disjunction, Negation, Implication, Converse, Contra positive, Inverse, Biconditional Statements, Logical Equivalence, Tautology, Normal Forms, CNF and DNF, Predicates, Universal and Existential Quantifiers, Bound and Free Variables, Examples of Propositions with Quantifiers.

References:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw- Hill
2. C L Liu and D P Mohapatra, Elements of Discrete Mathematics : A Computer Oriented Approach, Tata McGraw Hill
3. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's
4. Application to Computer Science, Tata McGraw Hill
5. J.L.Mott, A. Kandel and T.P.Baker, Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall
6. Norman L. Biggs, Discrete Mathematics, Oxford University Press, Schaum's
7. Outlines Series, Seymour Lipschutz, Marc Lipson
8. S.K. Mapa, Higher Algebra(Classical), Sarat Book Distributors
9. Introduction to Graph Theory (2nd Ed), D G West, Prentice-Hall of India, 2006

Course Name : Analog Circuits					
Course Code: ECEN2101					
Contact hrs per week:	L	T	P	Total	Credit points
	3	0	-	3	3

Course Outcomes:

After going through this course, the students will be able to

1. Apply the previous knowledge gathered from Basic Electrical and Basic Electronics papers.
2. Understand the concepts of BJT, MOSFET and biasing techniques of BJT and MOSFET based amplifier circuits.
3. Analyze frequency response of amplifier circuits.
4. Design different types sinusoidal oscillators and multivibrator circuits.
5. Construct algebraic equations based amplifier and analog computers using OP-AMP
6. Design stable high-gain amplifier circuits.

MODULE 1: Analog Signals and Devices [9L]

Basic concepts and device biasing [5L]:

Analog, discrete and digital signals. Diode: piecewise-linear model, clipping and clamping operation. BJT biasing circuits, Q-point and stability.

Small Signal analysis of Amplifiers [4L]:

Small signal (h-parameter and r_e model) analysis of BJT CE mode amplifier circuit (derive input impedance, output impedance, voltage gain, current gain for the amplifiers).

MODULE 2: Oscillators and Frequency Responses of Amplifiers [9L]

Frequency Responses of Amplifiers [2L]:

Frequency response of CE mode RC-coupled amplifier; effect of external and parasitic capacitors on cut-off frequencies.

Feedback & Oscillator Circuits [7L]:

Concept of feedback, Effects of negative feedback in amplifiers, Oscillators circuits: Phase-shift, Wien-Bridge, Hartley, Colpitt and crystal Oscillators.

MODULE 3: Operational Amplifiers (OPAMPs) [7L]

Fundamentals of OPAMP [4L]:

Basic building blocks of OPAMP: Differential Amplifiers, Current source and current mirror circuits. Types of differential amplifiers, AC and DC analysis of differential amplifiers; Characteristics of an ideal OPAMP.

Applications of OPAMP [3L]:

Inverting and non-inverting OPAMP amplifiers, Log-antilog amplifiers, Instrumentation amplifier, Precision rectifiers, basic comparator, Schmitt Trigger.

MODULE 4: Analog Circuit Applications [7L]

Power Amplifiers [4L]:

Concepts and operations of Class A, B and AB amplifiers; Calculation of DC power, AC power and efficiency of these amplifiers.

Applications Analog IC [3L]:

Description of 555 Timer IC, astable and mono-stable operations using 555. Study of 78XX and 79XX voltage regulator ICs.

Books:

1. Microelectronic Circuits by Adel S. Sedra, Kenneth C. Smith
2. Electronics Devices and Circuits by Robert L. Boylestad, Louis Nashelskey
3. Fundamentals of Microelectronics by Behzad Razavi
4. Integrated electronics by Jacob Millman, Christos C. Halkias

Course Name : Digital Logic					
Course Code : ECEN2104					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

1. Students will learn Binary Number system, and logic design using combinational gates.
2. Students will design applications of Sequential Circuits.
3. Students will design Finite State Machines.
4. Students will learn Memory classifications.
5. Students will learn basics of CMOS logic.
6. Students will be prepared to learn various digital component design as used in VLSI applications.

Lecture hours: 36

Module 1: Binary System, Boolean Algebra and Logic Gates [10L]:
Data and number systems; Binary, Octal and Hexadecimal representation and their conversions, BCD, Gray codes, excess 3 codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic. Boolean algebra, De-Morgan's theorem, Various Logic gates- their truth tables and circuits, universal logic gates, Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, Karnaugh-map method, Quine-McCluskey method.

Module 2: Combinational Logic [10L]:
Arithmetic Circuits: Adder circuit – Ripple Carry Adder, CLA Adder, CSA, and BCD adder, subtractor circuit.
Combinational Circuit: Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and parity Generator. Shannon's Expansion Theorem, Realization of logic functions using Mux, Parity Generators.

Module 3: Sequential Logic [10L]:
Basic memory elements, S-R, J-K, D and T Flip Flops, Sequential circuits design methodology: State table and state diagram, State Reduction Method, Circuit Excitation and Output tables, Derivation of Boolean functions; Finite State Machine Design using Sequential circuit design methodology, various types of Registers (with Parallel load, shift Registers) and Counters (asynchronous ripple counters, synchronous counters: binary, BCD, Johnson)

Module 4: Memory Design and Logic Families [6L]:
4.1 **Memory Systems:** Concepts and basic designs of RAM (SRAM & DRAM), ROM, EPROM, EEPROM, Programmable logic devices and gate arrays (PLAs and PLDs)

4.2 **Logic families:**, NMOS and CMOS, their operation and specifications. Realization of basic gates using above logic families, Open collector & Tristate gates, wired-AND and bus operations.

Text Books:

1. Digital Logic and Computer Design, Morris M. Mano, PHI.
2. Digital Principles & Applications, 5th Edition, Leach & Malvino, Mc Graw Hill Company
3. Modern Digital Electronics, 2nd Edition, R.P. Jain. Tata Mc Graw Hill Company Limited
4. Digital Logic Design, Fourth Edition - Brian Holdsworth & Clive Woods (free download)
5. H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill Company Limited

Reference Books:

1. Digital Design: Principles and Practices: John F. Wakerly.
2. Fundamental of Digital Circuits, A. Anand Kumar, PHI

Course Name : Human Values and Professional Ethics					
Course Code: HMTS2001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**-**	**3**	**3**

COURSE OUTCOME:

The student will

1. be aware of the value system and the importance of following such values at workplace
2. learn to apply ethical theories in the decision making process
3. follow the ethical code of conduct as formulated by institutions and organizations
4. implement the principles governing work ethics
5. develop strategies to implement the principles of sustainable model of development
6. implement ecological ethics wherever relevant and also develop eco-friendly technology

Module I (10 L)

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 (10L)

Ethics and Ethical Values
Principles and theories of ethics
Consequential and non-consequential ethics
Egotism, Utilitarianism, 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, Gilligan'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 (10L)
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 (6L)
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.

Suggested Readings:

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 13 th Edition).

Subject Name: Data Structure & Algorithms Lab					
Paper Code: CSEN2151					
Contact hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**3**	**3**	**1.5**

Course Outcome:

The objectives of this course are:

1. To understand linear and non-linear data structures.
2. To understand different types of sorting and searching techniques.
3. To know how to create an application specific data structures.
4. To solve the faults / errors that may appear due to wrong choice of data structure.
5. To analyze reliability of different data structures in solving different problems.
6. To evaluate efficiency in terms of time and space complexity, when different data structures are used to solve same problem.

Day 1: Time and Space Complexity

Lab Assignment:

Create three different 10; 000 10; 000 matrices matrixOne, matrixTwo and result-Matrix, using dynamic memory allocation. Initialize matrixOne and matrixTwo by using rand() or srand() function, limit the values from 0 to 9. Multiply matrixOne and matrixTwo into resultMatrix.

While execution, open another terminal and use top command to see the usage of memory by the process. Calculate the time taken for the execution of the program.

Repeat the same exercise for 100,000 x 100,000matrices.

Home Assignment:

Write a program (WAP) to check whether a matrix is i) identity, ii) diagonal. WAP to reverse the elements of an array without using any other variable.

Day 2: Array

Lab Assignment

WAP to add two polynomials using array. Minimize the memory usage as much as you can.

Write a program to convert a matrix into its sparse representation (triple format). Once represented in sparse format, do not revert back to the matrix format any-more. Manipulate the sparse representation to find the transpose of the matrix (which should also be in sparse representation).

Calculate and find out whether using triple format for your example is advantageous or not.

Home Assignment

WAP to multiply two polynomials. Minimize usage of memory.

WAP to add two matrices using sparse representation. Manipulation of data should be done in sparse format.

Day 3: Singly Linked List

Lab Assignment

Write a menu driven program to implement a singly linked list with the operations:

i) create the list
ii) insert any element in any given position (front, end or intermediate)
iii) delete an element from any given position (front, end or intermediate)
iv) display the list

Home Assignment

Write a menu driven program to implement a singly linked list with the operations:

i) count the number of nodes
ii) reverse the list

Day 4: Circular and Doubly Linked List

Lab Assignment

Write a menu driven program to implement a circular linked list with the operations:

i) create the list
ii) insert any element in any given position (front, end or intermediate)
iii) delete an element from any given position (front, end or intermediate)
iv) display the list

Home Assignment

Write a menu driven program to implement a doubly linked list with the operations:

i) create the list
ii) insert any element in any given position (front, end or intermediate)
iii) delete an element from any given position (front, end or intermediate)
iv) display the list

Day 5: Stack, Queue - with array

Lab Assignment

Write a menu driven program to implement stack, using array, with
i) push, ii) pop, iii) display, iv) exit operations.

WAP to evaluate a postfix expression.

Write a menu driven program to implement a queue, using array, with
i) insert, ii) delete, iii) display, iv) exit operations

Home Assignment

WAP to convert an infix expression to its corresponding postfix operation.

Write a menu driven program to implement a double-ended queue, using array, with the following operations:

i) insert (from front, from rear)
ii) delete (from front, from rear)
iii) display,
iv) exit operations

Day 6: Stack, Queue - with linked list

Lab Assignment

Write a menu driven program to implement a stack, using linked list, with
i) push, ii) pop, iii) exit operations

Home Assignment

Write a menu driven program to implement a queue, using linked list, with
i) insert, ii) delete, iii) exit operations

Day 7: Circular Queue, Deque - with linked list

Lab Assignment

Write a menu driven program to implement a circular queue using linked list with
i) insert, ii) delete, iii) exit operations

Home Assignment

Write a menu driven program to implement a double-ended queue, using linked list, with the following operations:

i) insert (from front, rear), ii) delete (from front, rear), iii) exit operations

Day 8: Binary Search Tree (BST)

Lab Assignment

Write a program, which creates a binary search tree (BST). Also write the functions to insert, delete (all possible cases) and search elements from a BST.

Home Assignment

Write three functions to traverse a given BST in the following orders:

i) in-order, ii) pre-order, iii) post-order.

Display the elements while traversing.

Day 9: Searching

Lab Assignment

WAP to implement,

i) Linear Search, ii) Binary Search (iterative)

NB: As a pre-processing step, use bubble-sort to sort the elements in the search space.

WAP to generate integers from 1 to n (input parameter) in random order and guarantees that no number appears twice in the list. While the number sequence is being generated, store it in a text file.

Home Assignment

WAP to implement binary search recursively.

Day 10: Sorting

Lab Assignment

Write different functions for implementing,

i) Bubble sort,
ii) Cocktail shaker sort,
iii) Quick Sort.

Plot a graph of n vs. time taken, for n= 100, 1000, 10,000 and 100,000 to com-pare the performances of the sorting methods mentioned above. Use the second assignment of Day 9 to generate the data, using the given n values.

Home Assignment

Write different functions for implementing,

i) Insertion sort, ii) Merge sort.

Day 11: Graph Algorithms

Lab Assignment

Read a graph (consider it to be undirected) from an edge-list and store it in an adjacency list.

Use the adjacency list to run DFS algorithm on the graph and print the node labels. Detect and count the back-edges.

Home Assignment

WAP to implement BFS algorithm of a given graph (similarly as described for DFS, instead of back-edges count cross-edges).

Subject Name: Software Tools Lab					
Paper Code: CSEN2152					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**3**	**3**	**2**

Course Outcomes:

1. Understand the importance of knowing various tools to make programs more effective.
2. Learn the concept and use of integrated development environment.
3. Analyze the errors in a code using debugging methods in both Windows and Linux environment.
4. Understand the need for version control and learn effective methods to do the same.
5. Analyze a code with code coverage testing and know how to speed up execution using profiling tools.
6. Demonstrate the utility of effectively using software tools to minimize memory leaks and bad memory manipulations in programs.

CodeLite IDE [CodeBlock]

Learn to use CodeLite IDE for wrtiing C/C++ programming languages

Compiling with gcc

Learn all the command line options for compiling C programs in the unix environment using gcc

Git for sharing files and version control

Learn how to setup a repository so that it will be easy to sync your local with that on the server. Learn to use cvs for version controlling

Debugging with gdb

gdb is the standard C/C++ debugger to debug your code. Learn to interact with gdb directly via a shell, or use a graphical interface provided by CodeLite IDE.

Makefiles

Learn how you use makefile on Unix to properly build an executable.

Code coverage testing with gcov

Learn about good testing using gcov is used to make sure the tests are exercising all the branches in the code .

Runtime profiling with gprof

Learn about using gprof which is a very useful *profiling* tool for speeding up execution speed of a program: it will show where your program is spending most of its time, so one can know about the most important code to optimize.

Memory profiling with valgrind

Learn to use valgrind which is a critical tool for helping one to find memory leaks in the program: malloc without free, accessing an array outside its bounds, etc.

Course Name : Digital Logic Lab					
Course Code: ECEN2154					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**2**	**2**	**1**

Course Outcome:

The students after completion of this course will be able to:

1. Use the concept of Boolean algebra to minimize logic expressions by the algebraic method, K-map method etc.
2. Construct different Combinational circuits like Adder, Subtractor, Multiplexer, De-Multiplexer, Decoder, Encoder, etc.
3. Design various types of Registers and Counters Circuits using Flip-Flops (Synchronous, Asynchronous, Irregular, Cascaded, Ring, Johnson).
4. Realize different logic circuits using ICs built with various logic families.

Choose any ten experiments out of the twelve suggested

1. Realization of basic gates using Universal logic gates.
2. Four-bit parity generator and comparator circuits.
3. Code conversion circuits BCD to Excess-3 & vice-versa.
4. Construction of simple 3-to-8 Decoder circuit by 2-to-4 Decoders using logic gates.
5. Design a 4-to-1 Multiplexer using logic gates and use it as a Universal logic module.
6. Realization of SR(Set Reset), JK, and D flip-flops using Universal logic gates.
7. Construction of simple arithmetic logic circuits-Adder, Subtractor.
8. Realization of Asynchronous Up/Down Counter (Count up to 7) using logic gates.
9. Realization of Synchronous Up/Down Counter (Count up to 7) using logic gates.
10. Realization of Shift Registers using logic gates (Serial in Serial out and Parallel in Serial out).
11. Construction of Serial adder circuit using a D Flip-Flop and a Full adder.
12. Design a combinational circuit for BCD to Decimal conversion to drive 7-Segment display using logic gates.

Course Name : Probability and Statistical Methods					
Course Code: MATH2111					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**-**	**4**	**4**

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

1. Articulate the axioms (laws) of probability.
2. Compare and contrast different interpretations of probability theory and take a stance on which might be preferred.
3. Formulate predictive models to tackle situations where deterministic algorithms are intractable.
4. Summarize data visually and numerically
5. Assess data-based models.
6. Apply tools of formal inference.

Module I: [10L]

Probability-I (Single variable probability distributions): Review of basic probability : Axiomatic definition,Addition and Multiplication law, Conditional probability and Bayes' Theorem, Expectation and Variance of single variable discrete and continuous distributions, Normal approximation to Binomial and Poisson Distribution, Exponential and Multinomial distribution, Moment generating and characteristic functions, Limit theorems: Markov's inequality and Chebyshev's inequality with examples.

Module II: [10L]

Probability-II(Joint Distribution and Markov Chains): Joint distribution using joint probability mass/density function, Finding marginal pmf/pdf from joint distribution, Multiplicative property of joint pmf/pdf in case of independent random variables, Markov Chains: Introduction, Chapman-Kolmogorov equations, Classification of states, Some applications: Gambler's Ruin Problem.

Module III: [10L]

Statistics-I: Moments, Skewness and Kurtosis, Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Covariance, Correlation and Regression, Spearman's Rank Correlation coefficient, Curve fitting: Straight line and parabolas.

Module IV: [10L]

Statistics-II: Population and Samples, The sampling distribution of mean (standard deviation known), The sampling distribution of mean (standard deviation unknown), Point and Interval estimation, Tests of Hypotheses, Null Hypotheses and Tests of Hypotheses with examples.

References:

1. Probability and Statistics for Engineers , Richard A Johnson, Pearson Education
2. Groundwork of Mathematical Probability and Statistics, Amritava Gupta, Academic Publishers
3. Introduction to Probability Models, S.M. Ross, Elsevier.
4. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand and Sons.
5. An Introduction to Probability theory and its applications Vol-I, W. Feller, John Wiley and Sons.

Syllabus of 2nd year – 4th semester:

Subject Name: Design & Analysis of Algorithms					
Paper Code: CSEN 2201					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	4	**0**	**0**	**4**	**4**

COURSE OBJECTIVES

1. Introduce students to the methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

COURSE OUTCOMES

After completion of the course, students would be able to:

1. Remember time complexities of various existing algorithms in different situations.
2. Understand the basic principles of different paradigms of designing algorithms.
3. Apply mathematical principles to solve various problems.
4. Analyze the complexities of various algorithms.
5. Evaluate the performance of various algorithms in best case, worst case and average case.
6. Create/ Design a good algorithm for a new problem given to him/ her.

Module I

1. Algorithm Analysis (3 Lectures)

Time and space complexity. Asymptotic Notations and their significance. Asymptotic Analysis. Finding time complexity of well known algorithms like-insertion sort, heapsort, Asymptotic solution to recurrences, Substitution Method, Recursion Tree, Master Theorem.

2. Divide-and-Conquer Method. (3 Lectures)

Basic Principle, Binary Search – Worst-case and Average Case Analysis, Merge Sort – Time Complexity Analysis, quicksort – Worst-case and Average Case Analysis, Concept of Randomized Quicksort.

3. Medians and Order Statistics. (3 Lectures)

4. Lower Bound Theory (1 Lecture)

Bounds on sorting and searching techniques.

Module II

5. Greedy Method (3 Lectures)

Elements of the greedy strategy. Fractional Knapsack Problem, Huffman codes.

6. Dynamic Programming (4 Lectures)

Basic method, use, Examples: 0-1 Knapsack Problem, Matrix-chain multiplication, LCS Problem.

7. Graph Algorithms (9 Lectures)

Minimum cost spanning trees: Prim's and Kruskal's algorithms and their correctness proofs (Greedy Method). Shortest Path Algorithm: Dijkstra's with correctness proof. (Greedy method),Bellman Ford with correctness proof, All pair shortest path(Floyd-Warshall Algorithm)(Dynamic Programming).

Module III

8. Amortized Analysis (2 Lectures)

Aggregate, Accounting and Potential methods.

9. String matching algorithms: (3 lectures)

Different techniques – Naive algorithm, string matching using finite automata, and Knuth , Morris , Pratt (KMP) algorithm with their complexities .

10. Randomized Algorithm: Skip List (2 Lectures)

Module IV

11. Disjoint Set Manipulation (2 Lectures)

UNION-FIND with union by rank, Path compression.

12. Network Flow: (2 lectures)

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

13. NP-completeness (3 Lectures)

P class, NP-hard class, NP-complete class. Relative hardness of problems and polynomial time reductions. Satisfiability problem, Vertex Cover Problem, Independent Sets, Clique Decision Problem.

14. Approximation algorithms (3 Lectures)

Necessity of approximation scheme, performance guarantee. Approximation algorithms for 0/1 knapsack, vertex cover, TSP. Polynomial time approximation schemes: 0/1 knapsack problem.

TEXT BOOKS:

1. Introduction To Algorithms by Cormen, Leiserson, Rivest and Stein. Third Edition, 2009. Prentice Hall.
2. Algorithm Design by Jon Kleinberg and Eva Tardos. Addison Wesley, 2005.

REFERENCE:

1. Computer Algorithms: Introduction to Design and Analysis by Sarah Basee and Allen van Gelder. 3rd Edition, Addison Wesley.

Subject Name: Computer Organization and Architecture					
Paper Code : CSEN 2202					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the basic organization of computer and different instruction formats and addressing modes.
2. Analyze the concept of pipelining, segment registers and pin diagram of CPU.
3. Understand and analyze various issues related to memory hierarchy.
4. Understand various modes of data transfer between CPU and I/O devices.
5. Examine various inter connection structures of multi processor.
6. Design an architecture with all the required properties to solve state-of-the-art problems.

Module 1: Basics of Computer Organization: (10L)

Basic organization of the stored program computer and operation sequence for execution of a program, Von Neumann & Harvard Architecture. RISC vs. CISC based architecture. (2L)

Fetch, decode and execute cycle, Concept of registers and storage, Instruction format, Instruction sets and addressing modes. (4L)

Basics of Control Unit Design - hardwired and micro programmed control, Horizontal and Vertical micro instruction (4L)

Module 2: Memory and I/O Organization: (11L)

Memory system overview, Cache memory organizations, Techniques for reducing cache misses, Hierarchical memory technology: Inclusion, Coherence and locality properties, Virtual Memory, Memory mapped IO. (6L)

Introduction to I/O interfaces. Interrupts, Interrupt hardware, Enabling and Disabling interrupts, Concept of handshaking, Polled I/O, Priorities, Daisy Chaining. Vectored interrupts; Direct memory access, DMA controller. (5L)

Module 3: (10L)

Pipelined Architecture:

Brief Introduction, Performance Measures - speed up, Efficiency ,performance - cost ratio etc.

Static pipelines - reservation tables, scheduling of static pipelines, definitions - minimum average latency, minimum achievable latency, greedy strategy etc. Theoretical results on latency bounds without proof. (6L)

Vector Processing: Vector registers; Vector Functional Units; Vector Load / Store; Vectorization; Vector operations: gather / scatter; Masking; Vector chaining. (4L)

Module 4: (9L)

SIMD Architectures:

brief introduction, various concepts illustrated by studying detailed SIMD algorithms, viz., Matrix multiplication, Sorting on Linear array; (4L)

Interconnection Networks:

Detailed study of Interconnection Network - Boolean cube, Mesh, Shuffle-exchange, Banyan, Omega, Butterfly, Generalized Hypercube, Delta etc. (5L)

Text Books:

1. Computer Organization, 5th Edition, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, MGH
2. Computer System Architecture, 3rd Edition, Morris M. Mano, Pearson
3. Computer Organization and Design: The Hardware/Software interface, David
4. Patterson and John L. Hennessy, 3rd Edition, Elsevier, 2005.
5. NPTEL materials on Computer Organization.
6. Hwang & Briggs: Advanced Computer Architecture and Parallel processing, MH
7. Kai Hwang : Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill
8. Onur Mutlu's lecture materials on Computer Architecture from CMU web site: https://users.ece.cmu.edu/~omutlu/

Course Name : Operating Systems					
Course Code: CSEN2203					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

Course Outcomes:

The students will be able to:

1. develop knowledge about the importance of computer system resources and the role of operating system in their management policies and algorithms.
2. understand the process, process management policies and scheduling of processes by CPU.
3. acquire a understanding of the need of process synchronization, evaluate the requirement for process synchronization and coordination handled by operating system.
4. analyze the memory management and its allocation policies and compare different memory management approaches.
5. able to use system calls for managing processes, memory, file system etc.
6. familiarization of the storage management policies with respect to different storage management technologies.

Module I:

Introduction [4L]

Introduction to Operating System. Operating system functions, OS Architecture (Monolithic, Microkernel, Layered, Hybrid) , evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure [3L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, System calls.

Module II:

Process Management [17L]

Processes [3L]: Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.

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

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

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

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

Module III:

Storage Management [19L]

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

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

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

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

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

Module IV:

Protection & Security [4L]

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

Learning outcomes/Course Outcomes of Operating System :

This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems. In particular, the course will consider inherent functionality and processing of program execution. The emphasis of the course will be placed on understanding how the various elements that underlie operating system interact and provides services for execution of application software.

Master functions, structures and history of operating systems.

Master understanding of design issues associated with operating systems.

Master various process management concepts including scheduling, synchronization, deadlocks.

Be familiar with multithreading.

Master concepts of memory management including virtual memory.

Master system resources sharing among the users.

Master issues related to file system interface and implementation, disk management.

Be familiar with protection and security mechanisms.

Be familiar with various types of operating systems including Linux.

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: Algebraic Structures / Mathematics-III Algebraic Structures					
Course Code: MATH2201					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**-**	**4**	**4**

Course Outcomes:

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

1. Describe the basic foundation of computer related concepts like sets, POsets, lattice and Boolean Algebra.
2. Analyze sets with binary operations and identify their structures of algebraic nature such as groups, rings and fields.
3. Give examples of groups, rings, subgroups, cyclic groups, homomorphism and isomorphism, integral domains, skew-fields and fields.
4. Compare even permutations and odd permutations, abelian and non-abelian groups, normal and non-normal subgroups and units and zero divisors in rings.
5. Adapt algebraic thinking to design programming languages.
6. Identify the application of finite group theory in cryptography and coding theory.

Module I:[10L]

Sets, RelationsandFunctions: Basic operations on sets, Venn diagrams. Binary relations defined on sets, equivalence relations and equivalence classes, order, relation and lattices, partially ordered sets, Hasse diagrams, maximal, minimal, greatest and least elements in a partially ordered set, lattices and their properties, principle of duality, distributive and complementedlattices.

Module II:[10L]

GroupTheory 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.

Module III:[10L]

GroupTheoryII: 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.

Module IV:[10L]

Morphisms, RingsandFields: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, Sub-ring, Integral domain, Field, Division Ring or Skew Field. (Emphasis should be given on examples and elementaryproperties.)

References:

1. HigherAlgebra,S.K.Mapa,SaratBookDistributors
2. AdvancedHigherAlgebra,J.G.ChakravortyandP.R.Ghosh,U.N.DhurandSons
3. AFirstcourseinAbstractAlgebra,J.B.Fraleigh,Narosa
4. Algebra, M. Artin,Pearson

Course Name : Microprocessors & Microcontrollers					
Course Code: AEIE2205					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**-**	**2**	**2**

Course outcome:

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

1. Understand the architecture of 8 bit microprocessor (8085A).
2. Develop the skill in program writing of 8 bit microprocessor (8085A).
3. Understand the architecture and develop the skill in program writing of 16 bit microprocessor (8086).
4. Understand the architecture and develop the skill in program writing of microprocessor 8051 and PIC16F877.
5. Understand the architecture and operation of programmable peripheral device 8255A.

Module I - [6L]

Introduction to 8 bit microprocessor: 8085 microprocessor internal architecture, 8085 pin configuration, Software instruction set, timing diagram of the instructions.

Module II - [7L]

Addressing modes and Assembly language programming, Interrupts of 8085 processor: classification of interrupts, Programming using interrupts. Counter and Time delay, Support IC chips 8255- Block diagram, pin configuration, mode of operation, control word(s) format and Interfacing with Microprocessors.

Module III - [7L]

Introduction to 8086/8088 Architecture: Architecture, memory segmentation, pin configuration, clock generator, instruction set, addressing modes and assembly language programming of 8086/8088, interrupts.

Module IV - [6L]

Introduction to microcontrollers: Intel MCS-51 family features, 8051 architecture, pin configuration, I/O ports and memory organization; Instruction set and basic assembly language programming, interrupts and returns; Interrupts, timer/counter and serial communication.

Brief introduction to PIC microcontroller (16F877): Architecture, pin details, memory layout etc.

References:

1. Ramesh S. Gaonkar, Microprocessor architecture, programming and applications with 8085/8085A; Wiley eastern Ltd.
2. B. Ram, Fundamental of Microprocessor and Microcontrollers; Dhanpat Rai Publications.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessors and Microcontrollers; Oxford Publications.
4. A. Nagoor Kani, 8085 Microprocessor and its Applications; Third Edition, TMH Education Pvt. Ltd.

Course Name : Environmental Sciences					
Course Code: EVS2016					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	2	**0**	**-**	**2**	**0**

Course outcome:

The subject code EVS2016 corresponds to basic environmental chemistry for the 2nd year B.Tech students, which is offered as Environmental Sciences and is mandatory for all branches of engineering. The course provides basic knowledge of various environmental pollutions as well as its impact and ways to curb it. The course outcomes of the subject are

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Educate engineers who can work in a multi-disciplinary environment to anticipate and address evolving challenges of the 21st century.
5. Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.
6. Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Module 1: Socio Environmental Impact 6L

Basic ideas of environment and its component

Population growth: exponential and logistic; resources; sustainable development. 3L

Concept of green chemistry, green catalyst, green solvents

Environmental disaster and social issue, environmental impact assessment, environmental audit, environmental laws and protection act of India. 3L

Module 2: Air Pollution 6L

Structures of the atmosphere, global temperature models

Green house effect, global warming; acid rain: causes, effects and control. 3L

Lapse rate and atmospheric stability; pollutants and contaminants; smog; depletion of ozone layer; standards and control measures of air pollution. 3L

Module 3: Water Pollution 6L

Hydrosphere; pollutants of water: origin and effects; oxygen demanding waste; thermal pollution; pesticides; salts.

Biochemical effects of heavy metals; eutrophication: source, effect and control. 2L

Water quality parameters: DO, BOD, COD.

Water treatment: surface water and waste water. 4L

Module 4: Land Pollution 6L

Land pollution: sources and control; solid waste: classification, recovery, recycling, treatment and disposal. 3L

Noise Pollution

Noise: definition and classification; noise frequency, noise pressure, noise intensity, loudness of noise, noise threshold limit value; noise pollution effects and control. 3L

Text/Books

1. GourKrishna Das Mahapatra, Basic Environmental Engineering and Elementary Biology, Vikas Publishing House P. Ltd.
2. A. K. De, “Environmental Chemistry”, New Age International.
3. A. K. Das, Environmental Chemistry with Green Chemistry, Books and Allied P. Ltd

References/Books

1. S. C. Santra, Environmental Science, New Central Book Agency P. Ltd
2. D. De, D. De, Fundamentals of Environment & Ecology, S. Chand & Company Ltd.

Subject Name: Design & Analysis of Algorithms Laboratory					
Paper Code: CSEN2251					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	0	3	3	1.5

Course Outcomes:

1. Understand and Apply different types of algorithm designing paradigms like divide and conquer, greedy, dynamic programming etc.
2. Realize and Apply underlying mathematical principles of algorithms in the corresponding implemented program.
3. Analyze and Evaluate the performance of various algorithms by observing the actual running time and main memory consumption of the corresponding implemented programs for best case, worst case and average case input data.
4. Create / Design a good algorithm for solving real life computing problems, by using various design techniques and data structures, learnt in this course.

A tentative list (non-exhaustive) of the practical topics are given below:

1. **Divide and Conquer:** Implement Quick Sort and **randomized version** of quick sort using Divide and Conquer approach. Check the running time for each of the n! combinations or input sequences of a particular set of integers to observe the best, worst and average cases.
2. **Divide and Conquer:** Implement Merge Sort using Divide and Conquer approach. Check the running time for each of the n! combinations or input sequences of a particular set of integers to observe the best, worst and average cases.
3. Implement Heapsort algorithm. Check the running time for each of the n! combination or input sequences of a particular set of integers to observe the best, worst and average cases.
4. **Dynamic Programming:** Find the minimum number of scalar multiplication needed for chain of Matrices Dynamic Programming:
5. **Dynamic Programming:** Implement Bellman Ford Algorithm to solve Single Source shortest Path problem of a graph
6. **Dynamic Programming:** Implement Floyd- Warshall Algorithm to solve all pair Shortest path for a graph
7. **Dynamic Programming:** Solve 0/1 Knapsack problem using dynamic problem.
8. **Dynamic Programming:** Solve Longest Common Subsequence problem using dynamic problem.
9. **Greedy method:** Implement Dijkstra's algorithm to find Minimum Spanning Tree of a graph by using minimum priority Queue or minimum heap data structure.
10. **Greedy method:** Implement Prim's algorithm to find Minimum Spanning Tree of a graph by using minimum priority Queue or minimum heap data structure.
11. **Greedy method:** Implement Kruskal's algorithm to find Minimum Spanning Tree of a graph by implementing and using various operations of Disjoint-set forest data structure.
12. **Greedy method:** Implement Huffman coding using greedy approach.
13. **Realization of Amortized Analysis:** Implement a Queue using Stacks.
14. Implement KMP algorithm for string matching
15. Implement Ford-Fulkerson algorithm to get maximum flow in a given flow network.
16. **Randomized Algorithm:** Implement Skip-List.

Subject Name: Computer Architecture Lab					
Paper Code : CSEN2252					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**1.5**

Course Outcome:

1. After completion of this, students would be able to have adequate knowledge of basics of computer architecture.
2. Students would be able to understand detailed implementation of machine instructions, their classifications and their relevance to programming paradigms.
3. Students would have sufficient knowledge of design implementations of various arithmetic operations such as adder, multiplier etc.
4. Students would be able to design and simulate various combinatorial and sequential logic circuits using Vivado/Xilinx.
5. Students would be able to understand various memory functions.
6. Students would be able to design a formal testbench from informal system requirements.

List of experiments:

Programming using VHDL

1. All Logic Gates (Data flow and Behavioral model)
2. Half adder and half subtractor (Data flow and Behavioral Model)
3. Combinatorial Designs (Data flow and Behavioral Model)
   a. 2:1 Multiplexer
   b. 4:1 Multiplexer
   c. 3:8 Decoder
   d. Comparator
4. Full adder and full subtractor (Data flow, Behavioral and Structural Model)
5. Sequential design of flip flops (SR, JK, D, T)
6. ALU design
7. Ripple carry adder (Structural Model)
8. Adder subtractor composite unit (Structural Model)
9. 4 bit synchronous and asynchronous counters.
10. Small projects like stepper motor.

Subject Name: Operating Systems Lab					
Paper Code : CSEN2253					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**1.5**

Course Outcomes:

Upon the completion of Operating Systems practical course, the student will be able to:

1. Understand and implement basic services and functionalities of the operating system using system calls.
2. Will be able to describe and create user defined processes.
3. Understand the benefits of thread over process and implement them.
4. Synchronization programs using multithreading concepts.
5. Use modern operating system calls and synchronization libraries in software to implement process synchronization.
6. Implementation of Inter-process communication using PIPE.

Operating Systems Lab

1. **Shell programming** [6P]: Creating a script, making a script executable, shell syntax (variables, Conditions, control structures, functions and commands).
2. **Process** [6P]: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. **Signal** [9P]: 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** [9P]: programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)
6. **Inter-process communication** [9P]: pipes(use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO).

References:

1. Sumitabha Das. Your Unix The Ultimate Guide, MH.
2. Neil Matthew, Richard Stones, Beginning Linux Programming, Wrox.

Subject Name: Microprocessors & Microcontroller Lab.					
Paper Code : AEIE2255					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**2**	**2**	**1**

Course outcome:

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

1. Understand and apply different instructions of 8085 microprocessor.
2. Understand and apply different instructions of 8086 microprocessor.
3. Understand and apply different instructions of 8051 microcontroller.
4. Interface 8085A microprocessor with different input and output devices (e.g., LEDs, seven segments displays ADC, DAC, and stepper motor etc.).
5. Interface 8086A microprocessor/ 8051 microcontroller with different input and output devices (e.g., LEDs, seven segments displays ADC, DAC, and stepper motor etc.).

List of experiments:

1. Familiarization with 8085A trainer kit components with the process of storing and viewing the contents of memory as well as registers. Repeat the above all using 8085A Simulator.
2. Study of programs using basic instruction set (data transfer, load/store, arithmetic, logical) of 8085A microprocessor.
3. Programming using 8085A trainer kit/simulator for:
   a) Copying and Shifting block of memory
   b) Packing and unpacking of BCD numbers
   c) Addition/Subtraction of two 8-bit Hex numbers
   d) Addition of 16-bit Hex numbers.
   e) BCD Addition
   f) Binary to ASCII conversion
   g) String Matching and Sorting.
4. Familiarization of 8086 microprocessor trainer kit/simulator using data transfer, load/store, arithmetic and logical instructions.
5. Write assembly language programs (ALP) using 8086 microprocessor trainer kit /simulator on the following:
   a) Finding the largest/ smallest number from an array
   b) Arranging numbers in ascending/descending order
   c) Shifting a block of data from one memory location to another
   d) Addition of a series of BCD numbers
   e) String matching
6. Interfacing of 8085A through 8255A PPI/ 8051 Microcontroller with switches and LEDs to perform
   a) Display operation
   b) Blinking operation and
   c) Scrolling operation
7. Interfacing with seven segment displays through 8-bit latch (e.g., 74LS373) using- a) 8085A trainer kit, b) 8086A trainer kit through 8255A PPI.
8. Interfacing of ADC, DAC, and Stepper motor with 8085A/8086 microprocessor trainer kit.