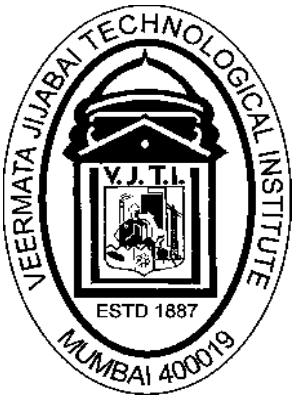
VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

(VJTI)

MATUNGA, MUMBAI 400 019

(Autonomous Institute affiliated to University of Mumbai)



Curriculum

(Scheme of Instruction & Evaluation and Course contents)

First Year
of
Four Year Undergraduate Programme
Leading to
Bachelor of Technology B Tech) Degree
In
Computer Engineering

Implemented from the batch admitted in Academic Year 2023-24

B. Tech. Computer Engineering

Program Educational Objectives (PEOs)

PEO1. Achieve excellence in their profession and demonstrate leadership skills in multidisciplinary domain.

PEO2. Promote design, analysis, product implementation, research, and services in the field of Information Technology through strong technical, communication and entrepreneurial skills.

PEO3. To complement the class room teaching with live projects, fieldwork, seminars to build self learning, and lifelong learning capability, and to develop out of box thinking.

Program Outcomes (POs)

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs) for BTech in Computer Engineering

PSO1: Professional Skills: The ability to analyze, design and implement application specific computer engineering domains related to Big Data Systems, Cloud Computing, Artificial Intelligence, Machine Learning, Networking and Cyber Security applications for efficient design of computer based system of varying complexity by applying the knowledge of core science, engineering mathematics and engineering fundamentals.
PSO 2: Problem-Solving Skills: The ability to adapt and apply rapid changes in tools and technology in software development using open ended programming environment to deliver a quality product relevant to professional engineering practice through life-long learning.
PSO 3: Successful Career and Entrepreneurship: Excellent adaptability to function in multi-disciplinary work environment, good interpersonal skills as a leader in a team in appreciation of professional ethics, societal responsibilities and a zest for higher studies.

Credit Framework for UG Programme in Electronics, Electronics and Communication, Computer Engineering, Information Technology

(Level 4.5- UG Certificate) -Semester - I

Sr.	Course Type	Course Code	Course Name	L	T	P	Hr	Cr	Examination Weightage in %			Ownership
									TA	MST	ESE	
1	BSC	R5CH1011T	Chemistry I	2	1	0	3	3	20	30	50	Chemistry
2	BSC	R5CH1011L	Chemistry I – Laboratory	0	0	2	2	1	ISCE :60		40	Chemistry
3	BSC	R5MA1003T	Mathematics-I	2	1	0	3	3	20	30	50	Mathematics
4	BSC	R5CO1026T	FRB 1: Probability & Statistics	2	0	0	2	2	20	30	50	Respective Department
5	ESC	R5SE1001T	Engineering Mechanics	2	0	0	2	2	20	30	50	Structural Engineering
6	ESC	R5SE1001L	Engineering Mechanics Laboratory	0	0	2	2	1	ISCE: 60		40	Structural Engineering
7	ESC	R5CO1001T	Programming for Problem Solving	2	0	0	2	2	20	30	50	Computer
8	ESC	R5CO1001L	Programming for Problem Solving Laboratory	0	0	2	2	1	ISCE :60		40	Computer
9	PCC	R5CO1027T	FRB 2: Digital Logic Design	2	0	0	2	2	20	30	50	Respective Department
10	VSEC	R5CO1028L	Department Specific Workshop	0	0	3	3	1.5	ISCE :100			Respective Department
11	IKS	R5CO1029T	Indian Knowledge System	2	0	0	2	2	20	30	50	Respective Department
									Or Credit Transfer			
12	CC2	R5CO1030L	Co-Curricular Course	0	0	3	3	1.5	ISCE:100			Respective Department
			Total	14	2	12	28	22				

Co-Curricular Courses:

Semester	Courses	Course Code
I	Digital Marketing	R5CO1030LA
I	Video Editing	R5CO1030LB

Credit Framework for UG Programme in Electronics, Electronics and Communication, Computer Engineering, Information Technology

(Level 4.5- UG Certificate) -Semester - II

Sr.	Course Type	Course Code	Course Name	L	T	P	Hr	Cr	Examination Weightage in %			Ownership
									TA	MST	ESE	
1	BSC	R5PH1012T	Physics II	2	1	0	3	3	20	30	50	Physics
2	BSC	R5PH1012L	Physics II– Laboratory	0	0	2	2	1	ISCE :60		40	Physics
3	BSC	R5MA1014T	Mathematics-II	2	1	0	3	3	20	30	50	Mathematics
4	ESC	R5ME1002T	Engineering Graphics	2	0	0	2	2	20	30	50	Mechanical
5	ESC	R5ME1002L	Engineering Graphics Laboratory	0	0	2	2	1	ISCE: 60		40	Mechanical
6	ESC	R5CO1021T	Computer Organisation	3	0	0	3	3	20	30	50	Respective Department
7	ESC	R5CO1022T	Data Structures	3	0	0	3	3	20	30	50	Respective Department
8	ESC	R5CO1022L	Data Structures Lab	0	0	2	2	1	ISCE :60		40	Respective Department
9	VSEC	R5CO1024L	Web Development Engineering Workshop (Design Thinking and Idea Lab)	0	0	3	3	1.5	ISCE :60		40	Respective Department
10	AEC	R5HS1002L	Ability Enhancement Course (Communication Skill)	1	0	2	3	2	ISCE :60		40	Humanities
11	CC1	R5CO1025L	Sports and Yoga or NSS/NCC	0	0	3	3	1.5	ISCE:100			Respective Department
			Total	13	2	14	29	22				

Use Department Code as: Electronic Engineering: EL, Electronic and Telecommunication: ET, Computer Engineering: CO, Information Technology IT

Co-Curricular Courses:

Semester	Courses	Course Code
II	Sports and Yoga	R5CO1025LA
II	Photography and Arts	R5CO1025LB

List of Exit Courses after completion of Semester I and II

1. Exit option is available for students those who have earned the total 44 credits at the End of Second Semester.
2. Student who wants to avail the exit option after first year have to earn additional 6-8 credits from the list of courses shown below.
3. These courses student have to complete within summer vacation after 1st Year.
4. After fulfilment as mentioned in 1to 3 above, Students can earn U.G Certificate and same will be issued by the Institute.

List of Exit Courses after completion of Semester I and II: Computer Engineering

Sr.	Course Type	Course Name	L	T	P	Hr	Cr	Examination Weightage in %		
								TA	MST	ESE
1	ECCE1001	Desktop Engineer	2	0	0	2	2	20	30	50
2	ECCE1002	IT Support Engineer	2	0	0	2	2	20	30	50
3	ECCE1003	Certified Programmer in C	2	0	0	2	2	20	30	50
4	ECCE1004	Certified Programmer in C++	2	0	0	2	2	20	30	50
5	ECCE1005	Certified Programmer in Java	2	0	0	2	2	20	30	50
6	ECCE1006	Certified Programmer in Python	2	0	0	2	2	20	30	50

Semester – I

Programme Name	***Bachelor of Technology in Computer Engineering***
Course Code	**R5CH1011T**
Course Title	**Chemistry I**

COURSE OUTCOMES:

The student should be able to

1. Correlate the different chemical reaction mechanisms with rate of reaction that are used in the industrial synthesis of organic molecules and drugs.
2. Rating the chemical fuels based on their chemical composition, and properties. Choosing the alternate energy sources.
3. Analyze the basic cause of corrosion, its reactions & corrective preventive measure to reduce the rate and adopt suitable method of treatment suitable for various industrial applications.
4. Analyse functional material based on their structure, and performance. Rationalize the concept Sustainability and adopt green chemistry approach
5. Select appropriate separation methods required in manufacturing industries by understanding the basic concept of chromatographic techniques. Choose the spectroscopic techniques for characterization of materials.

Course Contents

Reactions, Mechanisms & Kinetics

Introduction to Chemical reactions, Material balance for organic reactions, Mass balance and stoichiometry, SN1, SN2 Reactions, Chemical Kinetics, Energy profile diagram, Synthesis of drug molecule.

Energy Source:

Types of Chemical fuels, Calorific value, Determination of calorific value, combustion calculations, Analysis of coal, proximate and ultimate analysis, Fuels for IC engines, Effect of Chemical composition of fuel on knocking, anti knocking agents. Limitations of fossil fuels, Alternative fuels: Power alcohol, biomass, biogas,
biodiesel, Green hydrogen.

Science of Corrosion

Direct chemical corrosion, Electrochemical corrosion and its reaction mechanisms, Types of electrochemical corrosion, (differential aeration, galvanic, concentration cell), Electrochemical corrosion like Pitting, Intergranular, Soil, Waterline. Factors affecting corrosion, Protection of corrosion, Applications with few practical problems of corrosion.

Functional Materials for Engineers

Plastic, Elastomeric, & Fiber forming polymers, structural requirement, molecular weight determination, effect of structure, bonding, molecular weight, degree of polymerization on the performance of the polymers. Glass transition temperature, Structure property relationship.

Lubricants: Types of lubricants, Mechanism of lubrication, Physical and Chemical properties of lubricants, selection of lubricants.

Cementations Materials: Chemical composition of cement, Admixtures used in concrete, Chemical reactions involved, bitumen emulsions.

Identification, Separation & Purification

Types of Separation techniques: Column Chromatography, Thin layer chromatography, Paper chromatography. Spectroscopic principles and its applications, U.V. Spectroscopy, Fourier Transform Infra-Red Spectroscopy, Flame photometry. Determination of hardness of water by EDTA method and removal of hardness by ion exchange and zeolite method

Sustainable Engineering Chemistry

Concept of sustainability and its significance, Waste minimization, Atom Economy, Reduction of Materials and Energy requirement, Green Chemistry approach, Industrial applications of green chemistry.

Textbooks

1. Engineering Chemistry by Jain and Jain, Danpatrai publications;16th edn. (2013)
2. Engineering Chemistry by Dr.S.S.Dara, Dr.S.S.Umare, S.Chand & CompanyLtd,12th ed.
3. A Text Book of Engineering Chemistry by Shashi Chawla, Dhanpatrai publications; 4th edn;(2010)

Reference Books

1. Polymer Science-Billmayer, F.John Willey&Sons, N.Y.; 3rd edn(1984)
2. Introduction to Material Science William Callister, John Willey & Sons, N.Y.; 9th edn;(2013)
3. Engineering .Chemistry- NPTEL web- book, by T.L. Tembe, Kamaluddin and M.S.Krishnan
4. Fundamentals of Molecular spectroscopy: Colin N.Banwell & Elaine M. McCash, Tata McGraw- Hill 4th edn.
5. Fundamentals of Electrochemistry, Second Edition, V. S. Bagotsky, Wiley Interscience(2006).

Programme Name	***Bachelor of Technology in Computer Engineering***
Course Code	**R5CH1011L**
Course Title	**Chemistry I Laboratory**

COURSE OUTCOMES:

The student should be able to

1. Determine the quality of water suitable for different sectors.
2. Determine physical and chemical characteristics of lubricating oils.
3. Synthesis of Biodiesel, Chalcones and calculating atom economy.
4. Analysis of coal by proximate method.
5. Separate and analyze by Chromatographic techniques

Course Contents

Title of the Experiment: (Any 10 experiments)

1. Saponification value of oils
2. Acid value of an Oil
3. Viscosity &Viscosity Index by Redwood Viscometer
4. Flash Point by Abel's & Pensky-Marten's Apparatus
5. Conductometric titrations
6. Analysis Of fuel: Proximate analysis of coal sample
7. Determination of adulteration in transport fuels
8. Separation by TLC & Paper chromatography
9. Determination of alkali metals by Flame photometry
10. Synthesis of Biodiesel to find out Atom Economy.
11. Synthesis of drug molecule
12. Determination of hardness of water by EDTA method.

Reference

1. Lab. Manual for Engineering Chemistry - Dr.S.K.Basin & Dr. S.K. Rani, Dhanapat Rai Publishing Company; (2009)
2. Practical Manual for Chemistry of Engineering Materials - D.D. Shah, Nandu Publication, Mumbai
3. Post Graduate Practical Chemistry - H.N. Patel, S.P. Turakhia, S.S. Kelkar, S.R. Puniyani, Himalaya Publishing House, 5th edn; (2008)
4. A Manual of Practical Engineering Chemistry Sudha Jain & Shradha Sinha, S.Chand Company Ltd 1st edn (2002)

Programme Name	**Bachelor of Technology in Computer Engineering**
Course Code	**R5MA1003T**
Course Title	**Mathematics-I**

Course code		**Semester**	I	**Credits**	3	Scheme	2L:1T:0P
Course	Engineering Mathematics – I						

Course Outcomes:

After the completion of course, the student should be able to

1. Characterize a linear system in terms of number of solutions, whether it is consistent or not.
2. Compute eigenvalues and eigenvectors of a square Matrix and determine if it is diagonalizable
3. Demonstrate the concepts of vector spaces, subspaces, span, basis , dimension and their properties with examples and identify their subspaces
4. Calculate functional value of some point in a neighborhood using Taylor's series expansion and find the limit of a function at a point or at infinity using L'Hospital's rule.
5. Determine if an infinite series is convergent or not using suitable test.
6. Be familiar with the theorems of differentiability such as mean value theorem and interpret it geometrically.
7. Evaluate partial derivatives and apply it to find minima and maxima of a multivariate function. Also Find directional derivatives and gradient and illustrate geometric meaning with the help of sketches.
8. Apply definite integration to evaluate surface areas and volumes of revolution and evaluate improper integrals.
9. Evaluate multiple integrals for regions in a plane and find volume, area bounded by the curves, mass, center of gravity of solid geometric figures.

Module	**Content**	**Lectures**
1	**Linear Algebra:** Rank of a matrix, System of linear equations- check for consistency, Eigenvalues & eigenvectors of a matrix, Diagonalization, Cayley-Hamilton theorem, Minimal polynomial, Finding Inverse and Powers of a matrix, Linear dependence and independence of vectors, Vector spaces, Basis, Dimension, Subspaces, Linear transformations, Rank of a Linear transformation, Orthogonal transformation, Inner product spaces.	15
2	**Differential Calculus:** Mean value theorem, Rolle's theorem, Indeterminate forms, L'Hospital's rule, Taylor's theorem and Truncation error, Partial Derivatives, Chain rule, Total Derivative, Differentiation of an implicit function, Directional Derivative, Gradient, maxima, minima and saddle points of a multivariable function, Lagrange's multipliers method, tangent plane and normal line, Convergence of sequence and series, Tests for convergence -ratio test, root test, p-series test, comparison test, alternating series test, absolute convergence test.	9
3	**Integral Calculus:** Evaluation of definite integration to find surface areas and volumes of revolution, Introduction to Improper Integrals and Gamma functions and its properties, Multiple integrals, change of order of integration in double integrals, Change of variables (Cartesian	9

	to polar), Triple integrals (Cartesian, cylindrical and spherical co-ordinates). Applications: areas and volumes, Center of mass and Gravity (constant and variable densities).	

References:

- G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & sons, 2006.
- Ramana B. V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
- Veerarajan T., Engineering Mathematics for first year, Tata McGraw Hill, New Delhi 2008.
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
- Susan Jane Colley, Vector Calculus, 4th Edition,2012
- David Poole , Linear Algebra A Modern Introduction, Third Edition
- S. Kumareson, Linear Algebra A Geometric Approach, fourth edition.

Programme Name	***Bachelor of Technology in Computer Engineering***
Course Code	**R5SE1001T**
Course Title	**Engineering Mechanics**

COURSE OUTCOMES:

The student should be able to

1. Analyse the force system and relate it to the Engineering Applications.
2. Calculate centroids and centre of gravity of plane areas and volumes.
3. Analyse the different motions of a particle and apply principles of work, energy, impulse & momentum.

Course Contents

Fundamental of Mechanics

Review of basic concepts – mass, space, time and force: Particles and rigid bodies: Scalars and vectors: Free, sliding, fixed and unit vectors: Addition, subtraction and multiplication of two vectors. Definition of a force: Classification of forces: Principles of transmissibility, etc.

Force Systems

Introduction to different force systems, Composition of forces, triangle, parallelogram and polygon law of forces, addition of two parallel forces, Resolution of forces, moment of a force, Varignon's Theorem, Couple of forces, force – couple systems, Resultant of a force system, Equilibrium conditions for a force system, Free body diagram, Different types of supports, etc.

Distributed Forces

Line, area and volume distributions of forces, Centre of gravity, Centre of mass, Centroid ofplane figures, Cerntroid of composite figures, Moment of Inertia, Area and mass moments of inertia, Perpendicular and parallel axes theorems of moment of inertia, Radius of gyration, etc.

Dry Friction

Laws of dry friction, Co-efficient of friction, Angle and cone of friction, Angle of repose, Applications of friction to wedges and screw jacks, etc.

Virtual Work

Work done by forces and couples, Virtual displacement and virtual work, Principle of virtual work for equilibrium bodies in equilibrium, Active force diagram, Degree of freedom, etc.

Kinematics of Particles:

Differential equations of kinematics, plane, rectilinear and curvilinear motions, Cartesian co-ordinate system, Normal and tangent co-ordinate system, projectile motion, etc.

Kinetics of Particles:

Newton's second law of motion, Work and energy principle, Gravitational-potential energy, elastic-potential energy, kinetic energy, power, efficiency, Principle of impulse and momentum, Impact motion, Direct central impact, etc.

Recommended books

1. A textbook of Engineering Mechanics, Dr. Sadhu Singh (S. Chand publishing)
2. Tayal A.K., Mechanics for Engineering, Statics and Dynamics, Umesh Publication, N. Delhi, 2008.
3. Engineering Mechanics, K. L. Kumar, Veenu Kumar, McGrow Higher Education.

Additional Reading

1. Shames I.H, Engineering Mechanics, P.H.I. India 1980.
2. Kumar K. L., Engineering Mechanics, McGraw Hill publishing company New Delhi 2008.
3. Beer and Johnston, Mechanics for Engineers, McGraw Hill, 2009.
4. Timoshenko and Young, Mechanics for Engineers, McGraw Hill, 2010.
5. Mclean and Nelson, Mechanics for Engineers, Schaum Outline Series 2010.
6. Hibbeler R.C., Mechanics for Engineers, Pearson Education, 2012

Programme Name	***Bachelor of Technology in Computer Engineering***
Course Code	**R5SE1001L**
Course Title	**Engineering Mechanics Laboratory**

Course Outcomes

Students will be able to

1. Experimentally verify the Laws of static equilibrium including friction.
2. Analyse the experimental errors and comment on possible reasons for the errors.

Course Contents

List of Practical's (Any 10)

1. Bell Crank Lever:
   - Study the equilibrium conditions of a bell crank lever under different loads and angles.
   - Calculate the mechanical advantage and efficiency of the bell crank lever.
2. Simple Beam:
   - Determine the reactions at the supports of a simple beam loaded with various point loads and distributed loads.
   - Verify the principles of equilibrium and deflection calculations for the beam.
3. Simple Jib Crane:
   - Analyze the forces acting on a simple jib crane and calculate the reactions at its base.
4. Link Chain:
   - Study the forces acting on a link chain when subjected to a load.
   - Determine the tension in different segments of the chain and its equilibrium conditions.
5. Screw Jack (Friction):
   - Investigate the working of a screw jack, considering frictional forces.
   - Calculate the input force required to lift a given load using the screw jack.
6. Shear Leg Apparatus:
   - Set up and analyze a shear leg apparatus to lift a load using multiple ropes and pulleys.
   - Calculate the forces in the ropes and verify equilibrium conditions.
7. 'g' by Falling Weight Method:
   - Measure the acceleration due to gravity using the falling weight method.
   - Analyze the motion of a freely falling weight and calculate 'g' from the recorded data.

8. Plane Motion of Bodies:
    - Investigate the motion of bodies on inclined planes under the influence of gravity.
    - Determine the acceleration, time of motion, and distance covered on the inclined plane.
9. Moment of Inertia (M.I.) of Flywheel:
    - Determine the moment of inertia of a flywheel experimentally using rotational dynamics.
    - Compare experimental results with theoretical calculations.
10. Compound Pendulum:
    - Study the behaviour of a compound pendulum and analyze its oscillations.
    - Calculate the period of oscillation and verify the principles of simple harmonic motion.
11. Torsional Pendulum:
    - Set up a torsional pendulum and measure the torsional constant of the material.
    - Calculate the moment of inertia of the pendulum and analyze its oscillations.
12. Principle of Conservation of Energy (Connected Bodies with Flywheel):
    - Study the energy transfer and conservation principles in a system of connected bodies with a flywheel.
    - Analyze the changes in potential and kinetic energy and validate the principle of conservation of energy.
13. Stiffness of Spring:
    - Determine the stiffness (spring constant) of a spring experimentally.
    - Analyze the relationship between force and displacement for the spring.

Programme Name	**:**	**B. Tech. Computer Engineering**	**SEMESTER – I**
Course Code	**:**	**R5CO1026T**	
Course Title	**:**	**FRB 1: Probability and Statistics**	
Evaluation Scheme	**:**	**(L-P-T : 2-0-0) (TA-MST-ESE : 20-30-50)**	
Prerequisites: NIL			
Course Outcomes(CO): 1. Analyze and interpret data to draw valid conclusions. 2. Apply the concepts of statistics and probability theory in real life problems. 3. Identify the applications of various moment inequalities. 4. Use specific significance tests for evaluating the likelihood of population.			

Sr. No.	Contents	Hrs.	CO
1	Introduction to Statistics: Data Collection and Descriptive Statistics, Inferential Statistics and Probability Models, Population and Sample Descriptive Statistics: Describing Data Sets, Summarizing Data Sets, Chebyshev's Inequality, Normal Data Sets, Paired Data Sets and Sample Correlation Coefficient	4	CO1
2	Elements of Probability: Sample Space and Events, Venn Diagram and Algebra of Events, Axioms of Probability, Samples Space having Equally Likely Outcomes, Conditional Probability, Bayes Formula, Independent Events Random Variable and Expectation: Random Variables, Types of Random Variables, Jointly Distributed Random Variables, Expectation, Properties of the Expected Values, Variance, Covariance and Variance of Sum of Random Variables, Moment Generating Function, Chebyshev's Inequality and the Week Law of Large Numbers Special Random variable: Bernoulli and Binomial Random Variables, Poisson Random Variable, Hypergeometric Random Variables, Uniform Random Variable, Normal Random Variable, Exponential Random Variable, Gamma Distribution, Distribution arising from the Normal, Logistic Distribution.	6	CO2
3	Distribution of Sampling Statistics: Sample Mean, Central Limit Theorem, Sample Variance, Sampling Distribution from Normal Population, Sampling from Finite Population. Parameter Estimation: Maximum Likelihood Estimation, Interval Estimation, Estimating the Difference in Means of Two Normal Populations, Approximating Confidence Interval for the Mean of a Bernoulli Random Variable, Confidence Interval of the Mean of the Exponential Distribution, Evaluating a Point Estimator,	5	CO2, CO3

	Bayes Estimator.		
4	Hypothesis Testing: Significance Level, Tests Concerning the Mean of a Normal Population, Testing the Equality of Means of Two Normal Populations, HypothesisTests Concerning the Variance of a Normal Population, Hypothesis Tests in Bernoulli Populations, Tests Concerning the Mean of a Poisson Distribution Analysis of Variance: One-Way Analysis of Varianc, wo-Factor Analysis of Variance: Introduction and Parameter Estimation, Two-Factor Analysis of Variance:Testing Hypotheses, Two-Way Analysis of Variance with Interaction	5	CO4
5	Goodness of Fit Tests and Categorical Data Analysis: Goodness of Fit Tests When All Parameters Are Specified, Determining the Critical Region by Simulation, Goodness of Fit Tests When Some Parameters Are Unspecified. Nonparametric Hypothesis Tests: The Sign Test, The Signed Rank Test, The Two-Sample Problem, The Runs Test for Randomness.	4	CO4

Text Books:

1	Sheldon Ross, "Probability and Statistics for Engineers and Scientists", Academic Press, 2009.
2	R.E. Walpole, R.H. Myers, S.L. Myers, Keying Ye, "Probability and Statistics for Engineers andScientists", Prentice Hall, 2012

Reference Books:

1	V.K. Rohatgi and A.K. Md. E. Saleh, "An Introduction to Probability and Statistics", Wiley, 2008.
2	Hogg, R. V., Tanis, E. A. & Zimmerman D. L., "Probability and Statistical Inference", Pearson, 2015.
3	W.W. Hines, D.C. Montgomery, D.M. Goldsman, C.M. Borror, "Probability and Statistics inEngineering", Wiley, 2003.

Programme Name	**:**	**B. Tech. Computer Engineering**	**SEMESTER – I**
Course Code	**:**	**R5CO1001T**	
Course Title	**:**	**Programming for Problem Solving**	
Evaluation Scheme	**:**	**(L-P-T : 2-0-0) (TA-MST-ESE : 20-30-50)**	
Prerequisites: NIL			
Course Outcomes: Upon successful completion of the C++ programming course, students shouldbe able to: 1. Interpret the concepts of the C++ programming language. 2. Use control structures such as loops and conditional statements to control the flow of programs. 3. Develop simple C++ programs to solve computational problems using fundamental programming constructs. 4. Use file handling to store and retrieve data efficiently from files. 5. Develop problem-solving skills by applying C++ programming techniques to real-world scenarios and challenges.			

Sr. No.	Contents	Hrs.	CO
1	**Introduction to Programming and C++:** Elements of a computer systems, DOS Commands & Linux environment, Overview of programming languages, Introduction to C++ and its features, Setting up a C++ development environment, Language Processors, Object Oriented Programming Paradigm and benefits, Applications of Object Oriented programming.	04	CO1
2	**Beginning with C++:** Tokens, Expressions, Control Structures, Array, Functions, Structures, Unions and pointers, String Manipulation	06	CO2
3	**C++ Programming Features:** Classes, Objects, Constructors, Destructors, Inheritance and Polymorphism, Virtual Base Classes, Abstract Classes.	06	CO3
4	**Working with Files:** Classes for File Stream Operations and I/O stream operation, Opening and Closing a File, Detecting end-of-file, more about Open(): File Modes, Sequential Input and Output operations.	04	CO4

5	**Case Studies of C++ Programming:** (Note: For Electrical/Mechanical/Civil/textile Engineering) Number Conversions, Telecom Billing System, Logistic management of solid waste, Design of a scientific calculator (Note: For Computer/Information Technology/ExTC/Electronics Engineering) Library Management System, Rock Paper Scissor Game, Tariff Calculation, Electronic circuit analyzer etc	04	CO5
Text Books:			
1	How to Solve It: A New Aspect of Mathematical Method, by G. Polya, Princeton University Press, 2015		
2	The C++ Programming Language, Fourth Edition by Bjarne Stroustrup, Addison-Wesley Educational Publishers Inc		
3	Programming and Problem Solving with C++ by Chip Weems, Nell Dale and Tim Richards, Jones and Bartlett Publishers, Inc, 2022		
4	Scientific Approach to Problem Solving: With C++ Programming by Sal Washah, Cognella, Inc, 2013.		
Reference Books:			
1	Effective C++, 3rd edition, by Scott Meyers, Addison-Wesley Educational Publishers Inc		
2	Solving Mathematical Problems: A Personal Perspective, Illustrated Edition, by Terence Tao, Oxford University Press, 2006.		
3.	Object-Oriented Programming with C++, 8th edition, by E Balagurusamy, Publisher McGraw Hill		

Programme Name	**:**	**B. Tech. Computer Engineering**	**SEMESTER – I**
Course Code	**:**	**R5CO1001L**	
Course Title	**:**	**Programming for Problem Solving Laboratory**	
Evaluation Scheme	**:**	**(L-P-T : 0-0-2) (TA-MST-ESE : 0-60-40)**	
Prerequisites: NIL			

Course Outcomes: Upon successful completion of the C++ programming course, students should be able to:

1. Understand Linux Environment, basic Linux commands and computer elements.
2. Demonstrate proficiency in writing basic C++ programs, including understanding data types, variables, control structures, and functions.
3. Implement classes and objects, understand inheritance and polymorphism, and apply OOP principles in their code.
4. Apply C++ knowledge to design and implement complete software solutions for specific problem domains.
5. Develop their ability to manipulate strings, including concatenation, substring extraction, and other string operations.
6. Read from and write to files in C++, enabling them to process data from external sources.

List of Practicals

Practical No.	Aim of Practical	CO's Mapped
1.	Study of Linux Commands, language processor and Computer Elements.	CO1
2.	Study of Input and Output operations in C++ - Write a program in C++ for entering the detailed information of student and print all details of student.	CO2
3.	Study of for loop in C++ - Write a program in C and C++ to print Fibonacci series of any number inputted by person. Additional Program for practice - Write a program in C++ to find binary valuesof integer using for loop.	CO2
4.	Study of if-else loop in C++ - Write a program in C++ to check whether entered character is a vowel or not using if-else statement.	CO2
5.	Study of if – else if - else loop in C++ - Write a C++ program to accept marksof 5 subjects for a student. Calculate the total and percentage of marks, also decide grade of student depending on the percentage using if-else-if-else statements.	CO2

	Study of while loop and do-while in C++ - Write a C++ program to display numbers from 1 to 10 with the help of a while loop and do-while loop.	
6.	Study of switch case in C++ - Write a program in C++ to make a menu driven calculator. Additional Program for practice: Write a menu driven program in C++ to find sum of positive numbers, sum of negative numbers & avg of all numbers in an array.	CO2
7.	Study of arrays and structures in C++ (a) Write a program in C++ to display the information of 10 employees using array of structure variable. (b) Write a program in C++ to illustrate use of array within structure. (c) Write a program in C++ to illustrate use of nested structure.	CO4
8.	Study of Classes and Objects in C++ - Write a program in C++ to add two integers using classes. Additional Program for practice: Read and Print Student Information using class Student.	CO3
9.	(a) Study of Function Overloading in C++. (b) Study of Operator Overloading in C++ (Overloading unary and binary operators).	CO3
10.	Study of Constructors and Destructors in C++ - Write a program in C++ with class Rectangle with the data fields width, length, area and colour. The length, width and area are of double type and colour is of string type. The methods are get_length(), get_width(), get_colour() and find_area(). Create two objects of Rectangle and compare their area and colour. If the area and colour both are the same for the objects then display "Matching Rectangles", otherwise display "Non-matching Rectangle". Use Constructors. Additional Program for Practice - Write a program in C++ to implement Stack. Design the class for stack and the operations to be performed on stack. Use Constructors and destructors.	CO3
11.	Study of Inheritance, virtual class and virtual function in C++ - Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get_data() to initialize base class data members and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine this function in the derived classes to suit their requirements.	CO3
12.	Study of friend class and friend function in C++.	CO3
13.	Study of String Manipulation in C++ - Write a program in C++ to perform string operations by using predefined string functions.	CO5

14.	Study of File Handling in C++ - Write a program in C++ to open, read andclose a file using file stream operations.	CO6

Text Books:	
1	The C++ Programming Language, Fourth Edition by Bjarne Stroustrup, Addison-WesleyEducational Publishers Inc
2	Object-Oriented Programming with C++, 8th edition, by E Balagurusamy, Publisher McGrawHill
Reference Books:	
1	Effective C++, 3rd edition, by Scott Meyers, Addison-Wesley Educational Publishers Inc
2	Object-Oriented Analysis and Design with Applications by Grady Booch, 3rd edition, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, and Kelli A. Houston,Addison Wesley publisher

Program Name	B. Tech. (Computer Engineering)	Semester – I
Course Code	R5CO1027T	
Course Title	FRB 2: Digital Logic Design	
Prerequisite	Nil	

COURSE OUTCOMES: Students will be able to	
1.	Understand basic of analog circuits.
2.	Acquire basic of digital circuits and its application.
3.	Analyze basic of combinational logic design.
4.	Understand and analyze basic of sequential logic and its application.

COURSE CONTENTS		Hrs	CO
1.	**Introduction to analog devices and circuits:** Diode, Transistor, FET and its applications	4	CO1
2.	**Digital Integrated Circuits:** Digital circuit logic levels, Propagation delay times, Power dissipation, Fan-out and fan- in, Noise margin for popular logic families.	4	CO2
3.	**Combinational Logic:** Switching equations, Canonical logic forms, Sum of product & Product of sums, Karnaugh maps, Two, three and four variable Karnaugh maps, Simplification of expressions, Quine McCluskey minimization techniques, Mixed logic combinational circuits, Multiple output functions. Analysis and Design of Combinational Logic: Introduction to combinational circuit, Code conversion, Decoder, Encoder	8	CO3
4.	**Sequential Logic:** flip flops and its application, Asynchronous and synchronous counter design, Serial in serial out shift registers, State diagrams.	8	CO4
TEXTBOOKS			
1.	R. P. Jain , “Modern Digital Electronics”, Tata McGraw-Hill, 5th Edition, 2022.		
2.	A Anand Kumar, "Fundamental of Digital Circuits", Prentice Hall India, Fourth Edition.		
RECOMMENDED READING			
1	M. Morris Mano, "Digital Logic and Computer Design", PHI		

Programme Name	Bachelor of Technology in Computer Engineering / Information Technology	Semester – I
Course Code	R5CO1028L	
Course Title	Department Specific Workshop	
Prerequisites	Nil	

COURSE OUTCOMES: Students will be able to	
1.	Identify internal parts of a computer, peripherals, I/O ports, connecting cables
2.	Apply digital logic concepts for solving the live problem in the society
3.	Interconnect PCs into local area network and install operating system and various application programs.
4.	Classify and utilize application software and services.

COURSE CONTENTS		Hrs	CO
	Lab Assignment section A: Introduction to hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Working of SMPS. Study of various ports.		
	Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare areport containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storagebasics, networking components and speeds.	8	CO1
	Lab Assignment section B: Introduction to digital devices and integrated circuits		
	To study logic gates and minimization technique, combinational circuits, sequential logic and its applications. Apply the basics of digital logic to solve thelive problem in the society.	8	CO2
	Lab Assignment section C: Introduction to computer network. Study of various topologies. Preparing the network cable using crimping tools and connectors. Study of various network environments.		
	To study of different kinds of network cable and network devices. Connect computer in LAN, Networking Commands*: ping, ssh, ifconfig, scp, netstat, ipstat,nslookup, traceroute, telnet, host, ftp, arp, wget,* and *route*	8	CO3
	Lab Assignment section D: Case study of Installations step for operating system and application software.		

	Operating System installation: Installing an Operating System such as Linux on Computer hardware. Virtual Machine setup: Setting up and configuring a new Virtual Machine, Setting up and configuring an existing Virtual Machine, Exporting and packaging an existing Virtual Machine into a portable format.	8	CO3
	Lab Assignment section E: Introduction and evolution of internet. Study of various internet based services like Email, social network, chat, etc.		
	Internet Services: Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins, Antivirus installation, configuring a firewall, blocking pop-ups, Email creation and usage, Creating a Digital Profile on LinkedIn, Git and Github.	8	CO4

TEXT BOOKS:

1.	Hardware Bible by Winn L. Rosch, Sams Publication, 2017
2.	UNIX : Concepts and Applications, by Sumitabha Das, 4th Edition, McGraw Hill Education, 2017.
3.	Fundamentals of Computers by V. Rajaraman, PHI Learning, 2014

RECOMMENDED READING

1	Computer Fundamentals, Anita Goel, Pearson Education, 2017
2	PC Hardware Trouble Shooting Made Easy, TMH
3	R. P. Jain , “Modern Digital Electronics”, Tata McGraw-Hill, 3rd Edition, (2003)

Program Name	**B. Tech. Computer Engineering**	**Semester – I**
Course Code	**R5CO1029T**	
Course Title	**Indian Knowledge Systems**	
Prerequisite	**Nil**	

COURSE OUTCOMES: Students will be able to	
1.	Explain the historicity of Indian Knowledge System and the broad classification of Indian philosophical systems
2.	Explain the potential of Sanskrit in natural language processing
3.	Explain the features of Indian numeral system and its role in science & technology advancement
4.	Outline the science, engineering & technology heritage of ancient and medieval India
5.	Learn about the Indian pioneers in the field in Computer Engineering and Technology.

COURSE CONTENTS		**Hrs**	**CO**
1.	**Indian Knowledge System- An Overview** An overview of Indian Knowledge System (IKS): Importance of Ancient Knowledge -Definition of IKS - Classification framework of IKS - Unique aspects of IKS The vedic corpus: Vedas and Vedangas - Distinctive features of vedic life.Indian philosophical systems: Different schools of philosophy. Wisdom through the ages: Puranas – Ithihasas - Niti shastras - Subhasitas.	6	1
2.	**Foundational Concepts for Science and technology** Linguistics: Components of a language - Paṇini's work on Sanskrit grammar - Phonetics in Sanskrit and the role of Sanskrit in natural language processing. Number Systems and units of measurement Knowledge : Framework and classification	6	2
3.	**Science , Engineering and Technology in IKS** Mathematics, Astronomy, Engineering and Technology , Town planning andarchitecture Humanities and Social Sciences in IKS	6	3,4
4.	**Indian Scientists and Engineers in Compute Engineering** Vinod Dham – Father of Intel Pentium processor Satyan Pitroda - "Father of India's Computer and IT Revolution." Sabir Bhatia – Founder of Hotmail	6	5

	Raj Reddy - A.M. Turing Award Laureate Ajay Bhatt – Father of USB standard		

TEXTBOOKS	
1.	B. Mahadevan, Nagendra Pavana, Vinayak Rajat Bhat, "Introduction To Indian Knowledge System :Concepts And Applications ",PHI Learning, 2022
2.	A. K. Bag, History of Technology in India, Vol. I, Indian National Science Academy, New Delhi, 1997.

RECOMMENDED READING	
1	Bal Ram Singh, Nath Girish, Umesh Kumar Singh ,"Science and Technology in Ancient Indian Texts", D.K. Print World Ltd, 2012
2	Dhirendranath Banerjee ,Sanjit Kumar Sadhukhan ,"Ancient Indian Scientific Thought and Modern Theories- An Overview", D.K. Print World Ltd, 2019
3.	Vinit K. Bansal , "Vinod Dham Father of the Pentium Chip", Petals Publishers and Distributors
4.	Mayank Chhaya, "Sam Pitroda, a Biography", Konark Publishers, 1992
5	Jessica Livingston, "Founders at Work: Stories of Startups' Early Days" Apress, 2007
6.	https://pressbooks.pub/thiscouldbeimportantbook/chapter/raj-reddy-and-the-dawn-of-machine-learning/
7.	https://smartermsp.com/pioneers-in-tech-ajay-bhatt-co-inventor-of-usb-technology/#:~:text=In%201994%2C%20Ajay%20Bhatt%2C%20an,into%20an%20outlet%2C%20
	Bhatt%20thought.

SEMESTER II

Program Name			Electronics, Electronics and Communication, Computer, and Information Technology			**Semester II**	
Course Code			R5PH1012T				
Course Title			Physics II				
Teaching Scheme			**Examination Scheme**				
L	**T**	**P**	**TA%**	**MST%**	**ESE%**	**ESE (hr)**	**Credit**
2	1	0	**20**	**30**	**50**	**3**	**3**

Course Outcomes (CO's) for Physics -II

1. Examine the band theory of solids and semiconductors.
2. Identify and summarize properties and applications of dielectric materials.
3. Classify and analyze magnetic materials.
4. Explain basic Concepts of quantum mechanics.
5. Define the concepts of Special Theory of Relativity and application.

1	**Semiconductor**: Energy band in solids and classification of solids, the concept of Fermi level and Fermi distribution function, Intrinsic and extrinsic semiconductors, Transport properties of semiconductors: Conductivity in semiconductors and its dependence of carrier concentration and mobility.	7
2	**Dielectric properties:** Capacitance, Permittivity & dielectric constant; Polarizability-polar and nonpolar, dielectric susceptibility, Gauss law in dielectrics, Polarizations: - electronics, ionic, orientation interface, internal fields in solids, Dielectrics in alternating fields, ferroelectricity, piezoelectricity	7
3	**Magnetism**: The Langevin theory of Diamagnetism and Paramagnetism: deriving the magnetic susceptibility and Curie's law. An introduction to the Weiss theory of Paramagnetism and ferromagnetism.	5
4	**Quantum Mechanics:** limitation of classical physics, Planks Law, Matter waves and its characteristics, Wave Velocity, Group velocity, Heisenberg Uncertainty principle, wave function	4
5	**Relativity: Special Theory of relativity:** Galilean Transformations, Michelson Morley experiment, Einstein Principle of relativity, Lorentz Transformation equations, Lorentz Velocity transformation, Consequences of Special theory of relativity: - Simultaneity, time dilation, Lorentz-Fitzgerald contraction, Relativistic doppler Shift, twins' paradox, Relativistic mass variation, mass energy equivalence, **General Theory of relativity:** Gravitational deflection of light, black hole, Mercury odd orbit, GPS system, gravitational waves	7

Reference Books

1. Modern Physics, 3rd edition, R Serway, C Moses and C Moyer, Thomson Learning inc,
2. Material Science and Engineering: An Introduction, 6th Edn., Callister W.C. Jr., JohnWiley & Sons
3. Applied Physics I for Science and Engineering, Dattatray Wavhal, ISBN 978-93-5267-180-9, 2016
4. Applied Physics II for Science and Engineering, Dattatray Wavhal, ISBN 978-93-5268-289-8, 2017
5. A textbook of Engineering Physics, M N Avadhanulu and P. G. Kshirsagar

Program Name			Electronics, Electronics and Communication, Computer, and Information Technology		**Semester II**
Course Code			R5PH1012L		
Course Title			Physics II Laboratory		
Teaching Scheme			**Examination Scheme**		
L	**T**	**P**	**ISCE**	**ESE**	**Credit**
0	0	2	60	**40**	**1**

Course Outcomes (CO's) for Physics -II, Laboratory

1. Calculate resistivity, band gap, Hall Voltage and Carrier concentration of semiconductor.
2. Calculate Band Gap of p-n junction diode
3. Determination of magnetic properties using hysteresis/curie temperature/ susceptibility
4. Determine Plank constant using Photoelectric effect.
5. Measurements of frequency, wavelength, rms voltage using CRO, e/m by Thomsonmethod, Stefan's law

Course Contents (any 10)

1. Measurement of Resistivity of solids
2. Band gap of Semiconductor by four probe methods
3. Hall Effect in Semiconductors
4. Band gap of p-n junction diode
5. Susceptibility of solids by Gouy's method
6. Hysteresis of a ferromagnetic material
7. Curie temperature by two probe method
8. Plank's constant determination
9. Ultrasonic Interferometer
10. CRO based measurements.
11. e/m by Thomson method
12. Stefans law

Programme Name	***Bachelor of Technology in Computer Engineering***
Course Code	**R5MA1014T**
Course Title	**Mathematics-II**

Course code		**Semester**	I	**Credits**	3	Scheme	2L:1T:0P
Course	Engineering Mathematics – II						

Course Outcomes:

1. Formulate Differential equations from the given physical problems and solve first order Differential equations using different techniques.
2. Find the complete solution of a differential equation with constant coefficients in terms of complementary function and particular integral.
3. Express a logical statement in terms of predicates, quantifiers and logical connectives.
4. Construct correct direct and indirect proofs (proofs by contradiction and contraposition), proof by induction, exhaustion and find a counterexample to disprove a proposed statement.
5. Solve counting problems involving the multiplication rule, permutations and combinations (with and without replacement), principle of inclusion- exclusion, and Pigeonhole principle.
6. Determine properties of relations, identify equivalence and partial order relations and sketch relations.
7. Recognize the mathematical objects called groups and link the fundamental concepts of group such as orbits and symmetry of geometrical objects.
8. Explain the significance of notion of cosets, normal subgroups and analyse the result of Lagrange s theorem.

Module	**Content**	**Lectures**
1	Ordinary Differential Equations: Solving First order equations – Exact, linear and Bernoulli's equations, higher order linear differential equations with constant coefficients, Complementary functions and Particular integrals by operator method, method of variation of parameters, Method of Undetermined coefficients, Euler-Cauchy equation; initial and boundary value problems.	10
2	Logic: Propositional equivalences, Methods of proof, Tautologies and contradictions, Predicates and Quantifiers, Duality Law, Program correctness.	5
3	Counting: The basics of counting, the pigeonhole principle, permutations and combinations with repetition, Binomial coefficients and identities, recurrence relations, solving recurrence relations, generating functions, inclusion - exclusion principle, application of inclusion-exclusion.	5
4	Relations Relations and their properties, n-ary Relations and their applications, Representing Relations, Closure of Relations, Equivalence Relations, Partial Ordering	5
5	Algebraic structures: Algebraic structures with one Binary operation, Groups ,Subgroups, Monoids, generators and evaluation of powers, cosets and Lagrange's theorem, permutations groups, homomorphism and normal subgroups, Congruence relations and Quotient structures. Algebraic structures with two Binary operations: rings, integral domains and fields.	10

References:

- Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay, R. Manohar, Tata McGraw Hill, 2008
- Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & sons, 2006.
- Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, Tata McGraw Hill, 2012
- E.A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
- Elements of Discrete Mathematics, C. L. Liu and D. P. Mohapatra 4th Ed., McGraw Hill Edu.(India) Pvt. Ltd.
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
- Joseph A Gallian, 4th Edition, Contemporary Abstract Algebra.

Programme Name	**Bachelor of Technology in Computer Engineering**
Course Code	**R5ME1002T**
Course Title	**Engineering Graphics**

Course Outcomes

The student should be able to –

1. Represent projections of lines and solids.
2. Draw projections of solids cut by section planes.
3. Convert the pictorial view into orthographic projections.
4. Convert the orthographic projections into isometric view.

Course Contents

Introduction to Drawing & Geometrical Contraction

Introduction: Introduction and importance of engineering drawing, Drawing Instruments and their use, Drawing layout, types of lines, lettering and Dimensioning

Engineering Curves: Cycloid, Epicycloid, and Hypocycloid; Involutes.

Projection of Points and Lines

Introduction: Method of projections, Orthographic projection, Reference planes, Quadrants, Reference line etc. Projection of Points.

Projections of lines: Line inclined to both the reference planes (excluding the traces), True/Apparent lengths & inclinations.

Projection Solids, Sections of Solids

Projections of Solids: Solids (Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron and cone only with their axis inclined to HP or VP only (Excluding Spheres, Composite and Hollow solids) Use change of position or Auxiliary Plane method.

Section of Solids: Section of Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron & cone cut by plane. Use change of Position or Auxiliary plane method.

Orthographic Projections

Multi View Orthographic projections of simple machine parts by first angle method, Sectional views of simple machine parts (full & Half Section only)

Isomeric Projection

Isomeric scale, isometric view/Drawing of simple blocks with plain and cylindrical surfaces. (excluding spherical surface)

Note: Only FIRST ANGLE Method of projections must be used throughout the course.

Text books

1. N. D. Bhatt, Engineering Drawing, Charotar publishing house, 53rd Edition, 2014
2. N. H. Dubey, Engineering Drawing Nandu Publishers & printers, 15th Edition, 2015

Programme Name	**Bachelor of Technology in Computer Engineering**
Course Code	**R5ME1002L**
Course Title	**Engineering Graphics Laboratory**

Course Outcomes

The student should be able to –

1. Draft various Geometrical Elements used in Engineering Practice using CAD software.
2. Draft projections of various objects and their representation and dimensioning using CAD software.
3. Represent objects through isometric projections. Interpret drawings of engineering parts and objects.
4. Acquire drawing skills pertaining to various topics like projection of points, lines and solids.

Course Contents

Introduction to Computer Aided sketching

Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tools bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of co-ordinate points, lines, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions material conventions and lettering

Minimum 10 Exercises based on above mentioned topics with minimum two problems in each Exercise.

Programme Name	**B. Tech. (Computer Engineering)**	**Semester – II**
Course Code	**R5CO1021T**	
Course Title	**Computer Organization**	
Prerequisites	**Nil**	

COURSE OUTCOMES:	
At the end of this course student will able to:	
1	Explain the basic organization of a computer system.
2	Demonstrate functioning of different sub systems, such as processor, Input/output and memory.
3	Design and analyse simple arithmetic and logical units.
4	Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.

COURSE CONTENTS:

Unit No	Topics	Hrs	CO
1	**Basic Structure of Computers:** Von Neumann Architecture, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.	06	01
2	**Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.	06	01
3	**Input/Output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.	06	02
4	**Arithmetic:** Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.	08	03
5	**Memory System:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, and Performance Considerations.	08	01,02
6	**Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, and Micro programmed Control.	08	04

TEXT BOOKS:	
1	W. Stallings, "Computer Organization and Architecture: Designing for performance" ,Prentice Hall of India, 8th Edition, 2003, ISBN 81 – 203 – 2962 – 7
2	C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill , 5thedition, 2002 ISBN 007-120411-3
3	Kai Hwang and Briggs, Computer Architecture and Parallel Processing ;, Tata McGraw Hill
REFERENCE BOOKS:	
1	J. Hays, "Computer Architecture and Organization", McGraw-Hill, 2nd Edition, 1988 ISBN 0 – 07 – 100479 – 3
2	Tanenbaum, "Structured Computer Organization", Prentice Hall of India, 4th Ed, 1991 ISBN 81 – 203 – 1553 – 7 (Chapter: 1,4,5,6,8).
3	D. Paterson, J. Hennesy, "Computer Organization and Design: The Hardware Software Interface", Morgan Kauffman, 2nd Edition, 2000

Program Name	B. Tech. (Computer Engineering)	Semester – II
Course Code	R5CO1022T	
Course Title	Data Structures	
Prerequisite	Nil	

COURSE OUTCOMES: Students will be able to	
1.	Understand the role of different types of data structures and compare their applications and advantages.
2.	Compare the operations and efficiency of stack and queue data structures.
3.	Implement linked data structures.
4.	Analyze and implement various graph, tree, and hashing.

COURSE CONTENTS		Hrs	CO
1.	**Introduction to data structures and analysis of algorithms**: Overview of data structures and their role in computer science, Need of data structures, Types of data structures, recursion and its significance in problem-solving, ADT (Abstract Data Types), Basics of algorithm**,** Understanding time and space complexity measures.	4	1
2.	**Stack and Queue**: Stack: The stack as an ADT, Representation of stack, Stack operation, Queue: The Queue as an ADT, Representation of stack and queue, Queue operation, Circular and Priority queue,Time and space complexity analysis of stack and queue operations, Applications of stack: Expression evaluation using stacks, Infix, postfix, and prefix notations and their conversions using stacks,	6	2
3.	**Linked list**: Linked list as an ADT, Operation on linked list,Time and space complexity analysis of linked list operations, Advantages and disadvantages of linked lists over arrays, Linked stacks and Queues, Array implementation of Linked List, Linked list using Dynamic Variable, Doubly, circular linked list, Time and space complexity analysis of linked list operations, Applications of Linked list: Memory allocation and dynamic data structures, File management systems	6	3
4.	**Graphs and Trees:** Basics concepts of graphs, Different ways to representation of graphs, types of graph, graph traversals Depth-First Search (DFS) and Breadth-First Search (BFS), Linear Search and Binary Search,Time complexity of linear and binary search algorithms, Introduction to Trees, basic tree concept, Types of trees, Binary tree operations, Binary tree representation: Array and Linked-list based representation of binary trees, Hashing: Direct-address tables, Hash tables, open addressing, Perfect Hashing.	8	4

TEXTBOOKS	
1.	Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, “Fundamental of Data Structure using C++”, Galgotia Publication.
2.	Y. Langsam, M. J. Augenstein and A. M. Tannenbaum, "Data Structures Using C and C++",, Prentice Hall India, Second Edition.
3.	H. Cormen, C. E. Leiserson, R. L.Rivest and C. Stein, “Introduction to Algorithms”, Second Edition, MIT Press/McGraw Hill.

RECOMMENDED READING	
1	John Kleinberg and Eva Tardos, “Algorithm Design”, Pearson Education
2	Goodrich and Tamassia, Data Structures and Algorithm in Java, John Wiley and Sons, Sixth Edition 2014.

Program Name	B. Tech. (Computer Engineering)	Semester – II
Course Code	R5CO1022L	
Course Title	Data Structures lab	
Prerequisite	Nil	

COURSE OUTCOMES: Students will be able to	
1.	Understanding of basic data structures and their implementation.
2.	Develop and apply abstract data types (ADTs) for stack and queue data structures, encompassing design and implementation.
3.	Analyze and implement fundamental concepts of linked lists, including node structure, pointers, and the dynamic nature of linked data structures.
4.	Analysis various graph traversal techniques, searching algorithms, and hashing techniques, including their implementations.

COURSE CONTENTS		Hrs	CO
	Lab Assignment section A: Understanding Complexity and Recursion.		
	i. Analysis of the time and memory complexity of a set of given programs provided by the faculty. The programs are designed to calculate the time complexity and space complexity, and the analysis will involve determining their efficiency based on input size." ii. Write a program that includes both iterative and recursive functions to calculate the factorial of a given positive integer. iii. Write a program that implements a recursive function to find the n'th Fibonacci number.	4	1
	Lab Assignment section B: Implementing Data Structures **Stack and Queue.**		
	i. Write a program that implements a stack data structure as an Abstract Data Type (ADT) with essential operations like push and pop. ii. Write a program that implements a queue data structure as an Abstract Data Type (ADT) with fundamental operations like enqueue and dequeue. iii. Write a program to evaluate expressions in infix, postfix, and prefix notations.	6	2
	Lab Assignment section C: Implementing Data Structures using **linked list.**		

	i. Create a singly linked list/ doubly linked list data structure with functions: (1). Add an element at the beginning and end of the list. (2). Edit an element by searching for its value and modifying it. (3). Delete an element from the linked list based on its value. (4). Search function that returns the position of an element in the linked list or a message indicating if the element is not present. ii. Linked lists in data storage scenarios: (1).Create a program that uses a linked list to store student information, including name, ID, and marks in multiple subjects. (2).Implement functions to add, edit, delete, and search student records in the linked list. (3).Allow the user to interactively perform operations on the student database, such as adding new students, editing their information, or deleting records. (4) Display the list of student records at the end of each operation to verify the changes made in the linked list. iii. Department maintains a student information. The file contains roll number, name, division and address. Allow user to add, delete information of student. Display information of particular employee. If record of student does not exist an appropriate message is displayed. If it is, then the system displays the student details. Use sequential file to main the data.	6	2
	Lab Assignment section D: Implementing Data Structures using **Graph, Trees, and Hashing.**	8	2
	i. Write a program: (1).Linear search to find an element in an unsorted dataset. (2).Binary search to find an element in a sorted dataset. ii. Write a program: (1).Create a graph data structure using an adjacency list or matrix representation. (2).Implement a function for BFS traversal starting from a given source node. (3).Implement a function for DFS traversal starting from a given source node using both recursive and iterative approaches. iii. Implement all the functions of a dictionary (ADT) using hashing and handle collisions using chaining with / without replacement. Data: Set of (key, value) pairs, Keys are mapped to values, Keys must be comparable, Keys must be unique. Standard Operations: Insert(key, value), Find(key), Delete(key).		

TEXT BOOKS:	
1.	Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, “Fundamental of Data Structure using C++”, Galgotia Publication.
2.	Y. Langsam, M. J. Augenstein and A. M. Tannenbaum, "Data Structures Using C and C++",, Prentice Hall India, Second Edition.
3.	Data Structures: A Pseudocode Approach with C, by Richard Gilberg (Author), Behrouz Forouzan (Author), 2nd Edition, Cengage Learning, 2004.
RECOMMENDED READING	
1	Goodrich and Tamassia, Data Structures and Algorithm in Java, John Wiley and Sons, Sixth Edition 2014.
2	H. Cormen, C. E. Leiserson, R. L.Rivest and C. Stein, “Introduction to Algorithms”, Second Edition, MIT Press/McGraw Hill.

Program Name	**B. Tech. (Computer Engineering)**	**Semester – II**
Course Code	**R5CO1024L**	
Course Title	**Web Development Engineering Workshop (Design Thinking and Idea Lab)**	
Prerequisite	**Nil**	

COURSE OUTCOMES: Students will be able to	
1.	Demonstrate the skill of HTML and CSS
2.	Execute small programs using JavaScript
3.	Develop dynamic web sites for requirement.
4.	Demonstrate skill to write back end code using databases.
5.	Apply the full stack knowledge for implementation of Capstone project.

COURSE CONTENTS		**Hrs**	**CO**
	Lab Assignment section A: HTML & CSS – Content, layout, and styling of web page		
	1. Laboratory to explore HTMLTags, Attribute and Elements, Doctype Element, Comments, Headings, Paragraphs, and Formatting Text, Lists and Links, Images and Tables. 2. Laboratory to explore applying CSS to HTML, Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and Font Properties.	8	CO1
	Lab Assignment section B: JavaScript Programming – Programming language of the web		
	1. Experiments to explore JS Syntax, Document and Window Object, Variables and Operators, Data Types and Num Type Conversion, Math and String Manipulation, Objects and Arrays, Date and Time, Conditional Statements, Switch Case, Looping in JS, Functions.	8	CO2
	Lab Assignment section C: Dynamic Website Development		
	1. Experiments to explore Document Object Model, DOM Manipulation, DOM Events, JavaScript Libraries (jQuery and Underscore), Persistent Data Storage With Back-end Servers, Simple HTML CSS JavaScript Project with AJAX	8	CO3
	Lab Assignment section D: NodeJS Development, MongoDB		
	1. Experiments to explore Node js Console, Node js Command Utilities, Modules, Concepts, Events, Express js, Database Access.	8	CO4

	2. Experiments to explore MongoDB, Migration of Data into MongoDB, MongoDB with NodeJS.		
	Lab Assignment section E: Capstone Project	8	CO5
	Part 1: Define Project Scope Part 2: Project Idea Generation using wireframe Part 3: Planning website development Part 4: Building website Part 5: Testing and deployment website		

TEXT BOOKS:

1.	HTML & CSS: THE COMPLETE REFERENCE, by Thomas Powell, 2017 fifth Edition
2.	Web Development with MongoDB and Node.js by Jason Krol, September 2014 Packt Publishing,ISBN: 9781783987306
3.	Node.js, MongoDB, React, React Native Full-Stack Fundamentals and Beyond, by Eric Bush

RECOMMENDED READING:

1	Head First HTML and CSS, 2nd Edition by Elisabeth Robson, Eric Freeman Released August 2012
2	Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia
3	Web Development with Node and Express: Leveraging the JavaScript Stack by Ethan Brown, 2nd Edition Oreilly publication, 2019.

Programme Name	**Bachelor of Technology in Computer, Electronics, Information Technology, Electronics & Telecommunication (Common Course)**		**SEM II**
Course Code	**R5HS1002L**		
Course Title	**Business & Technical Communication (Ability Enhancement Course)**		
Scheme	**L - T - P**	**Credit**	**Examination Weightage in %**
	1 - 0 - 2	**02**	**ISCE : 60 ESE : 40**

Course Outcomes:

After completion of course students will be able to

1) Apply the principles and practices of business communication for communicating in aprofessional environment.
2) Design a technical document with correctness of language, appropriate vocabulary and style.
3) Display competence in oral and visual communication.
4) Demonstrate capabilities for self -assessment and development.

Module 1: Foundations of Business English

- Introduction to Business English and its importance in the professional world.
- Business Vocabulary and commonly used expressions.
- Business Idioms at the workplace.

Module 2: Business and Technical Writing

- Understanding Business writing language, style and tone.
- Crafting clear and concise business documents: Instruction Manuals/Brochures.
- Developing Email Etiquette.

Module 3 Business Grammar and Language Usage

- Review of essential English grammar rules.
- Identifying commonly made errors in Indian English.

Module 4: Group Discussion

- Basics of a Group Discussion.
- Understanding the different types of Group Discussions.
- Practical tips and suggestions for a GD.

Module 5: Presentation Skills

- Structuring a compelling business presentation.
- Engaging an audience and using visual aids effectively.

Module 6: Introduction to Public Speaking for Engineers

- Techniques to manage and reduce public speaking anxiety.
- Crafting a clear and concise speech outline.
- Tailoring the message for different audiences

Module 7: Critical Thinking Skills

- Introduction to the processes of logical reasoning to interpret arguments
- Evaluating information from a lens of fact checking, evidentiary support, confirmation biasand language analysis.

Text Books

1. H. S. Mukherjee, Business Communication: Connecting at Work, Oxford University Press;Pap/Cdr edition (26 November 2012), (ISBN: 9780198073475)

2. A. Rizvi, Effective Technical Communication, McGraw Hill Education; 1 edition (27 June2005), (ISBN: 0070599521)

3. M. Raman, P. Singh, Business Communication, Oxford; Second edition (6 August 2012),(ISBN: 9780198077053)

Recommended Reading:

1. E. H. Mcgrath, Basic Managerial Skills for All, Prentice Hall India Learning Private Limited;9 edition (2011), (ISBN: 9788120343146)

2. R. Subramanian, Professional Ethics, Oxford University Press; Second edition (17 April 2017), (ISBN: 019947