Heritage Institute of Technology

(An Autonomous Institute under MAKAUT)

Computer Science and Business Systems

B. Tech. Course

Document Release Month & Year: April, 2021

PART- I

Structures of Syllabus

1st Year

1st Semester Syllabus:

Theory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CHEM1001	Chemistry I	3	1	0	4	4	Basic Science Course
2	MATH1101	Mathematics I	3	1	0	4	4	Basic Science Course
3	ELEC1001	Basic Electrical Engineering	3	1	0	4	4	Engineering Science Course
Total Theory			**9**	**3**	**0**	**12**	**12**	

Laboratory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CHEM1051	Chemistry I Lab	0	0	3	3	1.5	Basic Science Course
2	ELEC1051	Basic Electrical Engineering Lab	0	0	2	2	1	Engineering Science Course
3	MECH1052	Engineering Graphics & Design Lab	1	0	4	5	3	Engineering Science Course
Total Laboratory			**1**	**0**	**9**	**10**	**5.5**	
Total of Semester without Honours			**10**	**3**	**9**	**22**	**17.5**	
1	HMTS1011	Communication for Professionals	3	0	0	3	3	Honours Course
2	HMTS1061	Professional Communication Lab	0	0	2	2	1	Honours Course
Total of Semester with Honours			**13**	**3**	**11**	**27**	**21.5**	

2nd Semester Syllabus:

Theory								
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**	**Type of Paper**
			L	**T**	**P**	**Total**		
1	MATH1201	Mathematics II	3	1	0	4	4	Basic Science Course
2	PHYS1001	Physics I	3	1	0	4	4	Basic Science Course
3	CSEN1001	Programming for Problem Solving	3	0	0	3	3	Engineering Science Course
4	HMTS1202	Business English	2	0	0	2	2	Humanities & Social Sciences including Management
Total Theory			**11**	**2**	**0**	**13**	**13**	

Laboratory								
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**	**Type of Paper**
			L	**T**	**P**	**Total**		
1	PHYS1051	Physics I Lab	0	0	3	3	1.5	Basic Science Course
2	CSEN1051	Programming for Problem Solving Lab	0	0	4	4	2	Engineering Science Course
3	MECH1051	Workshop / Manufacturing Practice	1	0	4	5	3	Engineering Science Course
4	HMTS1252	Language Lab	0	0	2	2	1	Humanities & Social Sciences including Management
Total Laboratory			**1**	**0**	**13**	**14**	**7.5**	
Total of Semester without Honours			**12**	**2**	**13**	**27**	**20.5**	
1	ECEN1011	Basic Electronics	3	0	0	3	3	Honours Course
2	ECEN1061	Basic Electronics Lab	0	0	2	2	1	Honours Course
Total of Semester with Honours			**15**	**2**	**15**	**32**	**24.5**	

2nd Year

3rdSemester Syllabus:

Theory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CSBS2101	Data Structure & Algorithms	4	0	0	4	4	Professional Core Courses
2	CSEN2102	Discrete Mathematics	4	0	0	4	4	Engineering Science Course
3	HMTS2101	Economics for Engineers	3	0	0	3	3	Humanities & Social Sciences including Management Courses
4	ECEN2104	Digital Logic	3	0	0	3	3	Engineering Science Course
5	HMTS2001	Human Values and Professional Ethics	3	0	0	3	3	Humanities & Social Sciences including Management Courses
Total Theory			**17**	**0**	**0**	**17**	**17**	

Laboratory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CSBS2151	Data Structure & Algorithms Lab	0	0	3	3	1.5	Professional Core Courses
2	ECEN2154	Digital Logic Lab	0	0	2	2	1	Engineering Science Course
Total Laboratory			**0**	**0**	**5**	**5**	**2.5**	
Total of Semester without Honours			**17**	**0**	**5**	**22**	**19.5**	
1	MATH2111	Probability and Statistical Methods	4	0	0	4	4	Honours Course
Total of Semester with Honours			**21**	**0**	**5**	**26**	**23.5**	

4th Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	CSBS2201	Operating System Concept	4	0	0	4	4	Professional Core Courses
2	CSBS2202	Computer Organization and Architecture	4	0	0	4	4	Professional Core Courses
3	CSBS2203	Design and Analysis of Algorithms	4	0	0	4	4	Professional Core Courses
4	CSBS2204	Introduction to Innovation and Entrepreneurship	4	0	0	4	4	Professional Core Courses
5	CSBS2205	Managerial Economics	3	0	0	3	3	Professional Core Courses
6	EVSC2016	Environmental Sciences (MANDATORY)	2	-	-	2	-	Mandatory Courses
Total Theory			**21**	**0**	**0**	**21**	**19**	

Laboratory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	CSBS2251	Operating System Concept Lab	0	0	3	3	1.5	Professional Core Courses
2	CSBS2252	Computer Organization and Architecture Lab	0	0	3	3	1.5	Professional Core Courses
3	CSBS2253	Design and Analysis of Algorithms Lab	0	0	3	3	1.5	Professional Core Courses
Total Laboratory			**0**	**0**	**9**	**9**	**4.5**	
Total of Semester			**21**	**0**	**9**	**30**	**23.5**	

3rd Year

5th Semester Syllabus:

Theory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CSBS3101	Computer Networks	4	0	0	4	4	Professional Core Courses
2	CSBS3102	Object Oriented Programming	4	0	0	4	4	Professional Core Courses
3	CSBS3103	Formal Language & Automata Theory	4	0	0	4	4	Professional Core Courses
4	CSBS3104	Business Strategy	3	0	0	3	3	Professional Core Courses
5	CSBS3131 - CSBS3133	Professional Elective – I	3	0	0	3	3	Professional Elective Courses
	CSBS3131 CSBS3132 CSBS3133	Computer Graphics Advanced Operating Systems E-Commerce and ERP						
Total Theory			**18**	**0**	**0**	**18**	**18**	

Laboratory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CSBS3151	Computer Networks Lab	0	0	3	3	1.5	Professional Core Courses
2	CSBS3152	Object Oriented Programming Lab	0	0	3	3	1.5	Professional Core Courses
Total Laboratory			**0**	**0**	**6**	**6**	**3**	
Total of Semester without Honours			**18**	**0**	**6**	**24**	**21**	
1	CSBS3111	Machine Learning	3	0	0	3	3	Honours Course
2	CSBS3161	Machine Learning Lab	0	0	2	2	1	Honours Course
Total of Semester with Honours			**21**	**0**	**8**	**29**	**25**	

6th Semester Syllabus:

Theory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CSBS3201	Software Engineering	4	0	0	4	4	Professional Core Courses
2	CSBS3202	Database Management Systems	4	0	0	4	4	Professional Core Courses
3	CSBS3203	Enterprise System and IT Solutions	3	0	0	3	3	Professional Core Courses
4	CSBS3231-CSBS3235	Professional Elective-II	3	0	0	3	3	Professional Elective Courses
	CSBS3231 CSBS3232 CSBS3233 CSBS3234 CSBS3235	Mobile Computing Artificial Intelligence Compiler Design Introduction to IoT Introduction to Blockchain						
5		Open Elective-I	3	0	0	3	3	Open Elective Courses
	AEIE3221 ECEN3222 MATH3221 HMTS3221	Fundamentals of Sensors and Transducers Designing with Processors and Controllers Computational Mathematics Human Resource Management						
6	INCO3016	Indian Constitution and Civil Society (MANDATORY)	2	-	-	2	-	Mandatory Courses
Total Theory			**19**	**0**	**0**	**19**	**17**	

Laboratory								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1.	CSBS3251	Software Engineering Lab	0	0	3	3	1.5	Professional Core Courses
2.	CSBS3252	Database Management Systems Lab	0	0	3	3	1.5	Professional Core Courses
Total Laboratory			**0**	**0**	**6**	**6**	**3**	

Sessional								
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	Type of Paper
			L	T	P	Total		
1	CSBS3293	Term Paper and Seminar	0	0	4	4	2	Seminar
Total Sessional			**0**	**0**	**4**	**4**	**2**	
Total of Semester			**19**	**0**	**10**	**29**	**22**	

** Open Elective-I offered by CSBS Department is: **Introduction to E-Commerce and ERP (CSBS3221)**

4th Year

7thSemester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	HMTS4101	Principles of Management	3	0	0	3	3	Humanities & Social Sciences including Management Courses
2	CSBS4131-CSBS4133	Professional Elective-III	3	0	0	3	3	Professional Elective Courses
	CSBS4131 CSBS4132 CSBS4133	Introduction to Industrial Management Introduction to Marketing Management Digital Marketing						
3		Open Elective-II	3	0	0	3	3	Open Elective Courses
	AEIE4122 CHEN4123 ECEN4122 ECEN4123 MATH4121	Linear Control Systems and Applications Industrial Total Quality Management Software Defined Radio Error Control Coding Methods in Optimization						
4		Open Elective-III	3	0	0	3	3	Open Elective Courses
	AEIE4127 MATH4122 BIOT4124 HMTS4125	Introduction to Embedded System Advanced Linear Algebra Biosensor Marketing Research & Marketing Management						
Total Theory			**12**	**0**	**0**	**12**	**12**	

Sessional								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	CSBS4191	Industrial Training / Internship	-	-	-	-	2	Internship in industry or Elsewhere
2	CSBS4195	Project-I	0	0	8	8	4	Project work, internship in industry or Elsewhere
Total Sessional			**0**	**0**	**8**	**8**	**6**	
Total of Semester without Honours			**12**	**0**	**8**	**20**	**18**	
1	CSBS4111	Data Analytics	3	0	0	3	3	Honours Course
2	CSBS4161	Data Analytics Lab	0	0	2	2	1	Honours Course
Total of Semester with Honours			**15**	**0**	**10**	**25**	**22**	

****** Open Elective-III offered by CSBS Department is: **Soft Computing (CSBS4121)**

8th Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	CSBS4231-CSBS4233	Professional Elective-IV	3	0	0	3	3	Professional Elective Courses
	CSBS4231 CSBS4232 CSBS4233	Organizational Behavior Behavioral Economics Leadership						
2	CSBS4241-CSBS4243	Professional Elective-V	3	0	0	3	3	Professional Elective Courses
	CSBS4241 CSBS4242 CSBS4243	Introduction to Cognitive Science Cyber Sociality Business Analytics						
3		Open Elective-IV	3	0	0	3	3	Open Elective Courses
	AEIE4221 BIOT4222 HMTS4224 HMTS4226	Process Instrumentation Non-conventional Energy Psychology Advanced Finance						
Total Theory			**9**	**0**	**0**	**9**	**9**	

Sessional								
1	CSBS4295	Project-II	0	0	16	16	8	Project work, internship in industry or Elsewhere
2	CSBS4297	Comprehensive Viva-voce	-	-	-	-	1	
Total Sessional			**0**	**0**	**16**	**16**	**9**	
Total of Semester			**9**	**0**	**16**	**25**	**18**	

** Open Elective-IV offered by CSBS Department is: **Introduction to Industrial Sociology (HMTS4281)**

Credit points distribution

Sl. No.	Category	**CSBS**
1	Humanities and Social Sciences including Management Courses	**12**
2	Basic Science Courses	**19**
3	Engineering Science Courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer, etc.	**24**
4	Professional Core Courses	**61**
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**

*Minor variation is allowed as per need of the respective disciplines.

Honours Credit Chart

Sl. No.	Semester	Paper Code	Course Title	Contact Hours / Week			Credit Points
				L	T	P	
1.	1st	HMTS1011	Communication for Professionals	3	0	0	3
2.		HMTS1061	Professional Communication Lab	0	0	2	1
3.	2nd	ECEN1011	Basic Electronics	3	0	0	3
4.		ECEN1061	Basic Electronics lab	0	0	2	1
5.	3rd	MATH2111	Probability and Statistical Methods	4	0	0	4
6.	5th	CSBS3111	Machine Learning	3	0	0	3
7.		CSBS3161	Machine Learning Lab	0	0	2	1
8.	7th	CSBS4111	Data Analytics	3	0	0	3
9.		CSBS4161	Data Analytics lab	0	0	2	1
	Total						20

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.

Heritage Institute of Technology

Anandapur, Kolkata – 700107

PART- II

Detailed Syllabus

1st Year 1st Semester

Course Name: CHEMISTRY-1					
Course Code: CHEM1001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcome:

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, reactiondynamics, electrochemistry, structureandreactivity of molecules.

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

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 inter molecular 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.

Detailed Syllabus:

MODULE – I [10L]

Atomic structure and Wave Mechanics: [3L]

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.

Thermodynamics: [4L]

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.

Spectroscopic Techniques & Application: [3L]

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

MODULE – II [10L]

Chemical Bonding: [5L]

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.

Periodicity: [3L]

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

Ionic Equilibria: [2L]

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

MODULE – III [10L]

Conductance: [3L]

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.

Electrochemical Cell: [4L]

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.

Reaction dynamics: [3L]

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).

MODULE – IV [10L]

Stereochemistry: [4L]

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

Structure and reactivity of Organic molecule: [3L]

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

Organic reactions and synthesis of drug molecule: [3L]

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

Text Books:

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

Reference Books:

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

Course Name: MATHEMATICS – I					
Course Code: MATH1101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcome:

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

Detailed Syllabus:

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'stype.

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.

Books:

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. M. R. Spiegel, Seymour Lipschutz, Dennis Spellman, "Vector Analysis (Schaum's outline series)", McGraw Hill Education.
9. S. S. Sastry, "Engineering Mathematics", PHI.
10. M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), "Advanced Engineering Mathematics", Indian Edition.
11. Seymour Lipschutz, Marc Lipson, "Linear Algebra (Schaum's outline series)", 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 Outcome:

After successfully completing this 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.

Detailed Syllabus:

MODULE –I [11L]

DC Network Theorem: [6L]

Kirchhoff's law, Nodal analysis, Mesh analysis, Superposition theorem, Thevenin's theorem, Norton theorem, Maximum power transfer theorem, Star-Delta conversion.

Electromagnetism: [5L]

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.

MODULE–II [10L]

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.

MODULE–III [11L]

Three phase system: [4L]

Balanced three phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams, power measurement by two wattmeter method.

DC Machines: [7L]

Construction, EMF equation, Principle of operation of DC generator, Open circuit characteristics, External characteristics, Principle of operation of DC motor, speed-torque characteristics of shunt and series machine, starting of DC motor, speed control of dc motor.

MODULE – IV [10L]

Transformer: [6L]

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 and Introduction to three phase transformer.

3-phase induction motor: [4L]

Concept of rotating magnetic field, Principle of operation, Construction, Equivalent circuit and phasor diagram, torque-speed/slip characteristics, Starting of Induction Motor.

Text Books:

1. D.P Kothari & I.J Nagrath, "Basic Electrical Engineering", TMH, Second Edition.
2. V.N Mittle & Arvind Mittal, "Basic Electrical Engineering", TMH, Second Edition.
3. Hughes, "Basic Electrical Engineering".
4. Surinder Pal Bali, "Electrical Technology", Vol-I,Vol-II, Pearson Publication.
5. B.L. Theraja, A.K. Theraja, "A Text Book of Electrical Technology", Vol. I & II, 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: CHEM1051					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

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.

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

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 Fe^{2+}, Cu^{2+} 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 23hysic-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.

Syllabus:

1. Estimation of iron using $KmnO_4$ self indicator.
2. Iodometric estimation of Cu^{2+}.
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)

Books:

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

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

Course Outcome:

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

1. Get an exposure to common electrical apparatus and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Apply various network theorems in Electrical Circuits
4. Understand the application of common electrical measuring instruments.
5. Understand the basic characteristics of different electrical machines.
6. Know the measurement technique various electrical parameters.

Syllabus:

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.

Books:

B.L. Theraja, A.K. Theraja, "A Text Book of Electrical Technology", Vol. I & II, S.Chand & Company.

Course Name: ENGINEERING GRAPHICS & DESIGN LAB					
Course Code: MECH1052					
Contact Hours per week	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcome:

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

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).

Syllabus:

Lecture Plan (13L)

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

Detailed contents of Lab hours (52 hrs)

MODULE-I: 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.

[4hrs + 4hrs]

MODULE-II: Orthographic Projections covering**,**
Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina.

[4hrs+4hrs+4hrs]

MODULE-III: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views.

[4hrs + 4hrs]

MODULE-IV: 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.

[4hrs]

MODULE-V: 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.

[4hrs + 4hrs]

MODULE-VI: 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.

[4hrs]

MODULE-VII: Customisation & 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;

[2hrs]

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.

[2hrs]

MODULE-VIII: 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.

[4hrs]

Books:

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., "Engineering Drawing and Computer Graphics", (2008), Pearson Education.
5. Agarwal B. & Agarwal C. M., "Engineering Graphics", (2012), TMH Publications.

Honours Course for 1st Year 1st Semester

Course Name : COMMUNICATION FOR PROFESSIONALS					
Course Code: HMTS1011					
Contact Hours per week	L	T	P	Total	Credit points
	3	0	0	3	3

Course Outcome:

After successfully completing this course the 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 communication for multiple requirements of globalized workplaces.

Detailed Syllabus:

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

Books:

1. Kumar,S. & Lata, P. OUP, "Communication Skills", New Delhi2011.
2. Rizvi, Ashraf, M., "Effective Technical Communication", Mc Graw Hill Education (India) Pvt. Ltd., Chennai, 2018.
3. Technical Communication: Principles and Practice, 2nd Ed., 2011,Raman, M. and Sharma, S.

Course Name : PROFESSIONAL COMMUNICATION LAB					
Course Code: HMTS1061					
Contact Hours per week	L	T	P	Total	Credit points
	0	0	2	2	1

Course Outcome:

After successfully completing this course the 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

Syllabus:

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.

Books:

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.

1st Year2ND SEMESTER

Course Name: MATHEMATICS – II					
Course Code: MATH1201					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcome:

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

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

Detailed Syllabus:

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.

Books:

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

Course Name: PHYSICS – I					
Course Code: PHYS1001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcome:

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

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.

Detailed Syllabus:

MODULE–I [(7+5) = 12L]

Mechanics

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–II [12L]

Oscillatory Motion: **[4L]**

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: **[3L]**

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: **[5L]**

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–III [12L]

Electrostatics in free space: [8L]

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: [4L]

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–IV [12L]

Magnetostatics: [6L]

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: [3L]

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: **[3L]**

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:

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

Course Name: PROGRAMMING FOR PROBLEM SOLVING					
Course Code: CSEN1001					
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 Outcome:

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

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.

Detailed Syllabus:

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. Byron Gottfried, "Schaum's outline of Programming with C".
2. Herbert Schildtm "Teach Yourself C".
3. E Balagurusamy, "Programming in ANSI C".

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

Course Name: BUSINESS ENGLISH					
Course Code: HMTS1202					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	2	2

Course Outcome:

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

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.
5. Write reports according to various specifications.
6. Acquire the skill to express with brevity and clarity.

Detailed Syllabus:

MODULE–I [6L]
Grammar (Identifying Common Errors in Writing)

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

MODULE –II [6L]
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 [8L]
Business Communication- Scope & Importance

Writing Formal Business Letters: Form and Structure-Parts of a 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 [6L]

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

Books:

1. Armand Matterlart and Michele Matterlart, "Theories of Communication: A Short Introduction", Sage Publications Ltd.
2. Chan, Janis Fisher and Diane Lutovich. San Anselmo, "Professional Writing Skills", 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	L	T	P	Total	Credit Points
Hours per week	0	0	3	3	1.5

Course Outcome:

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

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.

Syllabus:

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:

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

Course Name: PROGRAMMING FOR PROBLEM SOLVING LAB					
Course Code: CSEN1051					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	4	4	2

Course Outcome:

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

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.

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

Syllabus:

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. Byron Gottfried, “Schaum’s outline of Programming with C”.
2. Herbert Schildt, “Teach Yourself C”.
3. E. Balagurusamy, “Programming in ANSI C”.

Course Name: WORKSHOP /MANUFACTURING PRACTICES					
Course Code: MECH1051					
Contact Hours per week	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcome:

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

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.

Syllabus:

(i) Lectures & videos: (13 hours)

Detailed contents

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

(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 ormore of the techniques covered above.

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. I,Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology”, PearsonEducation, 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: LANGUAGE LAB					
Course Code: HMTS1252					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

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

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.

Syllabus:

MODULE – I [4hrs]

Listening Skills

- Principles of Listening: Characteristics, Stages.
- Types of Listening: Passive listening, Marginal or superficial listening, 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

Books:

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. and Martin, J., "Intercultural Business Communication", Prentice Hall.

Honours Course for 1st Year 2nd Semester

Course Name: BASIC ELECTRONICS					
Course Code: ECEN1011					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

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

1. Categorize different semiconductormaterialsbased on their energy bands and analyze thecharacteristics of those materials fordifferent dopingconcentrations based on previous knowledge on semiconductors acquired.

2. Describe energy band of P-N Junction devices and solve problems related to P-NJunction Diodeboth from device and circuit perspectives.

3. Design different application specific circuits associated with diodes operating both inforward andreverse bias.

4. Analyze various biasing configurations of Bipolar Junction Transistor and categorizedifferentbiasing circuits based on stability.

5. Categorize different field-effect transistors based on their constructions, physics andworkingprinciples 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.

Detailed Syllabus:

MODULE-I [10L]

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 [8L]

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 [9L]
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 [9L]
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.

Books:

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 LAB					
Course Code: ECEN1061					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

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

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.

Detailed Syllabus:

List of Experiments

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.

Books:

1. D. Chattopadhyay, P. C. Rakshit, “Electronics Fundamentals and Applications”.
2. B Sasikala, “Electronics Laboratory Primer”.

2nd Year 1st Semester

Course Name: DATA STRUCTURE & ALGORITHMS					
Course Code: CSBS2101					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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

1. Develop the knowledge of basic data structures for storage and retrieval of ordered or unordered data.
2. Design linear and non-linear data structures to be used for storing, accessing and manipulating data,and be able to choose the appropriate data structure to be used for different real life applications.
3. Evaluate and compare the runtime and memory usage of algorithms with the help of mathematical background (Asymptotic Notation) of algorithm analysis.
4. Apply graph based algorithms on shortest path problems.
5. Apply efficient algorithm for solving problems like sorting, searching, insertion and deletion of data.
6. Analyze hash functions and collision resolution techniques for storing and retrieving data efficiently into a hash table.

Detailed Syllabus:

MODULE-I [8L]

Linear Data Structure I

Introduction **[2L]**

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms andprograms, basic idea of pseudo-code. Introduction to time and space complexity analysis of algorithm.

Array:

[1L]

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

Linked List:

[5L]

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

MODULE-II [10L]

Linear Data Structure II

Stack: **[5L]**

Stack and its implementations (using array, using linked list), Principles of Recursion – Applications of stack, differences between recursion and iteration, tail recursion.

Queue: **[5L]**

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.

MODULE-III [13L]

Nonlinear Data structures

Trees: **[9L]**

Basic terminologies, tree representation (using array, using linked list)

Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full).Binary search tree- operations ->creation, insertion, deletion, searching).

Height balanced binary tree – AVL tree --> insertion, deletion with examples only.
B- Trees – operations -->insertion, deletion with examples only.

Graphs: **[4L]**

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

MODULE-IV [12L]

Searching, Sorting, Hashing

Sorting Algorithms: **[8L]**

Bubble sort and its optimization, insertion sort, shell sort, selection sort, merge sort, quick sort,heap sort, radix sort. Complexity analysis.

Searching: **[2L]**

Sequential search, binary search, Interpolation Search

Hashing: **[2L]**

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

Books:

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

Course Name: DISCRETE MATHEMATICS					
Course Code: CSEN2102					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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, graphcoloring 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 ofalgorithms.
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 thelogical subtleties involved in computational mathematics.

Detailed Syllabus:

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 Coloring, 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 somebasic 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 [12L]

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.

Text Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw- Hill.
2. T Veerarajan, "Discrete Mathematics", Tata McGraw- Hill.

Reference Books:

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

Course Name: ECONOMICS FOR ENGINEERS					
Course Code: HMTS2101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

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

1. Evaluate a project and estimate the total cost of the project
2. Apply financial analytical methodologies to prepare a report regarding the financial performance of an organization
3. Participate actively in an organization's capital budgeting process
4. Provide vital inputs regarding the pricing of a product
5. Apply the knowledge of the interplay of various economic variables and indicators in workplace
6. Provide insight about different accounting concepts and apply broader concepts like costs, revenues, assets, liabilities, capital, profit, investment and interest

Detailed Syllabus:

MODULE-I [6L]

Market: Meaning of Market, Types of Market, Perfect Competition, Monopoly, Monopolistic and Oligopoly market. The basic concept of economics – needs, wants, utility. National Income-GDP, GNP. Demand & Supply, Law of demand, Role of demand and supply in price determination, Price Elasticity. Inflation: meaning, reasons, etc.

MODULE-II [4L]

Business: Types of business, Proprietorship, Partnership, Joint-stock company, and cooperative society – their characteristics. Banking: role of commercial banks; credit and its importance in industrial functioning. Role of central bank: Reserve Bank of India. International Business or Trade Environment.

MODULE-III [8L]

Financial Accounting: Journals, Ledgers, Trial Balance, Profit & Loss Account, Balance Sheet. Financial Statement Analysis (Ratio and Cash Flow analysis).

MODULE-IV [6L]

Cost Accounting: Terminology, Fixed, Variable and Semi-variable costs. Break Even Analysis. Cost Sheet. Budgeting and Variance Analysis. Marginal Cost based decisions.

MODULE-V [4L]

Time Value of Money: Present and Future Value, Annuity, Perpetuity. Equity and Debt, Cost of Capital.

MODULE-VI [8L]

Capital Budgeting: Methods of project appraisal - average rate of return - payback period - discounted cash flow method: net present value, benefit cost ratio, internal rate of return. Depreciation and its types, Replacement Analysis, Sensitivity Analysis.

Books:

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

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

Course Outcome:

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

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.

Detailed Syllabus:

MODULE-I [10L]

Binary System, Boolean Algebra and Logic Gates: 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 [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 [10L]

Sequential Logic: 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 [6L]

Memory Systems: Concepts and basic designs of RAM (SRAM & DRAM), ROM, EPROM, EEPROM, Programmable logic devices and gate arrays (PLAs and PLDs)

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

Reference Books:

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

Course Name: HUMAN VALUES AND PROFESSIONAL ETHICS					
Course Code: HMTS2001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

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

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

Detailed Syllabus:

MODULE-I [10L]

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, Utilatirianism, Kant's theory and other non-consequential perspectives, Ethics of care, justice and fairness, rights and duties

Ethics-- Standardization, Codification, Acceptance, Application

Types of Ethics--- Ethics of rights and Duties
Ethics of Responsibility
Ethics and Moral judgment
Ethics of care
Ethics of justice and fairness
Work ethics and quality of life at work

Professional Ethics

Ethics in Engineering Profession; moral issues and dilemmas, moral autonomy (types of inquiry)
Kohlberg's theory, Giligan's theory (consensus and controversy)
Code of Professional Ethics Sample Code of ethics like ASME, ASCE. IEEE, Institute of Engineers, Indian Institute of materials management, Institute of Electronics and telecommunication engineers
Violation of Code of Ethics---conflict, causes and consequences
Engineering as social experimentation, engineers as responsible experimenters (computer ethics, weapons development)
Engineers as managers, consulting engineers, engineers as experts, witnesses and advisors, moral leadership
Conflict between business demands and professional ideals
social and ethical responsibilities of technologies.

Whistle Blowing: Facts, contexts, justifications and case studies

Ethics and Industrial Law

Institutionalizing Ethics: Relevance, Application, Digression and Consequences

MODULE-III [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.

Books:

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

Course Name: DATA STRUCTURE & ALGORITHMS LAB					
Course Code: CSBS2151					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

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

1. Design and analyze the time and space efficiency of the data structure.
2. Capable to identity the appropriate data structure for a given problem.
3. Implement the Stack ADT using both array based and linked-list based data structures.
4. Implement the Queue ADT using both array based circular queue and linked-list based implementations.
5. Implement Nonlinear Data structure operations and its applications
6. Apply Sorting and Searching algorithms on various problems and analyze run-time execution of these methods.

Detailed Syllabus:

1.Design and Implement List data structure using i) array ii) singly linked list.
2.Design and Implementation of basic operations on doubly linked list.
3.Design and Implementation of Linear Data Structure :
   a) Stack using i)array ii) singly linked list
   b) Queue using i)array ii) singly linked list
   c) Basic operations on Circular Queue
4.Design and Implementation of Conversion and Evaluation of expressions (Infix, Postfix) operations.
5.Implementation of Sorting Techniques.
6.Implementation of Searching Techniques.
7.Design and Implement Binary Search Tree (BST)- create, insert, delete, search elements. Traversal in a BST-inorder, preorder, postorder.
8.Design and Implement Graph Algorithms: BreadthFirstSearch Techniques, DepthFirstSearch Techniques.

Books:

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Prentice Hall of India.
2. E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill.
3. Byron Gottfried, “Schaum's Outline of Programming with C”, McGraw-Hill.
4. Seymour Lipschutz, “DataStructures, Schaum's Outlines Series”, Tata McGraw-Hill.
5. Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed, “Fundamentals of Data Structures in C”, W.H.Freeman and Company.
6. R. G. Dromey, “How to Solve it by Computer”, Prentice-Hall of India.
7. Reema Thareja, “Data Structures using C”, Oxford University Press.

Course Name: DIGITAL LOGIC LAB					
Course Code: ECEN2154					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

After successfully completing this course the students 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.

Detailed Syllabus:

Choose any ten experiments out of the twelve suggested next:

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.

Honours Course for 2nd Year 1st Semester

Course Name: PROBABILITY AND STATISTICAL METHODS					
Course Code: MATH2111					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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.

Detailed Syllabus:

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.

Text Books:

1. Richard A Johnson, “Probability and Statistics for Engineers”, Pearson Education.
2. Amritava Gupta, “Groundwork of Mathematical Probability and Statistics”, Academic Publishers.

Reference Books:

1. S.M. Ross, “Introduction to Probability Models”, Elsevier.
2. S.C. Gupta and V.K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons.
3. W. Feller, “An Introduction to Probability theory and its applications”, Vol-I, John Wiley and Sons.

2nd Year 2nd Semester

Course Name: OPERATING SYSTEM CONCEPT					
Course Code: CSBS2201					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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

1. Analyze and differentiate between different types of operating systems (namely, batch, multi programmed, time-sharing, real-time, distributed, parallel processing system) based on their application domains and evolution.
2. Demonstrate and describe system operations, internal structure of computer system and operating system.
3. Design multiprocessing and multithreading environments based on inter-process/thread communication and synchronization.
4. Compare the different level of memory (Primary memory, cache, virtual memory, secondary storage) and how they are correlated to improve the performance of the system.
5. Demonstrate the operations of IO devices and how they are governed by the operating system
6. Discuss the activity and impact of threat, virus, worm and how the system could be protected from them.

Detailed Syllabus:

MODULE – I [9L]

Introduction [2L]: Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.

System Structure [2L]: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, and system calls.

Process and Threads [5L]

Processes [3L]: Concept of processes, operations on processes (creation, maintenance, termination scheduling, communication).

Threads [2L]: Overview, benefits of threads, user and kernel threads, multithreading models and their use.

MODULE – II [14L]

Process Scheduling [2L]: Process scheduling, co-operating processes, inter process communication.

CPU Scheduling [4L]: Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), multilevel queue and feedback queue algorithms, algorithm evaluation, multi-processor scheduling.

Process Synchronization [5L]: Background, critical section problem, algorithms to address critical section problem (two process and multi-process solutions), synchronization hardware, semaphores, classical problems of synchronization and their solutions, deadlock during synchronization, monitor.

Deadlocks [3L]: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

MODULE-III [10L]

Memory Management [4L]: 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, Optimal, MRU, MFU, LFU), allocation of frames, thrashing.

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

MODULE-IV [12L]

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

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

Protection & Security [4L]: Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Text Books:

1. Silbersehatz A. and Peterson J. L., “Operating System Concepts”, Wiley.
2. Tanenbaum A.S., “Operating System Design & Implementation”, Practice Hall NJ.
3. Milenkovie M., “Operating System: Concept & Design”, McGraw Hill.

Reference Books:

1. Dhamdhere, “Operating System”, TMH.
2. Maxwell, “Operating Systems”, McMillan International Editions, 1992.
3. Dietel H. N., “An Introduction to Operating Systems”, Addison Wesley.

Course Name: COMPUTER ORGANIZATION AND ARCHITECTURE					
Course Code: CSBS2202					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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

1. Describe and explain the difference between computer organization and computer architecture.
2. Design the ALU for different arithmetical and logical problems and apply the knowledge of different multiplication and division algorithm.
3. Formulate design methodology for using various types of instructions.
4. Differentiate between different Memory hierarchy(Primary, Secondary, Cache). Able to solve different kind of numerical based on memory technologies and page replacement techniques.
5. Differentiate between types of pipeline, hazards and selecting remedial techniques to handle the hazards. able to distinguish between parallel architectures. Compare performance parameters of pipelines and deduce derivations to demonstrate change in performance parameters when branching is introduced. Able to solve numerical based on pipeline concepts.
6. Comparing techniques of ILP, types of CU, types of shared memory architectures. Distinguish between different multiprocessor architectures, Data Flow architecture, RISC and CISC architecture.

Detailed Syllabus:

MODULE–I [11L]

Introduction to Computer and Computer Arithmetic:

Von Neumann and Harvard Architecture, Computer organization vs Computer Architecture, Instruction format, Addressing modes, Addition and subtraction with signed magnitude, Half adder, Full adder, Ripple carry adder, Carry Look-ahead adder, Multiplication algorithm, Division algorithm, Floating point number representation, IEEE 754 standard and ALU design.

MODULE–II [10L]

Memory Organization and I/O techniques:

Inclusion, coherence and locality properties, Memory Hierarchy, Cache memory organization, Memory replacement policies, Techniques for reducing cache misses, Virtual memory organization, Mapping and management techniques, Modes of transfer, Handshaking and DMA.

MODULE–III [10L]

Pipeline and ILP:

Quantitative techniques in computer design, Introduction to pipeline, Instruction pipeline, Arithmetic pipeline, processor pipeline, Types of Pipeline hazards and its countermeasures, Super-pipeline, Superscalar and VLIW architecture. Introduction to ILP and techniques to improve ILP, Array and Vector processor.

MODULE–IV [11L]

Multiprocessor Architecture and Control Unit:

Taxonomy of parallel architectures, Types of Multiprocessor architectures, Multi Cache inconsistency, Centralized and Distributed shared memory architecture, Memory Consistency models, Cluster computer, Data flow architecture, RISC and CISC architecture. Introduction to Control unit, Hardwired CU and Microprogrammed CU.

Books:

1. Kai Hwang, “Advanced Computer Architecture”.
2. Patterson and Hennessy, “Computer Architecture: A Quantitative approach”.
3. Hwang and Briggs, “Computer Architecture and Parallel processing”.
4. T. K. Ghosh, “Computer Architecture”.
5. Mano, M.M, “Computer System Architecture”, PHI.
6. Hamacher, “Computer Organisation”, McGraw Hill.

Course Name: DESIGN AND ANALYSIS OF ALGORITHMS					
Course Code: CSBS2203					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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

1. Demonstrate how the time complexity of an algorithm is defined and analyze the asymptotic performance of algorithms.
2. Understand basic algorithm designing techniques such as divide and conquer, greedy, dynamic programming, branch and bound, backtracking and analyze them.
3. Explain the graph algorithms such as BFS, DFS, Ford Fulkerson Method, etc and analyze them.
4. Synthesize efficient algorithms in common engineering design situations.
5. Exploration of various research problems in algorithm like NP-hard and NP-complete problems.
6. Explain what an approximation algorithm is, and the benefit of using approximation algorithms.

Detailed Syllabus:

MODULE – I [9L]

Introduction [3L]:

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

Divide and Conquer [2L]:

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

Matrix Manipulation Algorithm [1L]:

Strassen's matrix manipulation algorithm.

Heapsort [2L]:

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

Lower Bound Theory [1L]:

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

MODULE – II [9L]

Graph Traversal Algorithm [5L]:

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

Greedy Method [4L]:

Basic method, Fractional Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm, Dijkstra algorithm for single source shortest path

MODULE – III [11L]

Dynamic Programming [8L]:

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

Network Flow [3L]:

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

MODULE – IV [12L]

Backtracking [4L]:

Basic method, 8 queens problem, Graph coloring problem.

Branch and Bound [2L]:

Basic method, 15 puzzles problem.

Notion of NP-completeness [3L]:

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

Approximation Algorithms [3L]:

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

Text Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”.
2. E.Horowitz and Shani, “Fundamentals of Computer Algorithms”.

Reference Books:

1. A. Aho, J.Hopcroft and J.Ullman, “The Design and Analysis of Algorithms”.
2. D.E.Knuth, “The Art of Computer Programming”.
3. Jon Kleiberg and Eva Tardos, "Algorithm Design".
4. K.Mehlhorn, “Data Structures and Algorithms” - Vol. I & Vol. 2.
5. S.Baase, “Computer Algorithms”.
6. E.M.Reingold, J.Nievergelt and N.Deo, “Combinatorial Algorithms- Theory and Practice”, Prentice Hall, 1997

Course Name: INTRODUCTION TO INNOVATION AND ENTREPRENEURSHIP					
Course Code: CSBS2204					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

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

1. Learn the various aspects of innovation.
2. Identify methods of fostering innovation.
3. Understand the concept and theories of entrepreneurship.
4. Recognize the qualities of entrepreneurs that contribute to their success.
5. Identify social entrepreneurship opportunities.
6. Generate several ideas for potential businesses based on important trends and each student's interests.

Detailed Syllabus:

MODULE–I [10L]

Introduction to innovation

- Creativity, Invention and Innovation
- Necessity of innovation in current business world
- Different types of Innovation
- Relevance of Technology and Innovation
- Adaptability of an innovation
- The Indian Innovations and opportunities

MODULE–II [10L]

Promoting and managing innovation

- Innovators and Imitators
- Patents, Trademarks, Intellectual Property
- Exploring, Executing, Leveraging and renewing innovation
- Strategy for Commercializing Innovation
- Risks and barriers for introducing products and services
- Selecting a Strategy, setting up the Investment and establishing organisation
- Evaluating the Costs and impact of the Project

MODULE–III [10L]

Introduction to Entrepreneurship

- Entrepreneurship in global context–social and economic development
- Opportunity discovery
- IP innovation and Entrepreneurship
- Entrepreneurial attributes/ indicators
- Theories of entrepreneurship
- Characteristics of an entrepreneurial venture, factors affecting entrepreneurial

MODULE–IV [10L]

Social Entrepreneurship

- Social Entrepreneurship opportunities
- Understanding sectoral opportunities for social enterprises
- Science and Technology for Social Change
- Tools and Approaches
- Social entrepreneurship models

Text Books:

1. Robin Lowe and Sue Marriott, "Enterprise: Entrepreneurship and Innovation Concepts, Contexts and Commercialization".
2. John Bessant and Joe Tidd, "Innovation and Entrepreneurship", ISBN: 978-1-118-99309-5, Wiley**.**

Reference Books:

1. Rabindra N. Kanungo, "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
2. Peter F. Drucker, "Innovation and Entrepreneurship", Harper Business Publication. (www.PETER-DRUCKER.com)
3. EDII, "Faculty and External Experts –A Hand Book for New Entrepreneurs", Entrepreneurship Development Institute of India, Ahmadabad, 1986.
4. Philips, Bonefiel and Sharma, "Social Entrepreneurship", Global vision publishing house, New Delhi (2011).

Course Name: MANAGERIAL ECONOMICS					
Course Code: CSBS2205					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

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

1. To appreciate the foundational concepts of managerial economics.
2. To develop a microeconomic approach to business decisions.
3. To arrive at decisions by applying concepts of microeconomics.
4. To apply the tools of managerial economics and find solutions to the complex problems of production processes.
5. To co-relate concepts and theories of microeconomics and macroeconomics.
6. To decide and choose options aimed at furthering the goals of the organization.

Detailed Syllabus:

MODULE-I [9L]

- Managerial Economics: Fundamental Concepts
- Objectives of the Firm; Environment of Business; Economic and Non-Economic Elements and their Interactions
- Decision Making Consumer Behaviour: Utility Analysis; Equi-marginal Utility; Indifference Curve; Consumer Equilibrium
- Demand Decision: Meaning & Types of Demand; Determinants of Demand; Demand Function
- Demand Elasticity Demand Estimation: Methods of Demand Estimation; Demand Forecasting; Types of Demand Forecasting

MODULE-II [10L]

- Production Decisions: Firm's behaviour in short & long run
- Cost Concepts; Cost-Output Relations
- Production Function; Elementary Description, Pricing Decisions: Determinants of Price; Pricing under different market conditions
- Objectives of Pricing under different market structures
- Perfect Competition; Monopoly; Oligopoly; Monopolistic Competition

MODULE-III [10L]

- Monetary Policy: Different Components of Money Supply
- Monetary Theory and Policy in Practice; Interest Rate Policy
- Role of RBI in Monetary Management; Credit Policy
- Financial Institutions Fiscal Policy: Fiscal Imbalance
- Government Expenditure; Plan and Non-Plan Expenditure; Tax Policy and Reforms; Government Borrowings: Domestic and External Commercial Policy
- Foreign Trade Policy; Foreign Exchange Management Act (FEMA)
- External Sector: Balance of Payment and Balance of Trade; Current Account and Capital Account; Trends in Exports and Imports

MODULE-IV [9L]

- Business and Government: Role of Government; Development Strategy
- Industrial Policy; Industries (Development and Regulations) Act, 1951; Industrial Policy Resolution (IPR) 1956
- Monopolies and Restrictive Trade Practices (MRTP) Act 1969
- Five Year Plans; Review of Preceding Five Year Plan; Overview of Latest Five Year Plan Public Sector in India: Role of Public Sector; Organisation of Public Sector; Problems and Prospects of Public Sector
- Economic Reforms: Liberalisation; Privatisation and Globalisation; Assessment of New Economic Reforms

Books:

1. Ahluwalia, I J, "India's economic reforms and development, essays for Manmohan Singh", New Delhi: OUP, 1998.
2. Ahluwalia, Montek S. , "Macroeconomics and Monetary Policy", New Delhi: Oxford University Press, 2002.
3. Ahluwalia, Montek S., "Macroeconomics and Monetary Policy: Issues for a reforming economy", New Delhi: Oxford University Press, 2003.
4. Ahuja, H. L., "Advanced Economic Theory: Microeconomic Theory", Ed 13, New Delhi: S Chand & Co, 2003
5. Bhatia, H. L., "Public Finance", Ed 25th, New Delhi: Vikas Publishing House, 2006.

Course Name: ENVIRONMENTAL SCIENCES					
Course Code: EVSC2016					
Contact Hours per week	L	T	P	Total	Credit Points
	2	-	-	2	-

Course Outcome:

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

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.

Detailed Syllabus:

MODULE-I [6L]
Socio Environmental Impact

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-II [6L]

Air Pollution

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-III [6L]

Water Pollution

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-IV [6L]

Land Pollution

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. Gour Krishna 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.

Reference 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.

Course Name: OPERATING SYSTEM CONCEPT LAB					
Course Code: CSBS2251					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

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

1. Develop and debug programs in UNIX environment.
2. Develop shell scripts to manage the system memory, user, files, and devices.
3. Develop multi-processing and multi-threading environment capable of performing multiple tasks or sub-tasks simultaneously.
4. Apply system calls and signals for user defined purposes
5. Design a synchronized multi-threaded system capable of resource sharing
6. Develop C programs to share information between two process using concepts of IPC.

Detailed Syllabus:

1. **Managing Unix/Linux Operating System [9P]:** Familiarization with LINUX OS and shell commands (commands and filters), Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).

2. **Process [6P]:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.

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

4. **Semaphore [6P]:** Programming with semaphores to solve critical section problems (e.g. producer consumer problem)

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

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

Text Books:

1. Behrouz A. Forouzan, Richard F. Gilberg, “UNIX and Shell Programming”, Thomson, 2003.
2. Brian W. Kernighan, Rob Pike, “The UNIX Programming Environment”, PHI, 1996.
3. K. Srirengan, “Understanding UNIX”, PHI 2002.

Reference Books:

1. Sumitabha Das, “Your UNIX- The Ultimate Guide”, TMGH, 2002.
2. Sumitabha Das, “UNIX Concepts and Applications”, Second Edition, TMGH, 2002.

Course Name: COMPUTER ORGANIZATION AND ARCHITECTURE LAB					
Course Code: CSBS2252					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

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

1. Analyze different types of logic gates and verify K-Maps and truth tables of logic gates.
2. Construct adder and subtractor circuits and defend the obtained truth tables and K-maps via TBW.
3. Design and construct Multiplexer circuits and defend the obtained truth tables and K-maps.
4. Design and construct different converters and ALU circuits and defend the obtained truth tables and K-maps via TBW.
5. Design horizontal and vertical expansion of RAM and compare their results from obtained truth tables.
6. Design seven segment display and defend the obtained truth tables.

Detailed Syllabus:

1. Logic gates
    2. Adders: Half-Adder, Full Adder
    3. Subtractors: Half Substractor, Full Substractor
    4. Horizontal and vertical expansion of RAM
    5. Combinational circuit designs
        a. Multiplexers: 4:1 and 8:1, 8:1 using 4:1 and 2:1
        b. Code Converters: 4-bit binary to gray, 4-bit gray to binary
        c. 7-segment display
        d. ALU

Books:

1. David E. Van, Den Bout, “The Practical Xilinx Designer Lab Book”, Version 1.5, Prentice Hall.
2. Denton Dailey, “Programmable Logic Fundamentals Using Xilinx ISE”, Prentice Hall.
3. Karen Parnell, Nick Mehta, “Programmable Logic Design Quick Start Hand Book”, Xilinx Corporation.

Course Name: DESIGN AND ANALYSIS OF ALGORITHMS LAB					
Course Code: CSBS2253					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

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

1. Analyze a problem and design a solution for the problem, following an algorithmic design paradigm.
2. Reconstruct the solution to a problem to achieve optimum solution in terms of time complexity.
3. Design and implement an algorithm using the technique of divide-and-conquer and greedy method.
4. Design and implement different Graph traversal algorithms (BFS and DFS).
5. Solve different problem using the technique of backtracking and branch and bound algorithms.
6. Solve different problem using the technique of dynamic programming algorithms.

Detailed Syllabus:

Programming Language used: C

Lab:1 : Divide and Conquer:

Implement Binary Search using Divide and Conquer approach
Implement Merge Sort using Divide and Conquer approach

Lab:2 : Divide and Conquer:

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

Lab:3 : Graph Traversal Algorithm:

Implement Breadth First Search (BFS)
Implement Depth First Search (DFS)

Lab:4 : Greedy method(implement any one of the following problems):

Knapsack Problem
Job sequencing with deadlines

Lab:5 : Greedy method (implement any two of the following problems):

Minimum Cost Spanning Tree by Prim's Algorithm
Minimum Cost Spanning Tree by Kruskal's Algorithm
Single Source shortest Path for a graph (Dijkstra)

Lab:6 : Dynamic Programming:

Find the minimum number of scalar multiplication needed for chain of matrix

Lab:7 : Dynamic Programming:

Implement all pair of Shortest path for a graph (Floyed- Warshall Algorithm)
Implement Traveling Salesman Problem

Lab:8: Dynamic Programming:

Implement Single Source shortest Path for a graph (Bellman Ford Algorithm)

Lab:9 : Backtracking:

Implement 8 Queen Problem

Lab:10 : Backtracking:

Graph Coloring Problem

Lab:11 : Brunch and Bound:

Implement 15 Puzzle Problem

Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”.
2. A. Aho, J.Hopcroft and J.Ullman “The Design and Analysis of Algorithms”.
3. E.Horowitz and Shani, “Fundamentals of Computer Algorithms”.
4. Y. Kanetkar, “Let Us C”.
5. B. S. Gottfried, “Programming with C”.
6. B.W. Kernighan and D. M. Ritchie, “The C Programming Language”.