Heritage Institute of Technology

(An Autonomous Institute under MAKAUT)

Department of Computer Science and Business Systems

B. Tech. Course

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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 Honours			**3**	**0**	**2**	**5**	**4**	
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 Honours			**3**	**0**	**2**	**5**	**4**	
Total of Semester with Honours			**15**	**2**	**15**	**32**	**24.5**	

2nd Year

3rd Semester Syllabus:

Theory							
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points
			L	T	P	Total	
1	CSBS2101	Data Structure & Algorithms	4	0	0	4	4
2	CSEN2102	Discrete Mathematics	4	0	0	4	4
3	CSBS2104	Introduction to Innovation, IP Management & Entrepreneurship	3	0	0	3	3
4	ECEN2104	Digital Logic	3	0	0	3	3
5	HMTS2001	Human Values and Professional Ethics	3	0	0	3	3
Total Theory			**17**	**0**	**0**	**17**	**17**

Laboratory							
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points
			L	T	P	Total	
1	CSBS2151	Data Structure & Algorithms lab	0	0	3	3	1.5
2	CSBS2153	IT Workshop Skylab / Matlab	0	0	3	3	1.5
3	ECEN2154	Digital Logic Lab	0	0	2	2	1
Total Laboratory			**0**	**0**	**8**	**8**	**4**
Total of Semester without Honours			**17**	**0**	**8**	**25**	**21**
1	MATH2111	Probability and Statistical Methods	4	0	0	4	4
Total Honours			**4**	**0**	**0**	**4**	**4**
Total of Semester with Honours			**21**	**0**	**8**	**29**	**25**

4th Semester Syllabus:

Theory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSBS2201	Design & Analysis of Algorithms	4	0	0	4	4
2	CSBS2202	Computer Organization and Architecture	4	0	0	4	4
3	CSBS2203	Operating Systems	3	0	0	3	3
4	MATH2204	Computational Statistics	3	0	0	3	3
5	CSBS2204	Software Design with UML	2	0	0	2	2
6	EVSC2016	Environmental Sciences (MANDATORY)	2	-	-	2	-
Total Theory			**18**	**0**	**0**	**18**	**16**

Laboratory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSBS2251	Design & Analysis of Algorithms lab	0	0	3	3	1.5
2	CSBS2252	Computer Architecture lab	0	0	2	2	1
3	CSBS2253	Operating Systems lab	0	0	3	3	1.5
4	CSBS2254	Design Lab with UML	0	0	2	2	1
5	MATH2254	Computational Statistics lab	0	0	2	2	1
Total Laboratory			**0**	**0**	**12**	**12**	**6**
Total of Semester			**18**	**0**	**12**	**30**	**22**

3rd Year

5th Semester Syllabus:

Theory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSBS3101	Database Management Systems	4	0	0	4	4
2	CSEN3102	Formal Language & Automata Theory	4	0	0	4	4
3	CSBS3103	Object Oriented Programming	4	0	0	4	4
4	CSBS3104	Business Strategy	3	0	0	3	3
5	CSBS3131 - CSBS3140	Professional Elective – I	3	0	0	3	3
	CSBS3132 CSBS3133 CSBS3135 CSBS3136 CSBS3137	Data Mining & Knowledge Discovery Web Technologies Big Data Conversational Systems Cloud, Microservices & Application					
Total Theory			**18**	**0**	**0**	**18**	**18**

Laboratory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**L**	**L**	**L**	
1	CSBS3151	Database Management Systems lab	0	0	3	3	1.5
2	CSBS3153	Object Oriented Programming lab	0	0	3	3	1.5
Total Laboratory			**0**	**0**	**6**	**6**	**3**
Total of Semester without Honours			**18**	**0**	**6**	**24**	**21**
1	CSEN3111	Artificial Intelligence	3	0	0	3	3
2	CSEN3161	Artificial Intelligence lab	0	0	2	2	1
Total Honours			**3**	**0**	**2**	**5**	**4**
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**
			L	**T**	**P**	**Total**	
1	CSBS3201	Software Engineering	4	0	0	4	4
2	CSBS3202	Computer Networks	4	0	0	4	4
3	HMTS3201	Economics for Engineers	3	0	0	3	3
4	CSBS3231- CSBS3240	Professional Elective-II	3	0	0	3	3
	CSBS3231 CSBS3232 CSBS3233 CSBS3236 CSBS3237	Advanced Operating System Advanced Java Programming Machine Learning Usability Design of Software Applications Introduction to IoT					
5		Open Elective-I	3	0	0	3	3
	AEIE3221 ECEN3222 MATH3221 CSBS3221	Introduction to Sensors Designing with Processors and Controllers Computational Mathematics Human Resource Management					
6	INCO3016	Constitution of India / Essence of Indian Traditional Knowledge (MANDATORY)	2	-	-	2	-
Total Theory			**19**	**0**	**0**	**19**	**17**

Laboratory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1.	CSBS3251	Software Engineering lab	0	0	3	3	1.5
2.	CSBS3252	Computer Networks lab	0	0	3	3	1.5
Total Laboratory			**0**	**0**	**6**	**6**	**3**

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

4th Year

7th Semester Syllabus:

Theory							
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
2	CSBS4131-CSBS4140	Professional Elective-III	3	0	0	3	3
	CSBS4131 CSBS4132 CSBS4133 CSBS4135 CSBS4136	Soft Computing Cryptography & Network Security Image Processing Information Retrieval Cognitive Science & Analytics					
3		Open Elective-II	3	0	0	3	3
	AEIE4122 CHEN4121 CHEN4122 ECEN4122 MATH4121 HMTS4124	Linear Control Systems and Applications Industrial Total Quality Management Industrial Pollution Control Error Control Coding Methods in Optimization Financial Management					
4		Open Elective-III	3	0	0	3	3
	AEIE4127 MATH4122 BIOT4123 CHEN4123 HMTS4125	Introduction to Embedded System Advanced Linear Algebra Biosensor Statistical Methods in Design of Experiments Marketing Research & Marketing Management					
Total Theory			**12**	**0**	**0**	**12**	**12**

Sessional							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSBS4191	Industrial Training / Internship	-	-	-	-	2
2	CSBS4195	Project-I	0	0	8	8	4
Total Sessional			**0**	**0**	**8**	**8**	**6**
Total of Semester without Honours			**12**	**0**	**8**	**20**	**18**
1	CSEN4111	Complier Design	3	0	0	3	3
2	CSEN4161	Complier Design lab	0	0	2	2	1
Total Honours			**3**	**0**	**2**	**5**	**4**
Total of Semester with Honours			**15**	**0**	**10**	**25**	**22**

8th Semester Syllabus:

Theory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSBS4231-CSBS4240	Professional Elective-IV	3	0	0	3	3
	CSBS4232 CSBS4233 CSBS4235 CSBS4236 CSBS4137	Mobile Computing Pattern Recognition Social Network Analysis Computer Vision Services Science & Service Operational Management					
2	CSBS4241-CSBS4250	Professional Elective-V	3	0	0	3	3
	CSBS4242 CSBS4244 CSBS4245 CSBS4246 CSBS4247 CSBS4248	Natural Language Processing Real Time & Embedded System Quantum Computing Robotics IT Project Management Enterprise Systems					
3		Open Elective-IV	3	0	0	3	3
	AEIE4221 BIOT4222 CHEN4221 HMTS4224 HMTS4225 HMTS4226	Process Instrumentation Non-conventional Energy Nanotechnology Psychology Behavioral Economics Advanced Finance					
Total Theory			**9**	**0**	**0**	**9**	**9**

Sessional							
1	CSBS4295	Project-II	0	0	16	16	8
2	CSBS4297	Comprehensive Viva-voce	-	-	-	-	1
Total Sessional			**0**	**0**	**16**	**16**	**9**
Total of Semester			**9**	**0**	**16**	**25**	**18**

Credit points distribution

Sl. No.	Category	**CSBS**
1	Humanities and Social Sciences including Management Courses	**12**
2	Basic Science Courses	**23**
3	Engineering Science Courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer, etc.	**28**
4	Professional Core Courses	**53**
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	CSEN3111	Artificial Intelligence	3	0	0	3
7.		CSEN3161	Artificial Intelligence lab	0	0	2	1
8.	7th	CSEN4111	Complier Design	3	0	0	3
9.		CSEN4161	Complier Design 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, reaction dynamics, electrochemistry, structure and reactivity 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. Atkins' Physical Chemistry, P.W. Atkins (10th Edition).
2. Organic Chemistry, I. L. Finar, Vol-1 (6th Edition).
3. Engineering Chemistry, Jain & Jain,(16th Edition).
4. Fundamental Concepts of Inorganic Chemistry, A. K. Das, (2nd Edition).
5. Engineering Chemistry -I, Gourkrishna Dasmohapatra, (3rd Edition).

Reference Books

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

Course Name: MATHEMATICS – I					
Course Code: MATH1101					
Contact 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's type.

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

MODULE-IV [10L]
Calculus of functions of several variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Determination of partial derivatives of higher orders with examples, Homogeneous functions and Euler's theorem and related problems up to three variables.
Multiple Integration: Concept of line integrals, Double and triple integrals. Green's Theorem, Stoke's Theorem and Gauss Divergence Theorem.

Books

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

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

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

Reference Books

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

Course Name: CHEMISTRY –I LAB					
Course Code: CHEM1051					
Contact	L	T	P	Total	Credit Points
Hours per week	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. Vogel's Textbook of Quantitative Chemical Analysis-G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney.
2. Advanced Practical Chemistry- S. C. Das.
3. Practicals in Physical Chemistry- P. S. Sindhu.

Course Name: BASIC ELECTRICAL ENGINEERING LAB					
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

A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, 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. Elementary Engineering Drawing,Bhatt, N.D., Panchal V.M. & Ingle P.R.,(2014),Charotan Publishing House.
2. Engineering Graphics Narayana, K.L. and Kannaaiah,P ,TMH.
3. Engineering Graphics,Lakshminarayanan, V. and Vaish Wanar, R.S, Jain Brothers.
4. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C. (2008), Pearson Education.
5. Engineering graphics, Agarwal B. & Agarwal C. M. (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 English to form derivatives
- 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. Communication Skills, Kumar,S. & Lata, P. OUP, New Delhi2011
2. Effective Technical Communication, Rizvi, Ashraf,M. 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. The Cambridge guide to Teaching English to Speakers of Other Languages Carter, R. And Nunan, D. (Eds), CUP, 2001.
2. Writing and Speaking At Work: A Practical Guide for Business Communication, Edward P. Bailey, Prentice Hall, 3rd Ed., 2004.
3. Guide to Managerial Communication: Effective Business Writing and Speaking, Munter, M., Prentice Hall, 5th Ed., 1999.
4. Job Readiness For IT & ITES- A Placement and Career Companion, R. Anand, McGraw Hill Education.2015.
5. Campus Placements, Malhotra, A., McGraw Hill Education.2015.

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

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

Course Name: PROGRAMMING FOR PROBLEM SOLVING					
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. Schaum's outline of Programming with C – Byron Gottfried.
2. Teach Yourself C- Herbert Schildt.
3. Programming in ANSI C – E Balagurusamy.

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

Course Name: BUSINESS ENGLISH					
Course Code: 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 ofa Business letter, Business Letter Formats, Style and Tone, Writing strategies.

Organizational Communication: Agenda & minutes of a meeting, Notice, Memo, Circular
Organizing e-mail messages, E-mail etiquette

Job Application Letter: Responding to Advertisements and Forced Applications, Qualities of well-written Application Letters: The You-Attitude, Length, Knowledge of Job Requirement, Reader-Benefit Information, Organization, Style, Mechanics – Letter Plan: Opening Section, Middle Section, Closing Section

Resume and CV: Difference, Content of the Resume – Formulating Career Plans: Self Analysis, Career Analysis, Job Analysis, Matching Personal Needs with Job Profile – Planning your Resume – Structuring the Resume: Chronological Resume, The Functional Resume, Combination of Chronological and Functional Resume, Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honors and Achievements, Personal Profile, Special Interests, References

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

Course Name: PHYSICS – I LAB					
Course Code: PHYS1051					
Contact	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. Optics – Eugene Hecht Pearson Education India Private Limited.
2. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited.
3. Waves and Oscillations by N.K. Bajaj.
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley.
5. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press.
6. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education.
7. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education.
8. Optics, Ghatak, McGraw Hill Education India Private Limited.
9. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – C.L.Arora.

Course Name: PROGRAMMING FOR PROBLEM SOLVING LAB					
Course Code: 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. Schaum's outline of Programming with C – Byron Gottfried.
2. Teach Yourself C- Herbert Schildt.
3. Programming in ANSI C – E Balagurusamy.

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 or more of the techniques covered above.

Books

1. Elements of Workshop Technology,Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

2. Manufacturing Engineering and Technology Kalpakjian S. And Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.

3. Manufacturing Technology – I,Gowri P. Hariharan and A. Suresh Babu,Pearson Education, 2008.

4. Processes and Materials of Manufacture,Roy A. Lindberg, 4th edition, Prentice Hall India, 1998.

5. Manufacturing Technology Rao P.N., 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 superficiallistening, Projective Listening, Sensitive or Empathetic Listening, Active or Attentive listening.
- Guidelines for Effective Listening
- Barriers to Effective Listening
- Listening Comprehension

MODULE – II [8HRS]

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

MODULE – III [6hrs]

- Public Speaking: The Speech 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. The Cambridge guide to Teaching English to Speakers of Other Languages, Carter, R. And Nunan, D. (Eds), CUP, 2001.
2. Writing and Speaking At Work: A Practical Guide for Business Communication, Edward P. Bailey, Prentice Hall, 3rd Ed., 2004.
3. Guide to Managerial Communication: Effective Business Writing and Speaking, Munter, M., Prentice Hall, 5th Ed., 1999.
4. Communication and Language Skills, Sen, S.,Mahendra,A. &Patnaik,P., Cambridge University Press, 2015.
5. Business and Administrative Communication Locker,Kitty O McGraw-Hill/ Irwin.
6. Intercultural Business Communication. Chaney,L.andMartin,J., 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 semiconductor materials based on their energy bands and analyze the characteristics of those materials for different doping concentrations based on previous knowledge on semiconductors acquired.

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

3. Design different application specific circuits associated with diodes operating both in forward and reverse bias.

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

5. Categorize different field-effect transistors based on their constructions, physics and working principles and solve problems associated with analog circuits based on operational amplifiers.

6. Design and implement various practical purpose electronic circuits and systems meant for both special purpose and general purpose and anlayze their performance depending on the type of required output and subsequently the applied input.

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.

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.