PART- I

Structures of Syllabus

Heritage Institute of Technology

Anandapur, Kolkata – 700107

Structures of Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Document Release Month & Year: April, 2019

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 HIT**	**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	Advanced Language Lab	0	0	2	2	1	Honours Course
Total of Semester with Honours			**13**	**3**	**11**	**27**	**21.5**	

2nd Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			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								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			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 Practices Lab	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

3rd Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	CSEN2102	Discrete Mathematics	4	0	0	4	4	Engineering Science Course
2	ECEN2101	Analog Circuits	3	0	0	3	3	Engineering Science Course
3	ECEN2002	Digital Systems Design	3	0	0	3	3	Engineering Science Course
4	HMTS2001	Human Values And Professional Ethics	3	0	0	3	3	Humanities & Social Sciences including Management Courses
5	INFO2101	Fundamentals of Data structure & Algorithms	3	1	0	4	4	Professional Core Courses
6	EVSC2016	Environmental Sciences	2	0	0	2	0	Mandatory Courses
		Total Theory	**18**	**1**	**0**	**19**	**17**	

Laboratory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	ECEN2151	Analog Circuits Lab	0	0	2	2	1	Engineering Science Course
2	ECEN2052	Digital Systems Design Lab	0	0	2	2	1	Engineering Science Course
3	INFO2151	Fundamentals of Data structure & Algorithms Lab	0	0	3	3	1.5	Professional Core Courses
		Total Laboratory	**0**	**0**	**7**	**7**	**3.5**	
Total of Semester without Honours			**18**	**1**	**7**	**26**	**20.5**	

1	INFO2111	Information Theory & coding	4	0	0	4	4	Honours Course
Total of Semester with Honours			22	1	7	30	24.5	

4th Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	MATH2201	Algebraic Structures	3	1	0	4	4	Basic Science course
2	INFO2201	Formal Language & Automata Theory	3	0	0	3	3	Professional Core Courses
3	INFO2202	Object Oriented Programming	3	0	0	3	3	Professional Core Courses
4	INFO2203	Computer Organization and Architecture	4	0	0	4	4	Professional Core Courses
5	INFO2204	Database Management Systems	4	0	0	4	4	Professional Core Courses
		Total Theory	**17**	**1**	**0**	**18**	**18**	

Laboratory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO2252	Object Oriented Programming Lab	0	0	3	3	1.5	Professional Core Courses
2	INFO2253	Computer Organization & Architecture Lab	0	0	3	3	1.5	Professional Core Courses
3	INFO2254	Database Management Systems Lab	0	0	3	3	1.5	Professional Core Courses
		Total Laboratory	**0**	**0**	**9**	**9**	**4.5**	
Total of Semester			**17**	**1**	**9**	**27**	**22.5**	

3rd Year

5th Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO3101	Advanced Java & Web Technology	3	0	0	3	3	Professional Core Courses
2	INFO3102	Operating Systems	3	0	0	3	3	Professional Core Courses
3	INFO3103	Design & Analysis of Algorithms	4	0	0	4	4	Professional Core Courses
4	INFO3104	Data Analytics & Big Data	3	0	0	3	3	Professional Core Courses
5	INFO3131/ INFO3132/ INFO3133	Elective I	3	0	0	3	3	Professional Elective courses
6	INCO3016	Indian Constitution And Civil Society	2	0	0	2	0	Mandatory Courses
		Total Theory	**18**	**0**	**0**	**18**	**16**	

Laboratory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO3151	Advanced Java & Web Technology Lab	0	0	4	4	2	Professional Core Courses
2	INFO3152	Operating Systems Lab	0	0	3	3	1.5	Professional Core Courses
3	INFO3153	Design & Analysis of Algorithms Lab	0	0	4	4	2	Professional Core Courses
4	INFO3154	Data Analytics Lab using Python	0	0	3	3	1.5	Professional Core Courses
		Total Laboratory	**0**	**0**	**14**	**14**	**7**	
Total of Semester			**18**	**0**	**14**	**32**	**23**	

Elective I (5th Sem)

1. INFO3131 - Computer Graphics
2. INFO3132 - Multimedia Technology & Application
3. INFO3133 - Compiler Design

6th Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	HMTS3201	Economics For Engineers	3	0	0	3	3	Humanities & Social Sciences including Management Courses
2	INFO3201	Computer Networks	3	0	0	3	3	Professional Core Courses
	INFO3202	Software Engineering	3	0	0	3	3	Professional Core Courses
3	INFO3231/ INFO3232/ INFO3233	Elective II	3	0	0	3	3	Professional Elective courses
4	MATH3223/ ELEC3121/ ECEN3222	Open Elective I	3	0	0	3	3	Open Elective courses
		Total Theory	**15**	**0**	**0**	**15**	**15**	

Laboratory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO3251	Computer Networks Lab	0	0	3	3	1.5	Professional Core Courses
2	INFO3252	Software Engineering Lab	0	0	3	3	1.5	Professional Core Courses
		Total Laboratory	**0**	**0**	**6**	**6**	**3**	

Sessional								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO3293	Term paper and Seminar	0	0	4	4	2	Seminar
		Total Sessional	**0**	**0**	**4**	**4**	**2**	
Total of Semester without Honours			**15**	**0**	**10**	**25**	**20**	
1	INFO3211	Artificial Intelligence	4	0	0	4	4	Honours Course
Total of Semester with Honours			**19**	**0**	**10**	**29**	**24**	

Elective II(6th Sem)	**Open Elective I(6th Sem)**
1. INFO3231 – Advanced Database Management System 2. INFO3232 – E-Commerce & ERP 3. INFO3233 – Machine Learning	1. MATH3223 – Scientific Computing 2. ELEC3121 – Fundamentals of Circuit Theory 3. ECEN3222 – Designing with Processors and Controllers

** Open Elective I offered by IT Department is: **E Commerce & ERP (INFO3221)**

4th Year

7th Semester 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	INFO4131/ INFO4132/ INFO4133/ INFO4134	Elective III	3	0	0	3	3	Professional Elective courses
3	MATH4121/ ELEC4121/ AEIE4122	Open Elective II	3	0	0	3	3	Open Elective courses
4	ECEN4126/ ECEN4127/ AEIE4127/ BIOT4124	Open Elective III	3	0	0	3	3	Open Elective courses
		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	INFO4195	Project I	0	0	8	8	4	Project
2	INFO4191	Industrial Training Evaluation	0	0	0	0	2	Internship in industry or elsewhere
		Total Sessional	**0**	**0**	**8**	**8**	**6**	
Total of Semester without Honours			**12**	**0**	**8**	**20**	**18**	
1	INFO4111	Digital Image Processing	4	0	0	4	4	Honours Course
Total of Semester with Honours			**16**	**0**	**8**	**24**	**22**	

Elective III(7th Sem) 1. INFO4131 – Soft Computing 2. INFO4132 – Cloud Computing 3. INFO4133 – Mobile Computing 4. INFO4134 – Real Time Systems	**Open Elective II(7th Sem)** 1. MATH4121 – Methods in Optimization 2. ELEC4121 – Automatic Control System 3. AEIE4122 - Linear Control Systems and Applications
	Open Elective III(7th Sem) 1. ECEN4126 – Ad Hoc Networks and Security Challenges 2. ECEN4127 - Introduction to VLSI Design 3. AEIE4127 – Introduction to Embedded System 4. BIOT4124 - Bio Sensor

** Open Elective III offered by IT Department is: **Fundamentals of Cloud Computing (INFO4121)**

8th Semester Syllabus:

Theory								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO4231/ INFO4232/ INFO4233	Elective IV	3	0	0	3	3	Professional Elective courses
2	INFO4241/ INFO4242/ INFO4243	Elective V	3	0	0	3	3	Professional Elective courses
3	BIOT4221/ AEIE4222/ ECEN4222/ BIOT4026	Open Elective IV	3	0	0	3	3	Open Elective courses
		Total Theory	**9**	**0**	**0**	**9**	**9**	

Sessional								Type of Paper
Sl. No	Course Code	Course Name	Contact Hrs per Week				Credit Points	
			L	T	P	Total		
1	INFO4295	Project II	0	0	16	16	8	Project
2	INFO4297	Comprehensive Viva Voce	0	0	0	0	1	Project work, seminar and internship in industry or elsewhere
		Total Sessional	**0**	**0**	**16**	**16**	**9**	
Total of Semester			**9**	**0**	**16**	**25**	**18**	

Elective IV(8th Sem)	**Open Elective IV(8th Sem)**
1. INFO4231 –Blockchain Technology and its Application 2. INFO4232 –Internet Technology 3. INFO4233 –Distributed Computing	1. BIOT4221 – Computational Biology 2. AEIE4222 – Medical Instrumentation 3. ECEN4222 – Optical Fiber Communication 4. BIOT4026 - Biology for Engineers
Elective V(8th Sem) 1. INFO4241 - Cryptography and Network Security 2. INFO4242 – Internet of Things and its applications 3. INFO4243 – Pattern Recognition	

** Open Elective IV offered by IT Department is: **Fundamentals of Cryptography (INFO4221)**

Credit points distribution

Sl. No	Category	As per AICTE	**IT**
1	Humanities and Social Sciences including Management courses	12*	**12**
2	Basic Science courses	25*	**23**
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	24*	**28.5**
4	Professional core courses	48*	**52.5**
5	Professional Elective courses relevant to chosen specialization/branch	18*	**15**
6	Open subjects – Electives from other technical and /or emerging subjects	18*	**12**
7	Project work, seminar and internship in industry or elsewhere	15*	**17**
8	Honours Course	-	**20**
9	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)	**2 non credit subjects**
	Total	160	**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	Advanced Language 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	INFO 2111	Information Theory & Coding	4	0	0	4
6.	4th						
7.	5th						
8.	6th	INFO3211	Artificial Intelligence	4	0	0	4
9.	7th	INFO4111	Digital Image Processing	4	0	0	4
10.	8th						
	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.
- ✓ For any additional information, the student may contact the concerned HODs.

Swayam/MOOCs courses recommended to the students of IT Department

Code	Name	Credit Points	Corresponding Online Course	Offered by	PLATFORM
ECEN1011	Basic Electronics	3	Fundamentals of Semiconductor Devices	IISc Bangalore	NPTEL
ECEN 1061	Basic Electronics Lab	1			
HMTS1011	Communication for Professionals	3	Effective Business Communication **AND**	IIM Bangalore	Swayam
HMTS1061	Professional Communication Lab	1	Developing Soft Skills and Personality	IIT Kanpur	Swayam
INFO3211	Artificial Intelligence	4	Fundamentals of Artificial Intelligence	IIT Guwahati	NPTEL
INFO4111	Digital Image Processing	4	Digital Image Processing	IIT Kharagpur	NPTEL

Heritage Institute of Technology

Anandapur, Kolkata – 700107

PART- II

Detailed Syllabus

Heritage Institute of Technology

Anandapur, Kolkata – 700107

Detailed Syllabus

Department Name: Information Technology

Programme Name: B. Tech.

Document Release Month & Year: April, 2019

1st Year 1st Semester

Course Name: CHEMISTRY-1					
Course Code: CHEM1001					
Contact	L	T	P	Total	Credit Points
Hours per week	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. The course outcomes of the subject are

1. Knowledge of understanding the operating principles and reaction involved in batteries and fuel cells and their application in automobiles as well as other sectors to reduce environmental pollution.

2. An ability to analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.for engineering applications.

3. Have knowledge of synthesizing nano materials and their applications in industry, carbon nano tube technology is used in every industry now-a-days.

4. Understanding of bulk properties and processes using thermodynamic considerations.

5 Elementary knowledge of IR, UV, NMR and X-ray spectroscopy is usable in structure elucidation and characterisation of various molecules.

6. Knowledge of electronic effect and stereochemistry for understanding mechanism of the major chemical reactions involved in synthesis of various drug molecules.

MODULE – 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.

Reference 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. 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 attending the course, the students will be able to

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

Module – I [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: CHEM 1051					
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. The course outcomes of the subject are

1. Knowledge to estimate the hardness of water which is required to determine the usability of water used in industries.
2. Estimation of ions like 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 KmnO4 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)

Reference Books

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

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

Course Outcome:

The students are expected to

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

List of Experiments:

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

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

Course Outcome:

After going through the course, the students will be able

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

Lecture Plan (13 L)

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

Detailed contents of Lab hours (52 hrs)

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

(4 hrs + 4 hrs)

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

(4 hrs+4 hrs + 4 hrs)

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views.

(4 hrs + 4 hrs)

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

(4 hrs)

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

(4 hrs + 4 hrs)

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

(4 hrs)

Module 7: 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;

(2 hrs)

Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation.

(2 hrs)

Module 6: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame.

(4 hrs)

Reference 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. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.
5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, 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:

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.

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

Reference Books

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

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

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

Course Name: ADVANCED LANGUAGE LAB					
Course Code: HMTS1061					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

Students will be skilled in the following areas:

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

Module – I [4hrs]

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

Module – II [6hrs]

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

Module – III [6hrs]

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

Module – IV [10hrs.]

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

Reference 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 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

Reference 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:

1. To develop basic understanding of the modern science to the technology related domain.

2. Analytical & logical skill development through solving problems.

3. To impart idea of concise notation for presenting equations arising from mathematical formulation of physical as well as geometrical problems percolating ability of forming mental pictures of them.

4. Imparting the essence and developing the knowledge of controlling distant object like satellite, data transfer through optical fiber, implication of laser technology, handling materials in terms of their electrical and magnetic properties etc.

5. To understand how the systems under force field work giving their trajectories which is the basic of classical Field theory.

6. To impart basic knowledge of the electric and magnetic behavior of materials to increase the understanding of how and why electronic devices work .

Module - I : Mechanics (7+5)= 12L

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

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

Module – 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.

Reference 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

Course Outcome:

1. Understand and remember functions of the different parts of a computer.

2. Understand and remember how a high-level language (C programming language, in this course) works, different stages a program goes through.

3. Understand and remember syntax and semantics of a high-level language (C programming language, in this course).

4. Understand how code can be optimized in high-level languages.

5. Apply high-level language to automate the solution to a problem.

6. Apply high-level language to implement different solutions for the same problem and analyze why one solution is better than the other.

Module – I [10L]
Fundamentals of Computer
History of Computers, Generations of Computers, Classification of Computers. Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Basic Concepts of Assembly language, High level language, Compiler and Assembler. Binary & Allied number systems (decimal, octal and hexadecimal) with signed and unsigned numbers (using 1's and 2's complement) - their representation, conversion and arithmetic operations. Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation (half- 16 bit, full- 32 bit, double- 64 bit). Basic concepts of operating systems like MS WINDOWS, LINUX How to write algorithms & draw flow charts.

Module – II [10L]
Basic Concepts of C

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

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

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

Module – III [10L]
Program Structures in C
Basic of functions, function prototypes, functions returning values, functions not returning values. Storage classes - auto, external, static and register variables – comparison between them. Scope, longevity and visibility of variables. C preprocessor (macro, header files), command line arguments.

Arrays and Pointers: One dimensional arrays, pointers and functions – call by value and call by reference, array of arrays. Dynamic memory usage– using malloc(), calloc(), free(), realloc(). Array pointer duality. String and character arrays; C library string functions and their use.

Module – IV [10L]
Data Handling in C

User defined data types and files:
Basic of structures; structures and functions; arrays of structures.

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

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

Course Outcome:

The learner will

1. Acquire competence in using English language to communicate.
2. Be aware of the four essential skills of language usage-listening, speaking, reading and writing.
3. Be adept at using various modes of written communication at work.
4. Attain the skills to face formal interview sessions.
5. Write reports according to various specifications.
6. Acquire the skill to express with brevity and clarity

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

Reference 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 Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

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

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

Group 1: Experiments in General Properties of matter

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

Group 2: Experiments in Optics

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

Group 3: Electricity & Magnetism experiments

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

Group 4: Quantum Physics Experiments

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

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 completion of this course the students should be able:

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

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

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 LAB					
Course Code: MECH1051					
Contact Hours per week	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcome:

Upon completion of this course

1. The students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

2. The students will be able to fabricate components with their own hands.

3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

4. By assembling different components, they will be able to produce small devices of their interest.

5. The students will be able to describe different components and processes of machine tools.

6. The students will be able to apply the knowledge of welding technology and they can perform arc and gas welding to join the material.

(i) Lectures & videos: (13 hours)

Detailed contents

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

(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.

Reference Books

(i) 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.

(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

(iii)Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

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

(v) 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:

The learner will

i) Acquire the techniques to become an effective listener.
ii) Acquire the skill to become an effortless speaker.
iii) Organize and present information for specific audience.
iv) Communicate to make a positive impact in professional and personal environment.
v) Engage in research and prepare authentic, formal, official documents.
vi) Acquire reading skills for specific purpose.

Module – I [4hrs]

Listening Skills

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

Module – II [8hrs]

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

Module – III [6hrs]

- Public Speaking: 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

Reference 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.andMartin,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 Outcome:

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

1) Categorize different semiconductor materials based on their energy bands and analyze the characteristics of those materials for different doping concentrations based on previous knowledge on semiconductors acquired.

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

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

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

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

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

Module – I [10 L]
Basic Semiconductor Physics:
Crystalline materials, Energy band theory, Conductors, Semiconductors and Insulators, Concept of Fermi Energy level, intrinsic and extrinsic semiconductors, drift and diffusion currents in semiconductor

Diodes and Diode Circuits:
Formation of p-n junction, Energy Band diagram, forward & reverse biased configurations, V-I characteristics, load line, breakdown mechanisms, Zener Diode and its Application. Rectifier circuits: half wave & full wave rectifiers: ripple factor, rectification efficiency.

Module – II [8 L]
Bipolar Junction Transistors (BJT):
PNP & NPN BJT structures, current components in BJT, CE, CB, CC configurations, V-I Characteristics of CB & CE modes, regions of operation, Base width modulation & Early effect, thermal runaway, Concept of Biasing: DC load line, Q-point, basics of BJT amplifier operation, current amplification factors, different biasing circuits: fixed bias, collector to base bias, voltage divider bias.

Module – III [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 [9 L]
Feedback in amplifiers:
Concept of feedback, advantages of negative feedback (qualitative), Barkhausen criteria.

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

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

Reference 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:

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

List of Experiments

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.

2nd Year 1st SEMESTER

Course Name: DISCRETE MATHEMATICS					
Course Code: CSEN2102					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcome:

After completing the course the student will be able to:

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

Module I: [10L]

Graph Theory:

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

Module II: [10L]

Number Theory:

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

Module III: [10L]
Combinatorics:

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

Module IV: [10L]
Propositional Calculus:

- Propositions, Logical Connectives, Truth Tables
- Conjunction, Disjunction, Negation, Implication
- Converse, Contrapositive, 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

Reference Books

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

Course Name: ANALOG CIRCUITS					
Course Code: ECEN2101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

After completing the course the student will be able to:

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

MODULE 1: Analog Signals and Devices [9L]

Basic concepts and device biasing [5L]:

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

Small Signal analysis of Amplifiers [4L]:

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

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

Frequency Responses of Amplifiers [2L]:

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

Feedback & Oscillator Circuits [7L]:

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

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

Fundamentals of OPAMP [4L]:

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

Applications of OPAMP [3L]:

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

MODULE 4: Analog Circuit Applications [7L]

Power Amplifiers [4L]:
Concepts and operations of Class A, B and AB amplifiers; Calculation of DC power, AC power and efficiency of these amplifiers.

Applications Analog IC [3L]:
Description of 555 Timer IC, a stable and mono-stable operations using 555. Study of 78XX and 79XX voltage regulator ICs.

Reference Books

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

Course Name: DIGITAL SYSTEMS DESIGN					
Course Code: ECEN2002					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

After completing the course the student will be able to:

1. Make use of the concept of Boolean algebra to minimize logic expressions by the algebraic method, K-map method, and Tabular method.
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. Outline the concept of different types of A/D and D/A conversion techniques.
5. Realize basic gates using RTL, DTL, TTL, ECL, and CMOS logic families.
6. Relate the concept of Flip flops to analyze different memory systems including RAM, ROM, EPROM, EEROM, etc.

Module-1

Data and number systems; Binary, Octal, and Hexadecimal representation and their conversions;
BCD, Gray 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; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, K- map method, Tabular method. [8]

Module-2:

a) Combinational circuits- Adder and Subtractor, BCD adder, Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator. [7]
b) Memory Systems: Concepts and basic designs of RAM, ROM, EPROM, EEROM, Programming logic devices and gate arrays. (PLAs and PLDs) [5]

Module-3:

Sequential Circuits- Basic memory element S-R, J-K, D, and T Flip Flops, Interconversions of Flip-Flop, State table and state transition diagram, sequential circuits design methodology, various types of Registers and Counters (Synchronous, asynchronous, Irregular, ring, johnson) and their design, Lockout and its remedy. [8]

Module-4:

a) Different types of A/D (Flash, SAR, Counter type, Dual slope) and D/A(R-2R, weighted resistor) conversion techniques. [4]
b) Logic families- RTL, DTL, TTL, ECL, and CMOS, their operation and specifications. [4]
Total: 36 hours

Text Books

1. Morries Mano-Digital Logic Design, PHI.
2. R.P.Jain-Modern Digital Electronics, 2/e, Mc Graw Hill.
3. Virendra Kumar-Digital technology, New Age Publication.
4. S.Salivahanan, S.Arivazhagan-Digital Circuit & Design, Bikas Publishing.
5. A. Anand kumar-Fundamental of Digital Circuits, PHI.

Reference Books

1. H.Taub & D.Shilling-Digital Integrated Electronics, Mc Graw Hill.
2. Tocci, Widmer, Moss-Digital Systems, 9/e, Pearson.
3. Leach & Malvino-Digital Principles &Application, 5/e, Mc Graw Hill.
4. Floyed & Jain-Digital Fundamentals, Pearson.

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 completing the course the student 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

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.

Reference Books

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

Course Name: FUNDAMENTALS OF DATA STRUCTURE & ALGORITHMS					
Course Code: INFO2101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcome:

After completing the course the student 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.

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 and programs, 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. Array representation 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, quicksort, 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).

Reference Books

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

Course Name: ENVIRONMENTAL SCIENCES					
Course Code: EVSC2016					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	0	0

Course Outcome:

The subject code EVSC2016 corresponds to basic environmental chemistry for the 2nd year B.Tech students, which is offered as Environmental Sciences and is mandatory for all branches of engineering. The course provides basic knowledge of various environmental pollutions as well as its impact and ways to curb it. The course outcomes of the subject are

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

Module 1: [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 2: [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 3: [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 4: [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. GourKrishna Das Mahapatra, Basic Environmental Engineering and Elementary Biology, Vikas Publishing House P. Ltd.
2. A. K. De, "Environmental Chemistry", New Age International.
3. A. K. Das, Environmental Chemistry with Green Chemistry, Books and Allied P. Ltd.

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: ANALOG CIRCUITS LAB					
Course Code: ECEN2151					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

The students, after finishing the course, will be able to:

1. Study and compare frequency responses of amplifiers.
2. Design different timer circuits with 555 IC.
3. Design rectifiers and measure rectifier parameters.
4. Generate various waveforms using OP AMPs.

Experiments using discrete components

1. Study of frequency response of RC coupled amplifier circuit.
2. Study of a stable multi-vibrator using 555 timer IC.
3. Study of mono stable multi-vibrator using 555 timer IC.
4. Study of full wave and half wave precision rectifier circuits.
5. Study of Wien-Bridge oscillator circuit.
6. Study of Phase Shift oscillator circuit.
7. Study of a stable multi-vibrator using OPAMP.
8. Study of Triangular wave generator circuit using OPAMP.
9. Study of Schmitt trigger circuit.
10. Study of fixed voltage regulator circuits using 78XX and 79XX ICs.

Experiments using ASLKv2010StarterKit

11. Negative feedback amplifiers and instrumentation amplifiers to measure parameters like time response, frequency response, DC transfer characteristics,
12. Study of analog filters like LPF, HPF, BPF and BSF
13. Study of VCO and PLL
14. Automatic gain / volume control (AGC/AVC)
15. PC based Oscilloscope

Course Name: DIGITAL SYSTEMS DESIGN LAB					
Course Code: ECEN2052					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

The students after finishing this course will be able to:

1. Design code converters.
2. Design adder and subtractor circuits.
3. Design decoders and multipexer circuits.
4. Realize counters.

Detailed Syllabus:

List of Experiments:

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 and vice-versa.
3. Design of Four-bit parity generator and comparator circuits.
4. Construction of simple arithmetic circuits-Adder, Subtractor.
5. Construction of simple Decoder & Multiplexer circuits using logic gates.
6. Realization of different combinational circuits using Multiplexers.
7. Realization of RS, JK, and D flip-flops using Universal logic gates.
8. Realization of Asynchronous Up/Down counters.
9. Realization of Synchronous Up/Down counters.
10. Design of Sequential Counter with irregular sequences.
11. Realization of Ring and Johnson's counters.

Reference Books

1. Linear Integrated Circuits, Salivahanan, McGraw Hill Education, Third Edition.
2. Digital design, Morris Mano, Prentice Hall of India, Third Edition.
3. An Engineering approach to Digital Design‖, William I. Fletcher, Prentice Hall of India, 2009.
4. Switching and Finite Automata Theory‖, Zvi Kohavi, Tata Mc Graw Hill, second edition.
5. Switching Theory and Logic Design‖, A. Ananda Kumar, Prentice Hall of India, 2009.

Course Name: FUNDAMENTALS OF DATA STRUCTURE & ALGORITHMS LAB					
Course Code: INFO2151					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	4	4	2

Course Outcome:

After completing the course the student 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.

Reference Books

1.Brian W.Kernighan and Dennis M.Ritchie, The CProgramming Language, Prentice Hall of India.
2.E.Balaguruswamy,ProgramminginANSIC, Tata McGraw-Hill.
3.ByronGottfried,Schaum'sOutlineofProgrammingwithC,McGraw-Hill.
4.SeymourLipschutz,DataStructures,Schaum'sOutlinesSeries,TataMcGraw-Hill.
5.EllisHorowitz,SatrajSahniandSusanAnderson-Freed,FundamentalsofDataStructuresinC, W.H.Freeman and Company.
6.R.G.Dromey,HowtoSolveitbyComputer,Prentice-HallofIndia.
7. Reema Thareja, Data Structures using C, Oxford University Press.

Honours Course for 2nd Year 1st Semester

Course Name: INFORMATION THEORY & CODING					
Course Code: INFO2111					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

After completing the course the student will be able to:

1. Derive equations for entropy, mutual information and channel capacity for all types of channels.
2. Compare among different types of error correcting codes.
3. Evaluate the channel performance using Information theory.
4. Formulate the basic equations of linear block codes.
5. Apply convolution codes for performance analysis.
6. Design BCH code for Channel performance improvement.

Module I: [14 L]

Source Coding: Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes, Shanon Codes.

Channel Capacity and Coding: Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

Module II: [15 L]

Linear And Block Codes For Error Correction: Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.

Cyclic Codes: Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

Module III : [8 L]

BCH Codes:Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, Error Syndrome,Error location polynomial,examples of BCH codes.

Module IV : [8 L]

Convolutional Codes :Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

Reference Books

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

2nd Year 2nd SEMESTER

Course Name: ALGEBRAIC STRUCTURES					
Course Code: MATH 2201					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

After completing the course the student will be able to:

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

Module I: [10L]

Sets, Relations and Functions:

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

Module II: [10L]

Group Theory I:

Cartesian Product, Binary operation, Composition Table.Group, Elementary theorems on groups, Quasi-group and Klein's 4 group. Permutations, Product of permutations, Group property of permutations, Cyclic permutation, Transposition, Even and Odd permutations, Proposition regarding permutations , Alternating Groups.

Module III: [10L]

Group Theory II:

Order of an element of a group, Properties of the order of an element of a group , Subgroups , some basic theorems on subgroups, Cyclic group, Cosets, Lagrange's theorem, Fermat's Little Theorem(statement only). Normal subgroup, some basic theorems on Normal subgroup.

Module IV: [10L]

Morphisms, Rings and Fields:

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

Reference Books

1. Higher Algebra, S.K.Mapa, Sarat Book Distributors.
2. Advanced Higher Algebra, J.G. Chakravorty and P.R. Ghosh, U.N. Dhur and Sons.
3. A First course in Abstract Algebra, J.B.Fraleigh, Narosa.
4. Algebra, M. Artin, Pearson.

Course Name: FORMAL LANGUAGE & AUTOMATA THEORY					
Course Code: INFO2201					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After completing the course the student will be able to:

1. Recall Knowledge of elementary discrete mathematics including the notion of set, function, relation, product, partial order, equivalence relation, graph & tree.
2. Classify, describe and discuss different types of Grammar (Chomsky's classification: Type 0. Type1, Type 2 and Type 3) and its corresponding Machines like (TM, LBA, PDA, FA).
3. Describe, Evaluate and express the different concepts in automata theory and formal languages such as formal proofs, (non-) deterministic automata, regular expressions, regular languages, context-free grammars, context-free languages, different Machines (LBA, Turing, DFA, NFA, nPDA, dPDA).
4. Apply powerful model of computation since they help computer scientists understand the limits of mechanical computation by providing a precise definition of an 'algorithm' or 'mechanical procedure'.
5. Construct different languages (type0-unresticted language, type1-context sensitive language, type2- context free language, type 3: regular language) and Turing machines
6. Develop and Evaluate different Machines corresponding different types of language like Unrestricted language: Turing Machine(TM), context sensitive language: Linear Bounded Automata, Context free language: Push Down Automata, Regular language: Finite Automata.

Module I: [11L]

Fundamentals:

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

Finite state machine:

Definitions, capability & state equivalent, kth- equivalent concept, Minimization of FSM, Equivalence between two FSM's , Limitations of FSM, Merger graph, Merger table, Compatibility graph, Finite memory definiteness, testing table & testing graph, Information lossless.

Module II: [13L]

Deterministic finite automaton and non deterministic finite automaton. Transition diagrams and Language recognizers.

Finite Automata:

NFA with Î transitions - Significance, acceptance of languages.

Conversions and Equivalence:

Equivalence between NFA with and without λ-transitions. NFA to DFA conversion. Application of finite automata, Finite Automata with output- Moore & Mealy machine.

Regular Language :

Regular sets Regular expressions, identity rules. Arden's theorem state and prove Constructing finite Automata for a given regular expressions, Regular string accepted by NFA/DFA, Pumping lemma of regular sets, Closure properties of regular sets (proofs not required).

Module III: [11L]

Grammar Formalism:

Regular grammars-right linear and left linear grammars. Equivalence between regular linear grammar and FA. Inter conversion, Context free grammar. Derivation trees, sentential forms. Right most and leftmost derivation of strings (Concept only). Context Free Grammars, Ambiguity in context free grammars. Normal forms for Context Free Grammars. Chomsky normal form and Greibatch normal form. Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted). Closure property of CFL, Ogden's lemma & its applications.

Module IV: [8L]

Push Down Automata:

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

Turing Machine :

Turing Machine definition, model, Design, Computable functions, Universal Turing Machine, Halting problem (proofs not required)

Reference Books

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

Course Name: OBJECT ORIENTED PROGRAMMING					
Course Code: INFO2202					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

After completing the course the student will be able to:

1. recall the knowledge of procedural language and map it to paradigm of Object oriented concept.
2. relate the real world problem with object oriented approach.
3. describe and illustrate the features of object oriented programming.
4. analyze any real world problem with object oriented approach and formulate a solution for the same.
5. manage the complexity of procedural language by using the concept polymorphism, inheritance, abstraction, encapsulation.
6. create and explain some GUI and thread based application.

Module-I: [10L]

Basics of OOP and Introduction to JAVA:

Properties of object oriented programming language, Comparison between object oriented programming language and Procedural Programming Language, Major and minor elements, Object, Class, relationships among objects. Aggregation, Association, Generalization, meta-class. Class, object, message passing, inheritance, encapsulation, polymorphism.

Basic concept of JAVA programming– advantages of java, byte-code & JVM, data types, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection.

Module-II: [10L]

Class & Object proprieties:

Different types of access specifiers, method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables, methods and block nested & inner classes, basic string handling concepts, concept of mutable and immutable string.

Reusability properties:

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

Module-III: [8L]

Exception handling and I/O:

Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Input Output stream structure, Wrapper class, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes. File copy programming using command line arguments.

Module-IV: [10L]

Multithreading and Applet & Swing Programming:
Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads. Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets. Basic of swing programming, Difference between applet and swing, AWT Event handling, message box input box, introduction to JFrame, JButton , JLabel.

Reference Books

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

Course Name: COMPUTER ORGANIZATION AND ARCHITECTURE					
Course Code: INFO2203					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

After completing the course the student 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 numericals 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 numericals 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.

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 [10 L]
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 [10 L]
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 Micro programmed CU.

Reference Books

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

Course Name: DATABASE MANAGEMENT SYSTEMS					
Course Code: INFO2204					
Contact Hours per week	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcome:

After completing the course the student will be able to:

1. Understand the need of DBMS over traditional file system and acquire the knowledge on overall database description, at three levels, namely, internal, conceptual, and external levels
2. Deduce the constraints , i.e., the candidate keys, super-keys, that exists in a given real world problem and design the entity relationship diagram to graphically represent entities and their relationships to each other, typically used in computing in regard to the organization of data within databases or information systems
3. Formulate a mathematical tool using relational algebra that operates on one or more relational tables and outputs a relational table as result, and design a normalized Database based on real-world situations, maintaining all constraints and manipulate database relations using SQL and PL/SQL.
4. Prove whether the ordering of concurrent transactions result in inconsistency of the database system or not.
5. Compare the number of block access required for searching a particular record, in an un indexed data file, with respect to a data file having (primary , secondary , clustering or multilevel) index structure.
6. Create a complete Normalized Database system, maintaining all the requirement specifications for a real life problem, and creating indexed relations for efficient accessing.

Module 1: Introduction and Conceptual Modeling [7L]

Database Model, Schema and architecture: [2L]

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

Entity-Relationship Model: [5L]

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

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

Introduction to relational model: [1L]

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

Relational Algebra and Calculus: [5L]

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

Introduction to Database languages [4L]

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

Module 3 : Relational Database Design [13L]

Database integrity: [1L]

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

Functional Dependencies: [3L]

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

Normalization: [8L]

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

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

Transaction processing concepts [8L]

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

File Organization & Index Structures [5L]

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

Reference Books

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

Course Name: OBJECT ORIENTED PROGRAMMING LAB					
Course Code: INFO2252					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

After completing the course the student will be able to:

1. Analyze a problem and design a solution for the problem, following an algorithmic design paradigm.
2. Implement Object Oriented Programming Features to improve the solution designs.
3. Apply Multithreading solutions of real life problems.
4. Reconstruct the solution to a problem in GUI mode.
5. Design programs in platform independent environment.

Detailed Syllabus:

Implement all problems abiding by features of object oriented programming (Abstraction, Encapsulation, Reusability, Data Hiding, Generalization, Specialization.)

Lab1:

Familiarization on object oriented approach of programming: use of class, object, reference.

Lab 2:

Use of constructor, static, final, array, date, access specifiers.

Lab 3:

Familiarization with String, StringBuffer, ArrayList and LinkedList classes

Lab 4:

Inheritance and Dynamic Method Dispatch

Lab 5 & 6:

Abstract Class, Interface and Package
Java Exception Handling.

Lab 7:

Familiarization on Java IO using Scanner, BufferedReader, PrintWriter. File handling in Java.

Lab 8:

Exploring Java multithreading concept.

Lab 9:

Java Applet, AWT Event Handling

Lab 10:

Exploring JOptionPane
Basics of Java Swing: Different Layouts, Event Handling

Lab 11:
Basic JDBC connection and data handling.

Reference Books

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

Course Name: COMPUTER ORGANIZATION & ARCHITECTURE LAB					
Course Code: INFO2253					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

After completing the course the student 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

Reference 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: DATABASE MANAGEMENT SYSTEMS LAB					
Course Code: INFO2254					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcome:

After completing the course the student will be able to:

1.Define and understand the Oracle Server architecture and also indentifying the different DDL,DML,DCL,DQL,TCL sql statement.

2.Construct and map an Entity Relationship model to relational tabular structure and maintaining all relationships and domain integrity, referential integrity, entity integrity constraints.

3. Make use of SQL commands to populate and query a database.

4. Apply and implement security and administrative aspect to a database.

5. Experiment with implementing event oriented programming using PL/SQL TRIGGER and CURSOR, and also implement user defined functions to solve real world problem.

6. Develop a normalized database system maintaining all the requirement specifications with respect to real life problem.

Detailed Syllabus:

Structured Query Language

1.Introduction to server architecture

2.Creating database objects

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

3. Table and Record Handling

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

4. Retrieving Data from a Database

The SELECT statement

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

5. Database Management

Creating Views Creating
Database Users
Granting and revoking
Privileges (GRANT,
REVOKE) Granting
object privileges

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

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

Reference Books

1. SQL, PL/SQL the Programming Language of Oracle by Ivan Bayross.
2. SQL The Complete Reference by Groff James.
3. Oracle PL/SQL Programming by Feuerstein, Steven.