

**GIET UNIVERSITY, GUNUPUR**  
**DEPARTMENT**

*OF*

**COMPUTER SCIENCE &  
ENGINEERING**

**(SCHOOL OF ENGINEERING & TECHNOLOGY)**



**BACHELOR'S DEGREE PROGRAMME**

**(B. Tech)**

**Course Structure and Syllabus**

**For**

**Students Admitted in**

**[2023-27]**

**Academic Session**



# GIET UNIVERSITY, GUNUPUR

## SCHOOL OF ENGINEERING AND TECHNOLOGY

### DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

#### 1. Institute Vision & Mission, Department Vision & Mission, PEO's, PO's, PSO's

##### **Institute Vision:**

To be a renowned and Globally Recognized University giving importance to academic excellence with latest technology, Research, Innovation and Entrepreneurial Attitude.

##### **Institute Mission:**

- To create innovative and committed work force to cater to the societal, environmental and economic needs of the Nation.
- To promote Education and Research Globally at par with the international standards
- To prepare the future leaders with latest skills befitting to become Entrepreneurs or Employable.
- To support and uplift the meritorious students of this Tribal Area to represent as an Ambassador in all forums as a part of our social responsibility.

##### **Department Vision:**

To be globally acclaimed as a premier Computer Science and Engineering department through excellent teaching and strong research environment by creating professionally competent engineers with moral values committed to build a vibrant nation.

##### **Department Mission:**

- Provide a positive and professional learning environment to master the fundamental principle of computing, problem solving skills, leadership qualities, team-spirit, ethics and societal responsibilities.
- To enable the graduates to use modern tools and technologies in the area of computer science and information technology.
- Establish Industry Institute Interaction program to enhance the employability skills.
- To promote innovative research in Computer Science and Engineering to serve the needs of Industry, Government and Society at large.

##### **Program Educational Objectives:**

- To render best platform for adequate training and opportunities to work as teams on projects with effective communication skills and leadership qualities and understand professional ethics, social awareness and organizational context in which their engineering skills are utilized.
- To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.



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- To extend an ability to analyze the need of the society by providing innovation solutions, leading to their personal cum professional growth as an entrepreneur.

#### Program Outcome:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.



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11. **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.
12. **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:**

- To provide students an understanding of the expectations of industry and practical competence with a broad range of programming language and open source platforms through value added courses.
- The ability to analyze and develop computer programs in the areas related to Artificial Intelligence, Big Data Analysis and Cyber Security for efficient design of computer-based systems of varying complexity.

#### **Program Educational Objectives:**

- Develop proficiency in the field of mathematics, basic science, and engineering fundamentals to analyze and solve a wide range of computational problems in industry or other work environments and succeed in an advanced degree program in a field such as engineering.
- Possess the ability to collaborate as team members and team leaders for facilitating technical solutions for computing systems with awareness and commitment to their ethical responsibilities.
- Attain the ability to critically analyze the need of society and provide innovative solutions in multi-disciplinary areas adopting technologies leading to their personal cum professional growth as an entrepreneur.

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	CIA	ESE
				L	T	P			
<b>THEORY</b>									
1	BS	23BBSBS11001	Engineering Mathematics-I	3	1	0	4	40	60
2	ES	23BBSES11003	Programming for Problem Solving	3	0	0	3	40	60
3	HS	23BBSHS11001	Communicative English and Soft Skills	2	0	0	2	40	60
4	BS	23BBSBS10002	Engineering Physics	3	0	0	3	40	60
5	ES	23BBSES10001	Basic Electrical and Electronics Engineering	3	0	0	3	40	60
6		23BBSES10002	Elements of Mechanical Engineering	3	1	0	4	40	60
<b>PRACTICAL / SESSIONAL</b>									
1	ES	23BBSES10101	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	30	20
2	ES	23BSES10107	Fundamental of Web Technology Laboratory(Project)	1	0	4	3	90	60
3	ES	23BBSES11103	Programming for Problem Solving Laboratory	0	0	4	2	60	40
4	HS	23BBSHS11101	Communicative English and Soft Skills Laboratory	0	0	2	1	30	20
5	ES	23BBSES10105	Engineering Graphics and Design	1	0	2	2	60	40
		23BBSES10106	Engineering Workshop						
6		23BBSHS10002	Human Values and Professional Ethics	1	0	0	1	30	20
7	HMS/ ES	23BBSES10004	Dietetics and Nutrition						
8	MC	23BBSMC11101	Induction Program (3 weeks)	0	0	0	0	0	0
<b>TOTAL CREDIT</b>							22		

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	CIA	ESE
				L	T	P			
<b>THEORY</b>									
1	BS	23BBSBS12001	Engineering Mathematics-II	3	1	0	4	40	60
2	ES	23BBSES12003	Data Structures and Algorithms	3	0	0	3	40	60
3	HS	23BBSHS12001	Communicative English and Technical Communication	2	0	0	2	40	60
4	BS	23BBSBS10002	Engineering Physics	3	0	0	3	40	60
5	ES	23BBSES10001	Basic Electrical and Electronics Engineering	3	0	0	3	40	60
6		23BBSES10002	Elements of Mechanical Engineering	3	1	0	4	40	60
<b>PRACTICAL / SESSIONAL</b>									
1	ES	23BBSES10101	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	30	20
2	ES	23BSES10107	Fundamental of Web Technology Laboratory	1	0	4	3	90	60
3	ES	23BBSES12103	Data Structures and Algorithms Laboratory	0	0	4	2	60	40
4	HS	23BBSHS12101	Communicative English and Technical Communication Laboratory	0	0	2	1	30	20
5	ES	23BBSES10105	Engineering Graphics and Design/	1	0	2	2	60	40
		23BBSES10106	Engineering Workshop						
6	HMS/ ES	23BBSHS10002	Human Values and Professional Ethics	1	0	0	1	30	20
		23BBSES10004	Dietetics and Nutrition						
7	MC	23BBSMC12201	NSS/YOGA	0	0	0	0	0	0
<b>TOTAL CREDIT</b>							22		

**Pre –Requisite: differential calculus, functions and properties, matrices.**

Subject Code	Title of the subject	L	T	P	C
23BBSBS11001	Engineering Mathematics-I	3	1	0	4

**Course Educational Objectives**

CEO1	To find critical points, and use them to locate maxima and minima.
CEO2	To provide the standard methods for solving differential equations.
CEO3	To study Fourier series and to express a function in Fourier series.
CEO4	To use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra.

**Course Outcomes: Towards the end of the course students will be able to :**

CO1	Memorizing some mathematical definition for solving. mathematical problems
CO2	Understand and categorize. the basic concept of different problems
CO3	Determine and articulate the different concept for solving the problems.
CO4	Estimate the Eigen values and vectors of a matrix, and maxima minima for function of two variables .
CO5	predict the even and odd functions and extreme points.
CO6	Evaluate the engineering problems by using the concept of Partial differentiation and series and to understand its application.

**CO-PO & PSO Mapping**

COs	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2												
CO2	1	3												
CO3	2	3												
CO4	2	3												
CO5	3	2												
CO6	3	3												

**SYLLABUS**

**UNIT I - MATRICES**

**(12 hours)**

Matrices, Types of matrices, Rank of matrix, Solution of system of linear equations using Gauss elimination method, Eigenvalues and Eigenvectors, Cayley – Hamilton theorem (without proof), Orthogonal matrices, Complex matrices, Hermitian and Skew-Hermitian matrices, Unitary matrices, similar matrices, Diagonalization of matrices. Quadratic forms and Canonical forms – Reduction of quadratic forms to Canonical forms through orthogonal transformation

<p><b>UNIT II - MULTIVARIABLE CALCULUS</b></p> <p>Partial differentiation, Euler's theorem, Directional derivative, Total derivative, Taylor's theorem on function of two variables (without proof), Maxima and Minima for functions of two variables, Constrained Maxima and Minima using Lagrange multiplier method.</p>	<p><b>(12 Hours)</b></p>
<p><b>UNIT III - FIRST ORDER DIFFERENTIAL EQUATIONS</b></p> <p>Ordinary differential Equations: Differential equations and their solutions: Variable Separable, Homogeneous, Non-Homogeneous, Linear and Non-Linear, Exact and Non-Exact method. Applications to Electrical circuits and heat conduction.</p>	<p><b>(10 Hours)</b></p>
<p><b>UNIT IV- HIGHER ORDER DIFFERENTIAL EQUATIONS</b></p> <p>Linear differential equations of higher order and their different methods of Solutions (operator methods). Second Order Linear differential equations and their solutions: Cauchy - Euler equation solution by method of undermined coefficients and variation of parameters .Simple application to electrical circuits</p>	<p><b>(14 Hours)</b></p>
<p><b>UNIT V - FOURIER SERIES</b></p> <p>Fourier series, Dirichlet's conditions, Fourier series expansion of functions of with period <math>2\pi</math>, Fourier series expansion of functions with arbitrary period, Half Range Fourier expansion.</p>	<p><b>(12 Hours)</b></p>
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Willey</li> <li>2. Differential Calculus by Santi Narayan and P.K .Mittal, S.Chand Publications</li> <li>3. Higher Engineering Mathematics by B.V.Ramana, McGraw Hills Education</li> </ol>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Higher Engineering Mathematics by B.S Grewal: Khanna Publishers, New Delhi.</li> <li>2. Advanced Engineer Mathematics by N. P. Bali &amp; Manish Goyal</li> <li>3. Advanced Engineer Mathematics by H. K. Dass , S. Chand &amp; Company .LTD</li> <li>4. Differential Calculus by J. Sinha Roy &amp; S. Padhi.</li> <li>5. Differential Calculus" by Vinay Kumar, 3<sup>rd</sup> Edition 2021, Mc Graw Hill</li> </ol>	

**ENGINEERING MATHEMATICS-I  
(ONLY FOR BIO-TECH)**

**Pre –Requisite: sets and functions and properties, matrices**

Subject Code	Title of the subject	L	T	P	C										
23BBSBS110B1	Engineering Mathematics-I	3	1	0	4										
<b>Course Educational Objectives</b>															
CEO1	Concept about the sets, tautology, contra positive and truth table.														
CEO2	To use matrices, determinants and techniques for solving system of linear equations in Linear Algebra.														
CEO3	To Provide the standard methods for differentiation.														
CEO4	To Provide the standard methods for integration.														
<b>Course Outcomes: Towards the end of the course students will be able to :</b>															
CO1	Remember. the basic concept of about logic, set theory and matrices ..														
CO2	Understand and categorize. the basic concept of different problems by using matrix methods.														
CO3	Determine the differentiation of standard functions .														
CO4	Estimate the integration of standard functions														
CO5	Evaluate the different type of interpolation														
CO6	Solve the problems by using integration and differentiation														
<b>CO-PO &amp; PSO Mapping</b>															
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2													
CO2	2	2													
CO3	3	3													
CO4	2	3													
CO5	2	2													
CO6	3	2													
<b>SYLLABUS</b>															
<b>UNIT I- LOGIC AND SET THEORY</b>														<b>(12 Hours)</b>	
Introduction, Statement, Negation, Conjunction, Disjunction, Conditional, Converse, Bi-Conditional, Inverse, Contra positive, Truth Table, Tautology, Logical Equivalence and Implication. Methods of Proof, Sets, Subset and Power Set, Venn Diagrams and Cartesian Product of Sets. Relations and Functions.															

**UNIT-II LINEAR ALGEBRA****(10 Hours)**

Matrices, Types of matrices, Rank of matrix, Determinants of a matrices, Minors and Cofactors, Inverse of matrix, Transpose of Matrix and Properties, Solution of linear equations by Cramer's rule, symmetric and skew symmetric matrices, Orthogonal matrix.

**UNIT -III NUMERICAL METHODS****(14 Hours)**

Errors, solving of algebraic and transcendental equations by using Bisection method, fixed point iteration, and Newton-Raphson's method. Solution of system of Linear equations by Gauss elimination, Gauss Jordan, Gauss Seidal. Inverse of a matrix by Gauss Jordan method.

**UNIT- IV INTERPOLATION****(12 Hours)**

Errors, Finite Differences, Newton's forward and backward interpolation formula (without proof), Newton's divided difference interpolation, Lagrange's interpolation.

**UNIT-V STATISTICS****(12 Hours)**

Mean, Median, Mode, Correlation and Regression analysis, fitting of straight line by method of least squares method. Testing of hypothesis (small sample tests –t, F and chi-square test).

## Reference Books:

1. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Wiley
3. Numerical Method by S. S. Sastry
4. Higher Engineering Mathematics by B.V.Ramana, McGraw Hills Education
5. Advanced Engineer methods by N. P. Bali & Manish Goyal.

## ENGINEERING MATHEMATICS-II

(COMMON TO ALL BRANCHES)

**Pre –Requisite: differential calculus, integral calculus and vectors, properties**

Subject Code	Title of the subject	L	T	P	C	
<b>23BBSBS12001</b>	<b>Engineering Mathematics-II</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	

### Course Educational Objectives

CEO1	To focus on partial derivative and its methods.
CEO2	To make them understand about Laplace and Fourier and transform.
CEO3	To calculate the gradients and directional derivatives of functions of several variables
CEO4	To introduce the concept of Vector differentiation and integration that finds applications in various fields like solid mechanics, fluid flow, heat problems and potential theory

### Course Outcomes: Towards the end of the course students will be able to :

CO1	Understand the concept of partial differential equations and Laplace transforms, vector and scalar fields
CO2	Summarizing the concept of sequences and vector differentiation and integration.
CO3	Determine gradient, curl and divergence and Laplace transforms.
CO4	Analyze the solution of partial differential equation and multiple integrals
CO5	Evaluate Laplace transforms, and convergence and divergent of some series
CO6	solve partial differential equation, and Ordinary differential and integral equation

### CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	2	1														
CO2	2	3														
CO3	2	3														
CO4	2	3														
CO5	3	3														
CO6	3	3														

### SYLLABUS

#### UNIT - I PARTIAL DIFFERENTIAL EQUATIONS

**(12 Hours)**

Formation of Partial differential equations, linear partial differential equation of first order: Lagrange's linear differential equation, Non-Linear partial differential equation of first order using standard types and Charpit's method. Higher order Homogeneous Linear Partial Differential Equations with Constant Coefficients.

#### UNIT-II SEQUENCES AND SERIES

**(12 Hours)**

Sequence and series: convergent, Divergent and Oscillatory Series, D'Alembert's Ratio Test, Cauchy's Root Test, Radius of Convergence, Power Series Solution of ODE of First order and Second order.

**UNIT-III LAPLACE TRANSFORM:****(14 Hours)**

Definition, Sufficient condition for existence of Laplace Transform, Properties of Laplace Transform, Evaluation of integrals by using Laplace Transform. Inverse Laplace Transform, Convolution theorem, Laplace transform of unit step function, unit impulse function, and periodic function. Solution of ordinary differential equations by using Laplace Transform(up to second order).

**UNIT – IV MULTIPLE INTEGRALS AND VECTOR DIFFERENTIAL CALCULUS (12 Hours)**

Double integrals and triple integrals. Area and volume using multiple integrals.

Vector and scalar functions and fields, Directional Derivatives, Curves, tangents and arc Length, gradient, divergence, curl and their properties with simple applications.

**UNIT - V VECTOR INTEGRAL CALCULUS:****(12 Hours)**

Evaluation of double and triple integrals for vector valued functions. Evaluation of line integral, Surface integral and volume integral and their applications. Green's Theorem, Stoke's Theorem and Gauss Divergence Theorem and their simple applications.

**Text Books:**

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10th Edition.

**Reference Books:**

1. Higher Engineering Mathematics by B. V. Ramana , Mc Graw Hill Education.
2. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
3. Advanced Engineering mathematics by H. K. Dass.
4. Differential Calculus by J. Sinha Roy & S. Padhi

**ENGINEERING MATHEMATICS-II  
(ONLY FOR BIO-TECH)**

**Pre –Requisite: differential calculus, integral calculus and vectors,**

Subject Code	Title of the subject											L	T	P	C
23BBSBS120B1	Engineering Mathematics-II											3	1	0	4
<b>Course Educational Objectives</b>															
CEO1	To focus on coordinate system														
CEO2	To study vector function and scalar function in vectors.														
CEO3	To provide the standard methods for solving algebraic equations.														
CEO4	To study the probability and its properties.														
<b>Course Outcomes: Towards the end of the course students will be able to :</b>															
CO1	Understand the concept of straight-line and circle and application.														
CO2	Understand the concept of conditional probability and testing of hypothesis.														
CO3	Solve the algebraic equations by using different methods and also understand the concept of interpolation.														
CO4	Categorize different types of curves and their properties,														
CO5	Solve the equations by some numerical methods														
CO6	Evaluate the properties of curl ,divergence and gradient and its application.														
<b>CO-PO &amp; PSO Mapping</b>															
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2													
CO2	2	3													
CO3	1	3													
CO4	2	3													
CO5	2	3													
CO6	2	3													
<b>SYLLABUS</b>															
<b>UNIT -I CO-ORDINATE GEOMETRY</b>												<b>(12 Hours)</b>			
<p><b>Straight Lines:</b> Introduction, Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two point form, intercepts form and normal form. General equation of a line.</p> <p><b>Circles :</b> circle, Equation of circle whose centre and radius is known, General equation of a circle, equation of tangent and normal Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points.</p>															

**UNIT-II DIFFERENTIAL CALCULUS****(14 Hours)**

Limit and continuity Simple problems on limit, Simple problems on continuity, Differentiability, Derivatives using first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method

**UNIT- III INTEGRAL CALCULUS****(12 Hours)**

Integration of simple functions, Integration by substitution method, Definite Integral (simple problems based on it), Integration by parts, Integration by partial fraction, Area under simple well-known curves (simple problems based on it).

**UNIT-IV PROBABILITY****(12 Hours)**

Events, Sample space, definition of probability, Axioms of probability, Addition theorem of probability with examples, Multiplication theorem of probability with illustrate examples. Conditional probability, Bayer's theorem, simple problems.

**UNIT – V VECTOR ANALYSIS****(12 Hours)**

Vectors and Scalars, Types Of Vectors, Algebra Of Vectors, Position Vectors, Scalar Product , Vector Product, Unit Vectors, Scalar Triple Product And Vector Triple Product, Vector Functions, Derivatives, Gradient, Divergence, Curl And Their Simple Applications.

**Reference Books:**

1. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Willey
3. Numerical Method by S. S. Sastry
4. Higher Engineering Mathematics by B.V.Ramana, McGraw Hills Education
5. Advanced Engineer methods by N. P. Bali & Manish Goyal.

Subject Code	Name of the Subject (1 <sup>st</sup> Sem.)										L	T	P	C
23BBSHS11001	Communicative English and Soft Skills										2	0	0	2
<b>Course Educational Objectives</b>														
CEO1	To promote communication skills and soft skills.													
CEO2	To enhance the employ ability and entrepreneurial skills													
<b>Course Out comes:</b> Towards the end of the course, the students will be able to:														
CO1	Understand the importance of effective communication for professional development													
CO2	Apply effective vocabulary and grammar in everyday communication													
CO3	Analyze various types of corporate communication.													
CO4	Formulate crucial soft skills for career development.													
CO5	Develop useful LSRW skills for professional growth.													
CO6	Describe communication process effectively													
<b>CO-PO Mapping</b>														
COs	<b>PROGRAMME OUTCOMES</b>													
	1	2	3	4	5	6	7	8	9	10	11	12		
CO1										3				
CO2											2			
CO3										3				
CO4									3					
CO5										3				
CO6										3				
<b>SYLLABUS</b>														
<b>UNIT-1 Importance of English for Communication in the 21<sup>st</sup> Century</b>													<b>(8hours)</b>	
1.1 Role of English in enhancing employability and entrepreneurial skills. The Nature and Scope of Communication														
1.2 Introduction to LSRW skills; appropriate use of skills in communicative contexts.														
1.3 The process of communication and factors that influence communication: sender, receiver, channel, code, topic, message, context, feedback, noise, filters and barriers (steps such as Ideation, Encoding, Transmission, Decoding, etc.); audience and purpose														
1.4 Types of Communication: General and Professional Communication; Written communication and Spoken communication.														

<p><b>UNIT-2 English Vocabulary, Grammar &amp; Usage</b></p> <p>2.1 Essential grammar (Tense, Active &amp; Passive voice, Subject Verb Agreement)</p> <p>2.2 Words often confused</p> <p>2.3 Technical terms and one word substitutes</p> <p>2.4 Sentence Structure and syntax</p> <p>2.5 Common errors in English.</p> <p>2.6 Difference between American, British and Indian English (Vocabulary based)</p>	<p><b>(7hours)</b></p>
<p><b>UNIT- 3 Introduction to Corporate Communication</b></p> <p>3.1 Seven C’s communication and Ten C’s of Non-communication.</p> <p>3.2 Corporate Communication– Types, Characteristics, Importance.</p> <p>3.3 Direction of corporate communication</p> <p>3.4 Communication challenges in today’ s work place: Advances in technology; Culturally diverse workforce; Team- based organizational Settings; Strategies to overcome these challenges</p> <p>3.5 Use of ICT.</p> <p>3.6 Challenges in today’s workplace and how to overcome this.</p>	<p><b>(8hours)</b></p>
<p><b>UNIT-4 Basic Soft Skills Development.</b></p> <p>4.1 Soft Skills, Importance, Characteristics, Hard Skills v/s Soft Skills.</p> <p>4.2 Importance soft skill, lateral thinking, networking skill, emotional intelligence.</p> <p>4.3 Cross Cultural and Inter Cultural communication.</p>	<p><b>(7hours)</b></p>
<p><b>UNIT- 5 Corporate Etiquettes.</b></p> <p>5.1 Email etiquettes.</p> <p>5.2 Business Meeting Etiquettes</p> <p>5.3 Telephone Etiquettes</p>	<p><b>(6 hours)</b></p>
<p><b>Teaching Methods: Chalk &amp; Board/ PPT/ Video Lectures</b></p>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Technical Communication-, Principle and Practice by Meenakshi Raman &amp; Sangeeta Sharma, Oxford University Press, 2015.</li> <li>2. Business Communication Today by Bovee, Courtland L., Thill, John V. Prentice Hall, 2018.</li> <li>3. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh. Pearson, 2010.</li> <li>4. Oxford Guide to English Grammar by John East wood. Oxford University Press, 2003.</li> <li>5. 365 Ways to Change Your World by Norman Vincent Peale by Orient Paperbacks, 2019.</li> <li>6. Soft Skills For Your Career by Kalyani Samantray Oxford University Press, 2016.</li> </ol>	

Lab Code	Name of the Lab (1 <sup>st</sup> Sem)	L	T	P	C											
23BBSHS11101	Communicative English and Soft Skills Laboratory	0	0	2	1											
<b>Course Educational Objectives</b>																
CEO1	To develop communication skills of the students.															
CEO2	To develop vocabulary and usages skills of students by practice.															
CEO3	To enable students to participate I group discussions through listening and speaking.															
CEO4	To enable students eliminate grammatical mistakes in speech and writing.															
<b>Course Out comes :<i>The students will be able to:</i></b>																
CO1	Understand the importance of effective communication for professional development.															
CO2	Apply effective vocabulary and grammar in everyday communication.															
CO3	Analyse various types of corporate communication.															
CO4	Formulate crucial soft skills for career development.															
CO5	Develop useful LSRW skills for professional growth.															
CO6	Develop confidence for effective presentation.															
<b>CO-PO Mapping</b>																
<b>PROGRAMMEOUTCOMES</b>																
COs	1	2	3	4	5	6	7	8	9	10	11	12				
CO1										3						
CO2											2					
CO3										3						
CO4									3							
CO5										3						
CO6										3						
<b>SYLLABUS</b>																
<b>Motivational videos</b>																
Activity- Listening to videos and filling the gaps in a worksheet					<b>(2 hours)</b>											
<b>Famous Speeches</b>																
Activity- Describing, paraphrasing and summarizing famous speeches.					<b>(2 hours)</b>											
<b>Self-Evaluation</b>																
Activity–Evaluating self through assessments using British Council App					<b>(2 hours)</b>											
<b>Listening for Pronunciation</b>																
Activity- Listening to ted talks and focusing on segmental sounds and intonation																

by articulating it	(2 hours)
<b>Oral Presentation</b>	
Activity - Verbal presentation and speaking for 1 to 5 minutes.	(2 hours)
<b>Just a Minute</b>	
Activity –Speaking on any given topic for a minute	(2 hours)
<b>Story Telling</b>	
Activity- Analyzing and narrating a story.	(2 hours)
<b>PPT Presenting</b>	
Activity- Presentation and engaging topic with visual presentation.	(2 hours)
<b>News Article Reading</b>	
Activity - Regulating reading speed by loud reading and reading news article.	(2 hours)
<b>Reading story</b>	
Activity - Story reading with proper intonation.	(2 hours)
<b>Poem Recitation</b>	
Activity - Reading poems focusing on rhythm and specific reading skills.	(2 hours)
<b>Prose Reading</b>	
Activity- Reading prose focusing on the punctuations and pronunciation.	(2 hours)
<b>Basic Writing Skill</b>	
Activity - Focusing on basic writing skills by sequencing of thoughts and ideas.	(2 hours)
<b>Story Writing</b>	
Activity -. Writing a story using the given clues.	(2 hours)
<b>Precise Writing</b>	
Activity – Paraphrase a given passage	(2 hours)
<b>Article Writing</b>	
Activity- Writing newspaper article and magazines.	(2 hours)
Teaching Methods: Chalk & Board/ PPT/Video Lectures	
<b>Text/ Reference Books:</b>	
2. <i>Form and Finesse, Business Communication and Soft skills</i> by Shruti Das, Published by Orient Black Swan, 2022.	
3. <i>Business and Corporate Soft skills developed by RaiTech. University (PDF available)</i>	
4. <i>Spoken English (with CD). Sasikumar V nd PVD hamija. New Delhi:Tata McGraw-Hill Education Pvt. Ltd.(2<sup>nd</sup>Ed.),2008.</i>	

Subject Code	Title of the subject (2 <sup>nd</sup> Sem)	L	T	P	C										
23BBSHS12001	Communicative English and Technical Communication	2	0	0	2										
<b>Course Educational Objectives</b>															
CEO1	To develop communication skills and soft skills of the students.														
CEO2	To enhance employability and entrepreneurial skills														
<b>Course Out comes: <i>The students will be able to:</i></b>															
CO1	Understand the importance of technology in communication.														
CO2	Develop skills important for career making.														
CO3	Apply Technical approach to reading.														
CO4	Prepare professional documents for career needs (e.g. Job application letter, résumé) and Professional needs (e.g., Memo and E-mail writing)														
CO5	Develop creativity and imagination.														
CO6	Execute Self-learning through technology.														
<b>CO-PO Mapping</b>															
COs	<b>PROGRAMMEOUTCOMES</b>														
	1	2	3	4	5	6	7	8	9	10	11	12			
CO1										3					
CO2									2						
CO3									2						
CO4										3					
CO5									3						
CO6										3					
<b>SYLLABUS</b>															
<b>UNIT1 Introduction to Technical Communication</b>						<b>(7hours)</b>									
1.1 Introducing technical communication, Nature and Scope, Characteristics, Importance. 1.2 Self-learning through technology, use of internet for technical learning. 1.3 Need of technical communication for career development. 1.4 Computer Assisted Language Learning(CALL)for developing English language															
<b>UNIT-2 Skills for Career Making</b>						<b>(8 hours)</b>									
2.1. Career Making: Setting Goals, SWOT analysis 2.2 Preparing a Résumé: Elements of a Résumé; Types of Résumés: Chronological Résumé, Functional Résumé; Use of job portals 2.3 Group Discussion 2.4 Job Interview 2.5 Effective Oral Presentation															

**UNIT-3 Technical Approach to Reading****(7hours)**

- 3.1 Know your Reading speed; Advantages of speed reading
- 3.2 SQ4R Techniques of Reading
- 3.3 Techniques of Rapid Reading: Skimming, Scanning, Intensive and Extensive
- 3.4 Barriers to effective readings

**UNIT-4 Technical Writing****(7hours)**

- 4.1 Writing a technical paper  
Writing business letters—significance, purpose, structure and elements, layout; types of business letters, Job application/ cover letter
- 4.2 Email Etiquette
- 4.3 Business Reports and Technical proposals

**UNIT 5 Advanced Soft Skills development****(7 hours)**

- 5.1 What is conflict resolution; Importance, tips to improve conflict resolution.
- 5.2 What is Problem Solving Skills, Importance, tips to improve problem solving skills.
- 5.3 Difference between Conflict resolution and Problem Solving Skills.

**Teaching Methods: Chalk & Board/ PPT/ Video Lectures****Reference Books:**

- 1. Basic Communication Skills for Technology by Andrea J. Rutherford, Pearson Education Asia, Patparganj, New Delhi, 2001.
- 2. Business Communication by Varinder Kumar and Bodh Raj. Kalyani Publishers, 2014.
- 3. A Textbook of English Phonetics for Indian Students by T.Balasubramanian, 2017.
- 4. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, 2015.
- 5. How to Read better and Faster by Norman Lewis. 4<sup>th</sup> Edition. Publisher: Crowell, 1978.
- 6. Soft Skills For Your Career by Kalyani Samantray OXFORDUNIVERSITY PRESS, 2016

- 2.6 Handling a Meeting

Subject Code	Name of the Subject (2 <sup>nd</sup> Sem.)	L	T	P	C											
23BBSHS12101	Communicative English and Technical Communication Laboratory	0	0	2	1											
<b>Course Educational Objectives</b>																
CEO1	To develop communication skills and soft skills of the students.															
CEO2	To enhance employability and entrepreneurial skills															
<b>Course Out comes: <i>The students will be able to:</i></b>																
CO1	Understand the importance of technology in communication.															
CO2	Develop skills important for career making.															
CO3	Apply technical approach to reading.															
CO4	Prepare professional documents for career needs (e.g. Job application letter, résumé) and professional needs(e.g., Memo and E-mail writing)															
CO5	Develop creativity and imagination.															
CO6	Execute self-learning through technology.															
<b>CO-PO Mapping</b>																
Cos	<b>PROGRAMMEOUTCOMES</b>															
	1	2	3	4	5	6	7	8	9	10	11	12				
CO1										3						
CO2									2							
CO3									2							
CO4										3						
CO5									3							
CO6										3						
<b>SYLLABUS</b>																
<b>Professional Writing</b>															<b>(2hours)</b>	
Activity-Techniques to write Circular/notice writing																
<b>Resume Writing</b>															<b>(2hours)</b>	
Activity- Types and format for writing an effective resume																

<b>Writing Cover Letter</b>	<b>(2hours)</b>
Activity- Techniques, types and format for writing over letter	
<b>Group Discussion</b>	<b>(2hours)</b>
Activity- Case study based, opinion based discussions	
<b>Job Interview</b>	<b>(2 hours)</b>
Activity- Mock Interview	
<b>PPT Presentation</b>	<b>(2hours)</b>
Activity- Presenting any technical topics.	
<b>Debate</b>	<b>(2hours)</b>
Activity- Debate on current affairs.	
<b>Activities involved in a meeting</b>	<b>(2hours)</b>
Activity- Pre, during and post meeting activities. (agenda, MOM, etc.)	
<b>SWOT Analysis</b>	<b>(2hours)</b>
Activity- Creating SWOT matrix and self-analysis	
<b>Vocabulary based activity</b>	<b>(2 hours)</b>
Activity- Flash cards and worksheets will be given based on technical writing	
Use of CALL and ESL (software) vocabulary games.	
<b>Content Writing</b>	<b>(2 hours)</b>
Activity- recording of reviews on various content and events.	
<b>Social/Business Etiquettes</b>	<b>(2 hours)</b>
Activity- Visual presentation on social etiquettes	
<b>Profiling a company</b>	<b>(2 hours)</b>
Activity- Giving a detailed description of a company of the student's choice.	
<b>Picture Description</b>	<b>(2 hours)</b>
Activity- Gap filling	
<b>Summarizing</b>	<b>(2 hours)</b>
Activity-summarize a book, research paper or news article	

**Reference Books:**

1. Basic Communication Skills for Technology by Andrea J. Rutherford, Pearson Education Asia, Patparganj, New Delhi, 2001.
2. Business Communication by Varinder Kumar and Bodh Raj. Kalyani Publishers, 2104.
3. A Text book of English Phonetics for Indian Students by T. Balasubramanian, 2017.
4. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, 2015.
5. How to Read better and Faster by Norman Lewis. 4th Edition. Publisher: Crowell, 1978.
6. Soft Skills For Your Career by Kalyani Samantray OXFORD UNIVERSITY PRESS, 2016

Course Code	Course Title	L	T	P	C	QP
23BBSES11003	Programming for Problem Solving	5	0	0	3	
<b>Pre -Requisite: computer basics.</b>						
<b>Course Educational Objective</b>						
CEO1:To formulate algorithm, translate into program and then execute the programs for verifying its correctness.						
CEO2: To analyse a problem for knowing its efficiency and decompose it into functions using divide and conquer approach.						
Course Outcome: student can able to						
CO1	Memorize features of structure oriented programming and describe control statements, arrays, structures and pointers.					
CO2	Classify various types of statements and demonstrate programs on control structures, arrays, functions, pointers and structures.					
CO3	Solve problems using different programming logics and can able to discover better solutions.					
CO4	Analyse different programs by experimenting on them and estimating their efficiency.					
CO5	Evaluate complex programs by verifying their logics and justify their results.					
CO6	Develop applications and projects using various features of structure oriented programming.					
<b>UNIT- I</b> <span style="float: right;"><b>(9 Hours)</b></span> <b>Programming Basics:</b> Introduction to Structured Programming Approach, Basic structure of C program, C compilers, Compilation and Execution Process, Error debugging. Character set, C Tokens, data types, modifiers, format specifiers, escape sequence characters, constants, variables, standard I/O statements, Operators classifications, Operator precedence and associativity, Implicit and Explicit type casting, programs using sequential statements						
<b>UNIT- II</b> <span style="float: right;"><b>(9 Hours)</b></span> <b>Selection Control Statements:</b> if, if..else, else if ladder, nested if, switch..case <b>Loop Control Statements:</b> while, do-while and for loop, break, continue, nested loop.						
<b>UNIT- III</b> <span style="float: right;"><b>(9 Hours)</b></span> <b>1-D Array:</b> declaration, initialization, array operations, <b>2-D Array:</b> declaration, Initialization, 2-D array operations <b>Character arrays and Strings:</b> String operations, Library Functions: strcmp(), strncmp(), strcat(), strncat(), strcpy (), strncpy (), strlen(), toupper(), tolower (), isupper (), islower().						

**UNIT- IV****(9 Hours)**

**User Defined Functions:** Function categories, Parameter passing in functions, Passing arrays to functions, Recursive functions, storage classes

**Pointers:** Declaration and initialization of pointers, Pointer arithmetic, Pointer to Array, Pointer to Function, call by value and call by address, Function returning pointer.

**UNIT- V****(9 Hours)**

Dynamic memory allocation with Array and Function. Declaration and initialization of structures, Union, type def, enum, accessing structure elements, nested structures, structures with array, structures with functions, structures with pointer, structures with DMA.

**Text Books:**

- 1) E. Balaguruswamy, Programming in ANSI C, 7<sup>th</sup> edition, Tata McGraw-Hill
- 2) Let us 'C' by Yashwant Kanethekar, 16<sup>th</sup> edition, BPB Publications
- 3) Byron Gottfried, Schaum's Outline of Programming with C, 3<sup>rd</sup> edition, McGraw-Hill

**References:**

- 1) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2<sup>nd</sup> edition, Prentice Hall of India
- 2) Programming in C, by Reema Thareja, 2<sup>nd</sup> edition, OUP India
- 3) C Programming and Coding by swati saxena, BPB Publications

**CO-PO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	2	1	1									
CO2	2	3	2	1									
CO3	2	2	3	3	1								
CO4	2	1	3	3	1				1				
CO5	0	0	2	2					1	1			
CO6	0	0	1	1					1	1			
	1.5	1.33	2	1.83	0.33				0.5	0.33			1.12

[ HIGH-3                  MID-2                  LOW -1]

Course Code	Course Title	L	T	P	C	QP
23BBSES11103	Programming for Problem Solving Laboratory	0	0	4	2	
Pre -Requisite: Basics of Computer Science						
<b>Course Educational Objective</b>						
CEO1: To develop programs for problems on different applications of array, functions, pointers and structure.						
CEO2: To analyse different problems by comparing and implementing in programming.						
<b>Course Outcome: student can able to</b>						
CO1	Memorize features of structure oriented programming and describe control statements, arrays, structures and pointers.					
CO2	Classify various types of statements and demonstrate programs on control structures, arrays, functions, pointers and structures.					
CO3	Solve problems using different programming logics and can able to discover better solutions.					
CO4	Analyse different programs by experimenting on them and estimating their efficiency.					
CO5	Evaluate complex programs by verifying their logics and justify their results.					
CO6	Develop applications and projects using various features of structure oriented programming.					
<b>Lab Experiment 1: Familiarization with programming environment</b>						
1) Introduction to OS: Before starting experiments explain the facilities and operations of OS.						
2) Introduction to the C compiler, Compilation and Execution Process & writing simple programs.						
<b>Lab Experiment 2: Simple computational problems using arithmetic expressions.</b>						
1) Write a program to input radius of a circle and Find the area, perimeter of it.						
2) Write a program to input two numbers and swap them using an intermediate variable.						
3) Write a program to input two float values and find their sum						
4) Write a program to input 2 sides i.e: length and breadth of a rectangle. Find the area and perimeter of it.						
<b>Lab Experiment 3: Simple computational problems using arithmetic expressions.</b>						
1) Write a program to accept Fahrenheit and calculate its equivalent Celsius.						
2) Write a program to input three unequal numbers and find the greatest using conditional operator.						
3) write a program to find simple interest when principle amount, no. of terms and rate of interest given. [ Given formula: $si=(p*t*r)/100$ ]						
4) write a program to find the area of a triangle when the 3 sides of it given as input. [ Given formula: $s=(a+b+c)/2$ and $area= \sqrt{s*(s-a)*(s-b)*(s-c)}$ ]						

**Lab Experiment 4: Simple computational problems using arithmetic expressions.**

- 1) Write a program to input three unequal integers and find the largest number using conditional operator.
- 2) Apply Pythagorean theorem for finding the distance between two points i.e. side 'a' when the two sides namely 'b', 'c' are given as input. [ Given formula is  $a = \sqrt{b^2 + c^2}$  ]
- 3) John, Ram and shah were fishing in a river bank. Input the no. of fishes caught by each person and display who have caught more fishes (use conditional operator).
- 4) A boy is running in a circular playground having radius R given input. What will be the distance and displacement from one end to other end of ground?[Formula distance= $\pi * R$  and Displacement= $2 * R$ ]

**Lab Experiment 5: Problems involving using if statement**

- 1) In your garden two flower plants of rose and lily are growing. Input the growth of each plant in centimetres. Display the plant whose height is more. (use if..else)
- 2) In a software company a project team of 3 members namely manvi, shyam and William. Input their job experience in no. of years. The team lead must have more experience. Display who can be team lead. (use if..else)
- 3) Write a program to input 3 co-efficient values and find the real roots of quadratic equation.
- 4) Write a program input a digit within 0 to 06. Display week day example: 0 for Sunday, 1 for Monday etc (use else if ladder).

**Lab Experiment 6: Problems involving using switch..case**

- 1) Write a program to input a lower case alphabet and test whether it is vowel or consonant.( using else..if and switch both)
- 2) Write a program to input an arithmetic operator and two operands. Calculate and display the result as per the given operator using switch..case.
- 3) Write a program to find the greatest among three numbers.(using else..if and switch both)

**Lab Experiment 7: Programming with while loop and do..while loop:**

- 1) Write a program to input a number and test whether it is prime number or not using while statement.
- 2) Write a program to test a number is perfect or not using while statement.  
(ex: The perfect number is 6, which is the sum of 1, 2, and 3. Other perfect numbers are 28, 496, and 8,128. )
- 3) Write a program to input a positive number and test whether it is palindrome or not using do..while statement.
- 4) Write a program to accept a positive integer and test it for Armstrong or not using do..while statement.

**Lab Experiment 8: Programming with For loops and nested Loop:**

- 1) The length of two rods are given as input in meters. The rods are to be cut into pieces of equal length. Find the maximum length of each piece. (use for loop)
- 2) Write a program to generate a series of Fibonacci numbers using for statement
- 3) Write a program to calculate the following sum using nested for statement:  
Sum =  $1 - (x^2)/2! + (x^4)/4! - (x^6)/6! + (x^8)/8! - (x^{10})/10! \dots (x^n/n!)$
- 4) Write a program to generate the following pyramid using nested for statement:

```
      1
     1 2 1
    1 2 3 2 1
   1 2 3 4 3 2 1
```

**Lab Experiment 9: Programming with 1D Array and 2D Array**

- 1) Write a program to accept 10 integers in to an array and find largest and smallest integers present in them.
- 2) Write a program to input 10 numbers into an array. Find how many prime numbers exist in the array.
- 3) Write a program to input values into a square matrix of size 3X3. Display the transpose of the matrix.
- 4) Write a program to input elements into two matrices A[3][4], B[4][3]. Multiply A and B store result into matrix C [3][3]. Display the resultant matrix C.

**Lab Experiment 10: Programming with Strings Handling Operations**

- 1) Write a program to input a string and find the frequency of a given character in it.
- 2) Write a program to input two strings and compare them for equality without using library function.
- 3) Write a program to input a string and test it for palindrome or not using library functions.

**Lab Experiment 11: Programming with User Defined Functions**

- 1) Write a C program which contains three UDF's namely add(), subtract() and multiply(). Each function accepts two integers as their arguments and calculate and return the results.
- 2) Write a program to create an UDF and test a number is prime or not.
- 3) Write a program to create an UDF which accepts an array of 10 integers and find the largest element and smallest element present in the array.

**Lab Experiment 12: Programming with Recursive Functions**

- 1) Write a program to find the factorial of a number using recursive function.
- 2) Write a program to accept 10 elements into an integer array. Find the largest element present using recursive function.

3) Write a program to generate Fibonacci series using a recursive function.

### **Lab Experiment 13: Programming with Pointers**

- 1) Write a program to swap two numbers using User Defined Function by applying call by address concept.
- 2) Write a program to perform matrix addition. Create an UDF which accepts the two matrices using two pointers and performs matrix addition.
- 3) Write a program to store N integer values using dynamic memory allocation. Then find the largest, smallest present in it using User Defined Function.
- 4) Write a program to store N integers using dynamic memory allocation. Find the average value of the integers using a user defined function.

### **Lab Experiment 14: Programming with Structures**

- 1) Write a program create a structure PRODUCT having members Product no, Name and Price. Using a pointer Input 5 product details into a structure array and then display those products whose price is >1000 rupees.
- 2) Write a program to store 11 cricket players' details into an array of structure. The structure having member's player name, team name and batting average. Displays the name of players whose batting average is  $\geq 30$ .
- 3) Write a program to create a structure EMPLOYEE to store N employee details using DMA having members: employee no, name, salary. Create a function which displays only those employee names whose salary  $\geq 50000$ .
- 4) Write a program to create a structure for store library books using a structure having members book no, name, author, price. Store N books details using dynamic memory allocation. Create an UDF which accepts these books details using pointer and then display only those books whose cost  $\geq 1000$ .

### **Topic Beyond Syllabus**

- 2) Write a program to input a set of numbers into a file called NUM.TXT. Display only the even numbers present in the file and also display their sum.
- 3) Write a program to store a paragraph into a file A.TXT using command line arguments and then create a copy of it with name B.TXT.

### **Teaching Methods: Chalk& Board/ PPT/Video Lecture**

- A case study can be given to each student for each UNIT.
- A Mini Project can be given which the student has to complete during the semester break.

**Text Books:**

- 4) E. Balaguruswamy, Programming in ANSI C, 7<sup>th</sup> edition, Tata McGraw-Hill
- 5) Let us 'C' by YashwantKanethekar, 16<sup>th</sup> edition, BPB Publications
- 6) Byron Gottfried, Schaum's Outline of Programming with C, 3<sup>rd</sup> edition, McGraw-Hill

**References:**

- 4) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2<sup>nd</sup> edition, Prentice Hall of India
- 5) Programming in C, by ReemaThareja, 2<sup>nd</sup> edition, OUP India
- 6) C Programming and Coding by swatisaxena, BPB Publications

**CO-PO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	2	1	1									
CO2	2	3	2	1									
CO3	2	2	3	3	1								
CO4	2	1	3	3	1				1				
CO5	0	0	2	2					1	1			
CO6	0	0	1	1					1	1			
	1.5	1.33	2	1.83	0.33				0.5	0.33			1.12

[ HIGH-3                      MID-2                      LOW -1]

Course Code	Course Title	L	T	P	Credits	QP
23BBSES12003	<b>THEORY SYLLABUS DATA STRUCTURES &amp; ALGORITHMS</b>	5	0	0	3	
Pre -Requisite: Basic knowledge of Algorithms						
<b>Course Educational Objective</b>						
CEO1: Develop algorithms for performing different operations on arrays, stack, Queue, linked list. Analyze the difference between them and understand different applications. Understand different searching and sorting methods and applications.						
CEO2: Understand and analyze Binary Search Tree, AVL Tree, Heap Tree and their applications. Understand the memory representation of graph, its traversal methods and applications. Analyze the Hashing techniques in compare with other sorting techniques.						
Course Outcome: student can able to						
CO1	Understand the basic concepts of data structures, remember the fundamental concepts.					
CO2	Understand the methods by comparing the different data structures concepts.					
CO3	Develop algorithms for implementing different operations on data structures.					
CO4	Analyses of the algorithms regarding different operations on data structures.					
CO5	Solve and evaluate complex problems by coding on linear and non-linear data structures.					
CO6	Design algorithms on advanced concepts of data structure by implementation in different application of data structure.					
<b>UNIT- I</b> <span style="float: right;"><b>(9 Hours)</b></span>						
Basic concepts: Data abstraction, Data structures and types. Algorithm specification, 1D array: operations, 2D array: row major order and column major order, sparse matrix and storing into triplet matrix						
Stack: Basic concepts, operations and implementation of stack using arrays, Mathematical procedure for conversions of arithmetic expressions. Applications of stack: infix to postfix conversion and postfix evaluation.						
<b>UNIT- II</b> <span style="float: right;"><b>(9 Hours)</b></span>						
Queue: Linear queue, operations and implementation using arrays, circular queue and its operations, Basics concepts of Double ended Queue and priority queue						
Searching: Linear search and Binary search on elements in a linear array.						
Sorting: Bubble sort, Insertion sort, Selection sort, radix sort using linear array.						

<b>UNIT- III</b>	<b>(9 Hours)</b>
<p>Linked Lists: The concepts and operations: insertion of a node(at the beginning, at the end, at location), deletion of a node(from the beginning, from the end, from a specific location), searching for a node in single linked list, circular single linked list and Double linked list. Implementation of stack and queue using single linked list. Basic concept of Circular double linked list.</p>	
<b>UNIT- IV</b>	<b>(9 Hours)</b>
<p>Trees: Introduction, Terminology, Binary Trees, Memory Representation of Binary Trees using arrays and linked lists, Binary Tree recursive traversal methods, Construction of binary tree using in-order &amp; pre-order sequences, in-order &amp; post-order sequence. Binary Search Trees: Algorithm for construction, searching and insertion operation, Introduction to Height Balanced trees, Balance factor, Balancing the BST by rotations during insertions of a node.</p>	
<b>UNIT- V</b>	<b>(9 Hours)</b>
<p>Heaps: Introduction to binary heaps, definition of a Max-heap, Min-heap, creating Heap Tree using insertion. Graphs: Terminologies, Graph Memory representation - Adjacency matrix, Incidence Matrix, Linked Representation, path matrix, Warshall's Algorithm to find path matrix, Graph Traversals (BFS &amp; DFS),. Hashing: Hashing Functions: Division, Mid-square, Folding methods.</p>	
<b>Teaching Methods: Chalk&amp; Board/ PPT</b>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. "Fundamental of Data Structure" ( Schaums Series) Tata-McGraw-Hill.</li> <li>2. Pai: "Data Structures &amp; Algorithms; Concepts, Techniques &amp; Algorithms "Tata McGraw Hill.</li> <li>3. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. "Fundamentals of data structure in C" Horowitz, Sahani &amp; Freed, Computer Science Press.</li> <li>2. "Data Structures and algorithms" by Narasimha Karumanchi, Career Monk Publications</li> <li>3. "Data structures through C in depth" by S.K.Srivastava, BPB Publications</li> </ol>	

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	3	0	0	0				0	0			
CO2	2	3	2	1	0				0	0			
CO3	2	3	3	1	0				1	0			
CO4	2	3	3	1	1				1	0			
CO5	2	2	1	0	0				1	1			
CO6	1	1	0	0	0				0	0			
	<b>2.00</b>	<b>2.50</b>	<b>1.50</b>	<b>0.50</b>	<b>0.17</b>				<b>0.50</b>	<b>0.17</b>			<b>1.05</b>

Course Code	Course Title	L	T	P	Credits	QP
23BBSES12103	DATA STRUCTURES & ALGORITHMS LABORATORY	0	0	4	2	
Pre -Requisite: Basic knowledge of Algorithms						
<b>Course Educational Objective</b>						
CEO1: Develop programs for performing different operations on Arrays, Stack, Queue, Linked list. Analyze the difference between them and understand different applications.						
CEO2:Develop programs for understanding different searching and sorting methods and their applications.						
<b>Course Outcome: student can able to</b>						
CO1	Understand the basic concepts of data structures, remember the fundamental concepts.					
CO2	Understand the programming by comparing the types of data structures concepts.					
CO3	Develop the codes for implementing different operations on data structures.					
CO4	Analyses of the codes regarding different operations on data structures.					
CO5	Solve and evaluate complex problems by coding on linear and non-linear data structures.					
CO6	Design the codeson advanced concepts of data structure by implementation in different application of data structure.					
<b>Experiment-1(functions and arrays)</b>						
Q-1) Write a program to create an UDF for input 10 numbers into a 1D array. Create two functions MAX() and MIN(). MAX() is used to return the largest element and MIN() is used to return the smallest number in array.						
Q-2) Write a C program to create methods for operations insertion and display on 1D array of elements using UDF.						
Q-3) Write a C program to create methods for operations deletion, and display on 1D array of elements using UDF.						
<b>Experiment 2: (concepts of matrix and sparse matrix)</b>						
Q-1) Write a C program to create function for performing matrix multiplication using UDF						
Q-2) Write a C program to input elements into a square matrix and display the transpose of it using UDF.						
Q-3) Write a program to input elements into a 4X4 matrix, check it for sparse or not. If sparse then store the non-zero elements into an alternate matrix and then display it using UDF.						
<b>Experiment 3:(Pointer, structure and DMA)</b>						
Q-1) Write a program to store N numbers using dynamic memory allocation and then find the largest element using UDF.						
Q-2) Write a C program to create a structure called student to store your roll no, name, age. Create an array to input 5 students data and then create an UDF to display details where age>=20.						

Q-3) Write a program to create a structure for products of a super market. Store product no, name and cost for N products using dynamic memory allocation. Display the products whose cost is in between 100 rupees to 1000 rupees.

**Experiment 4: (stack and queue)**

Q-1) Write a program using C to create a stack of numbers and perform using UDF:

(i) push operation (ii) pop operation (iii) display operation

Q-2) Write a C program to create a linear queue and perform the following operations using UDF: (i) insertion (ii) deletion and (iii) Traversal

Q-3) Write a C program to create a circular queue and perform the following operations using UDF: (i) insertion (ii) deletion and (iii) Traversal

**Experiment 5: (searching and sorting)**

Q-1) Write a program to implement binary search on array elements using UDF

Q-2) Write a program to implement selection sort on a given list of array elements.

Q-3) Write a program to input a string and sort the alphabets in ascending order using bubble sort.

**Experiment 6: (sorting and merging)**

Q-1) Write a program to input elements into two arrays A[5] and B[5]. Input the elements in ascending order and then merge their values into a resultant array C[10] in sorted manner using UDF.

Q-2) Write a program to implement insertion sort on a given list of array elements.

**Experiment 7 : (single linked list)**

Q-1) Write a C program to perform the operations on a single linked list:

i) Insertion at beginning, ii) Deletion of 1<sup>st</sup> node iii) display all nodes

Q2) Write a C program to perform the operations on a single linked list:

i) insertion at end, i) deletion of last node iii) display all the nodes

Q-3) Write a C program to perform the operations on a single linked list:

i) insertion at location ii) searching for a node item iii) display all the nodes.

**Experiment-8 : (linked stack and linked queue)**

Q-1) Write a C program that uses functions to implement linked stack on single linked list.

Q-2) Write a C program that uses functions to implement linked queue on single linked list.

**Experiment-9 (double linked list)**

Q-1) Write a C program to perform the operations on a single linked list:

i) Insertion at beginning, ii) Deletion of 1<sup>st</sup> node iii) display all nodes

Q-2) Write a C program to perform the operations on a single linked list:

i) insertion at end, i) deletion of last node iii) display all the nodes

**Experiment 10: (Advanced Programs using linked list)**

- Q-1) Write a program to create a single linked list for storing the N cricket player details having member's player name, team name and batting average. Display only those players information whose batting average  $\geq 50$
- Q-2) Write a program to create a double linked list for storing account details of bank customers such as AC no, name, balance. Store details for N bank account holders and find the total balance for all account holders.

**Topic Beyond Syllabus:**

- Q-1) Write a C program to implement quick sort to a given list of integers to sort in ascending order.
- Q-2) Write a program to construction a Binary Search Tree for storing N unique numbers. Apply insertion(), deletion() and display() operation on it using UDF.
- Q-3) Write a program to create a connected graph when its adjacency list is given and display it.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	
CO1	3	2											
CO2	2	2	2										
CO3	2	3	3	1									
CO4	2	2	3	2	1				1				
CO5	2	3	2						1	1			
CO6	1	2											
	<b>2.00</b>	<b>2.33</b>	<b>1.67</b>	<b>0.50</b>	<b>0.17</b>				<b>0.33</b>	<b>0.17</b>			<b>1.02</b>

Subject Code	Title of the subject	L	T	P	C							
23BBSBS10002	Engineering Physics	3	0	0	3							
<b>Course Educational Objectives</b>												
CEO1	Impart among the students an attitude of being inquisitive so that they are capable of independent and critical thinking.											
CEO2	Enable the students to analyse problems starting from first principles, evaluate and validate experimental results, and draw logical conclusions.											
CEO3	Prepare the students to pursue research careers, careers in academics, industries in Physical Science and allied fields.											
CEO4	To attain fundamental information about Quantum mechanics with applications.											
<b>Pre-requisites:</b> Basic understanding of Basic Calculus, Complex numbers, and elementary understanding of Physics.												
<b>Course Outcomes:</b> <i>Upon successful completion of this course, students should be able to:</i>												
CO1	Get good experience in using and understanding areas like oscillations, wave mechanics, optics.											
CO2	Gain good experience using and understanding of electromagnetic theory.											
CO3	Explain the ideas of crystal structure, crystal diffraction and crystal defects											
CO4	Classify various types of materials and their applications											
CO5	Understand Principle of lasing and optoelectronics devices in communication system.											
CO6	Strengthen the student's analytical abilities and help them to formulate different relationships with natural phenomenon like quantum tunneling, potential well etc.											
<b>CO-PO Mapping</b>												
Cos	<b>PROGRAMME OUTCOMES</b>											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	2										
CO2	2	2										
CO3	1	2										
CO4	1	2										
CO5	1	1										
CO6	1	2										
<b>AVG.</b>	<b>1.33</b>	<b>1.83</b>										<b>1.58</b>
<b>SYLLABUS</b>												

**UNIT:1 Oscillation and Waves****(10 Hours)**

Introduction to Oscillatory motion, Simple harmonic oscillation, Damped harmonic oscillation and its characteristics, Waves and its characteristics, Wave equation, Superposition of Waves, coherent and incoherent superposition, Interference of light waves, Newton's Ring experiment, diameter of rings, determination of wavelength of unknown light and refractive index of liquid.

**UNIT:2 Electromagnetic Theory****(10Hours)**

Review of grad, divergence and curl, Gauss divergence theorem and Stokes theorem (no derivations), fundamental laws of electrostatics, magneto-statics and electromagnetism, displacement current and conduction current, Maxwell's equations, Equation of continuity using Maxwell's Relations. Electromagnetic wave and its characteristics, electromagnetic wave equation for free space and in Charge free conducting medium, electromagnetic energy and Poynting vector, Poynting theorem.

**UNIT: 3 Solid state Physics****(08Hours)**

Crystal Structure: crystal direction and plane, Miller indices, Inter planar spacing, Reciprocal Lattice and its characteristics, Reciprocal Lattice of SC, FCC and BCC, Brillouin Zone, X-ray diffraction (Basic) & Bragg's law, Crystal defects.

**UNIT: 4 Physics of Materials and Optoelectronics****(12Hours)**

Super Conducting Materials: Origin, type-1 and type-2, Meissner's effect, critical magnetic field and current density, Applications.

Magnetic Materials: Properties of Magnetic Materials types and applications.

Di-electric Materials: Polar and non-polar dielectric, types of dielectric, piezoelectric, pyro-electric and ferroelectric, Applications.

Nano Materials: (elementary ideas) Surface to volume ratio, graphene, carbon nano tubes and their applications.

LASER, Lasing action and characteristics & application of laser beam, construction and working of He-Ne Laser, applications of Laser. Optical fiber, Acceptance angle, Numerical aperture, Step index and Graded index fibers, Attenuations in optical fibers, Block diagram of optical fiber communication Systems and applications.

**UNIT: 5 Quantum Mechanics and Application****(12Hours)**

Introduction to dual nature: Black body radiation, photoelectric effect, Compton effect (qualitative ideas only), de-Broglie's hypothesis, Heisenberg's uncertainty principle and its application to non-existence of electron inside the nucleus and ground state energy of one dimensional harmonic oscillator, Basic postulates of Quantum Mechanics, Wave function and its characteristics, probability density, normalization, eigen values, eigen functions and expectation values,

Schrödinger's equation (time dependent and time independent). Application of Schrödinger equation to particle in a box and its Energy eigen values, Qualitative ideas on potential step and potential barrier with transmission probability.

**Teaching Methods: Chalk & Board/PPT/Video Lectures**

**Reference Books:**

1. Materials Science & Engg., V. Raghvan, Prentice Hall of India.
2. Concepts of Modern Physics, A. Beiser, S. Mahajan and S. R. Choudhary, Tata Mc Graw Hill.
3. Lasers & Optical engineering, P Dass, Narosa Publishers, Springer Publisher.
4. Engineering Physics by B. B. Swain and P. K. Jena, Kitab Mahal, Cuttack
5. Sears & Zemansky's University Physics with Modern Physics, Young and Freedman.
6. Fundamental of Physics, Halliday & Resnick, Wiley Publisher.
7. Engineering Physics by D.K. Bhattacharya and Poonam Tanden, Oxford University Press.
8. Engineering Physics, H K Malik and A K Singh, Tata Mc Graw Hill, MGH.

Lab Code	Name of the Lab						L	T	P	C	QP	
<b>23BBSBS10102</b>	<b>Engineering Physics Laboratory</b>						<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>		
<b>Course Educational Objectives</b>												
CEO1	Providing fundamental information on basic instruments and their uses.											
CEO2	To familiarize different apparatus and applications through different experiments.											
<b>Course Outcomes: <i>Upon successful completion of this course, students should be able to:</i></b>												
CO1	Understand the concepts of oscillation and waves through experimental observation.											
CO2	Study and explain the experimental observation of interference and diffraction pattern											
CO3	Interpret the fundamental characteristics of various materials and semiconductor materials through experiments											
CO4	Analyse the quantum concept of light by experimental observation.											
CO5	Study thermal conductivity and dielectric constant of a given solid.											
CO6	Understand surface tension and viscosity properties of liquids.											
<b>CO-PO &amp; PSO Mapping</b>												
COs	PROGRAMME OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2		1	1								
CO2	2		1	1								
CO3	2		1	1								
CO4	2		1	2								
CO5	2		1	2								
CO6	2		1	2								
<b>AVG.</b>	<b>2</b>		<b>1</b>	<b>1.5</b>	<b>1.58</b>							

### **List of Experiments:**

1. Determination of the acceleration due to gravity by using Bar/Kater's pendulum.
2. Verification of the laws of transverse vibration by using sonometer.
3. Determination of Rigidity modulus of a wire by Static/Dynamic method.
4. Determination of wavelength of light by Newton's Rings apparatus.
5. Determination of no. of lines of a diffraction grating plate.
6. Determination of slit width of a double slit.
7. Determination of plank's constant using photo-voltaic cell.
8. Determination of band gap energy of PN junction (Ge/Si) diode.
9. Determination of the resistivity of a semiconductor with temperature by four- probe method.
10. Determination of dielectric constant of given solid by Lecher wire method.

### **Add on Experiments**

11. Determination of coefficient of Thermal conductivity (K) of a metal (Cu) by using Searle's apparatus.
12. Study of B-H curve of ferromagnetic substance.
13. Study the Hall Effect.
14. Determination of surface tension of water using Capillary- rise method.
15. Determination of coefficient of viscosity using Stoke's method.

### **Practical Text Books:**

1. Advanced Practical Physics for students, B.L. Flint and H.T. Workshop, 1971, Asia Publishing House.
2. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, Indus Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

## SYLLABUS FOR ENGINEERING CHEMISTRY R-23

### COMMON TO AGE/BIOTECH/CHEMICAL/CIVIL/MECHANICAL BRANCHES

Subject Code	Title of the subject	L	T	P	C							
<b>23BBSBS10003</b>	<b>Engineering Chemistry</b>	3	0	0	3							
<b>Course Educational Objectives</b>												
CEO1	To impart the knowledge of application of chemical sciences in the field of engineering											
CEO2	To elucidates principles of applied chemistry in industrial systems, water treatment and engineering materials											
CEO3	To enlighten the students with the applications of advanced materials.											
<b>Course Outcomes: <i>Upon successful completion of this course, students will be able to:</i></b>												
CO1	Understand microscopic chemistry in terms of atomic and molecular orbitals.											
CO2	Implementation of water treatment techniques for domestic and industrial purposes											
CO3	Application of electrochemistry for the future study on battery/electrochemical devices related to energy storage.											
CO4	Evaluation of corrosion protective techniques to be applied on different materials.											
CO5	Design new materials, which are corrosion resistant and or bio-degradable.											
CO6	Creation and use of different materials as per the requirements of the society.											
<b>CO-PO &amp; PSO Mapping</b>												
COs	PROGRAMME OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	2	1				1					
CO2	3	2	2				2					
CO3	3	3	2				1					
CO4	2	3	2				2					
CO5	2	2	1				1					
CO6	3	2	1				1					
AVG	2.5	2.3	1.5	-	-	-	1.3	-	-	-	-	
<b>SYLLABUS</b>												

<p><b>UNIT:1 ATOMIC AND MOLECULAR STRUCTURE</b></p> <p>De Broglie's theory, Heisenberg's uncertainty principle- wave nature of electron, Schrodinger's wave equation (no derivation), Eigen values and Eigen functions, Significance of wave functions, Particle in one dimensional box, Pauli's exclusion principle – Hund's rule of maximum multiplicity, Aufbau principle. Molecular Orbital theory and Energy level diagram for Homo diatomic molecules of H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub> &amp; F<sub>2</sub>, and Hetero diatomic molecule CO &amp; NO.</p>	<p><b>(10Hours)</b></p>
<p><b>UNIT:02 WATER CHEMISTRY</b></p> <p>Types of Hardness, Determination of Hardness by EDTA method, Treatment of water for Domestic use, Water softening processes Lime-soda process, Ion Exchange method, Boiler feed water, Scale and Sludge, Caustic embrittlement, Carbonate and phosphate conditioning, Colloidal conditioning, Calgon conditioning.</p>	<p><b>(10Hours)</b></p>
<p><b>UNIT:03 ELECTROCHEMISTRY</b></p> <p>Electrodes and electrode potentials – construction of cell and EMF values, Relation between E.M.F and free energy, Electrochemical series, Galvanic series, Conductance, Faraday's Law of Electrolysis, Nernst Equation and applications. Ionic product of water, pH and pH– buffer solutions – use of pH values. Cells –Fuel cells.</p>	<p><b>(10Hours)</b></p>
<p><b>UNIT:04 CORROSION</b></p> <p>Definition of corrosion, Types of corrosion: Dry corrosion and wet corrosion, Galvanic corrosion, Concentration cell corrosion, Factors influencing corrosion, Corrosion control: Cathodic protection (Sacrificial anodic protection and Impressed current cathodic protection), Protective coatings: Electroplating, Galvanization and Tinning.</p>	<p><b>(10Hours)</b></p>
<p><b>UNIT:05 POLYMER CHEMISTRY</b></p> <p>Introduction, polymer, Classification of polymers, Plastics: Thermosetting and thermoplastic plastics, Preparation, Properties and uses of different plastics such as PVC, PE, PTFE, Bakelite, Nylon-6,6, Conducting Polymer (Polyaniline, and Polyacetylene), Bio-Degradable and Non-Bio Degradable Polymer.</p>	<p><b>(10Hours)</b></p>

## Teaching Methods: Chalk & Board/PPT/Video Lectures/Journals

### Reference Books:

1. Engineering chemistry by Jain & Jain, Dhanpat Rai publishing company (p) Ltd.
2. A Text Book of Engineering Chemistry by S. S. Dara, S Chand Publishers.
3. A Text Book of Engineering Chemistry by Sashi Chawla, Dhanpat Rai Publishing house.
4. Text Book of Engineering Chemistry, 2nd edition, by R.Gopalan, D.Venkapaya & Sulochana Nagarajan, Vikas Publishing House Pvt. Ltd.
5. B. Tech Chemistry- I and II by P.K. Kar, S. Dash, B. Mishra kalyani publishers.
6. Physical Chemistry By P.W. Atkins
7. Engineering Chemistry (NPTEL Web Book) by B. L Tembe, Kamaluddin and M.S.Krishna
8. Essentials of Physical Chemistry, Bahl & Tuli, S. Chand Publishing
9. Applied Chemistry, Sunita Rattan, Kataria
10. Engineering Chemistry, Baskar, Wiley
11. Engineering Chemistry Fundamental and Applications, Shikha Agarwal (Second Edition) 2019, Cambridge University Press.
12. University chemistry by B.H.Mahan.
13. Electrochemistry by Samuel Glasstone, East West Press Private, Limited.
14. Polymer Science by V R Gowariker, N V Viswanathan, J Sreedhar, New Age International Publishers 2<sup>nd</sup> edition.

**SYLLABUS FOR ENGINEERING CHEMISTRY LABORATORY  
COMMON TO ALL BRANCHES**

Lab Code	Name of the lab	L	T	P	C	QP						
<b>23BBSBS10103</b>	<b>Engineering Chemistry Laboratory</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>							
<b>Course Educational Objectives</b>												
CEO	To train the students about the applications of chemical sciences in the field of engineering and technology											
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>												
CO1	Understand the basic methods of chemical analysis and instrumentations involved											
CO2	Prepare standard chemicals											
CO3	Analyze various physical parameters such as pH, DO, etc of unknown sample.											
CO4	Apply the principle of chemistry for preparation of drugs.											
CO5	Evaluate different chemical parameters (Hardness and alkalinity)											
CO6	Design various materials for engineering applications											
<b>CO-PO &amp; PSO Mapping</b>												
COs	PROGRAMME OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2		1									
CO2	2		2				1					
CO3	2		2				1					
CO4	3		1				1					
CO5	2		1				1					
CO6	2		1				1					
<b>Avg.</b>	<b>2.1</b>		<b>1.3</b>	-	-	-	<b>1</b>	-	-	-	-	
<b>List of Experiments:</b>												
<ol style="list-style-type: none"> <li>Determination of amount of OH<sup>-</sup> and CO<sub>3</sub><sup>2-</sup> present in supplied water sample.</li> <li>Determination of total hardness of water.</li> <li>Standardization of KMnO<sub>4</sub> using sodium oxalate.</li> <li>Determination of ferrous ion in Mohr's salt by standardized KMnO<sub>4</sub>.</li> <li>Determination of percentage of dissolved oxygen in given water sample.</li> <li>Estimation of available chlorine in bleaching powder/ chloride content.</li> <li>Determination of rate constant of acid catalyzed hydrolysis of ester.</li> <li>Preparation of drug (aspirin/Paracetamol).</li> <li>Adsorption of acetic acid by charcoal.</li> <li>Acid value of oil.</li> </ol>												

11. Determination of strength of HCl and CH<sub>3</sub>COOH acid from the mixture of acids using NaOH by Conductrometry.
12. Determination moisture and ash content of coal.
13. Determination of partition coefficient of iodine in benzene and water.
14. Preparation and determination of pH of buffer solution.
15. Determination of viscosity of supplied sample.
16. Potentiometric estimation of Mohr's salt with standard potassium dichromate solution.

**Add on Laboratory**

1. Synthesis of materials by solgel technology
2. Synthesis of hybrid materials by micro emulsion technique
3. Separation and purification technique (Homogeneous Mixture)
4. Synthesis of Polystyrene and determination of molecular weight by UV method
5. Preparation of Soap and Sanitizer

**Reference Books:**

1. Chemistry Practicals By S. Dara
2. Theory and Practicals of Engineering Chemistry By Dr Sunita Ratan S.K. Kataria & Sons; Reprint 2012 edition (2013)

## Basic Electrical and Electronics Engineering

Subject Code	Title of the subject	L	T	P	C
<b>23BBSES10001</b>	<b>Basic Electrical and Electronics Engineering</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>3</b>
<b>Course Educational Objectives:</b>					
<b>CEO1:</b>	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.				
<b>CEO2:</b>	To provide comprehensive idea about AC and DC circuit analysis, working principles and applications of basic machines in electrical engineering.				
<b>CEO3:</b>	To expose the students in the field of analog and digital electronics engineering and to acquire the fundamental knowledge in the field.				

### Assessment Methods

<b>Direct</b>
<ol style="list-style-type: none"> <li>1. Continuous assessment of skills</li> <li>2. Class Test – 2Nos</li> <li>3. Cycle Test – 2Nos</li> <li>4. Semester End Examination</li> </ol>
<b>Indirect</b>
<ol style="list-style-type: none"> <li>1. Course End Survey</li> </ol>

### Course Outcomes:

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

<b>CO1:</b>	Analyze the circuits by applying network theorems like Mesh, Nodal analysis, and Thevenin's theorem and find various electrical parameters.
<b>CO2:</b>	Illustrate the single-phase and three phase AC circuits along with the concept of impedance parameters and power.
<b>CO3:</b>	Understand the working principle and applications of DC & AC machines.
<b>CO4:</b>	To acquire the knowledge about the characteristics and working principles of semiconductor diodes.
<b>CO5:</b>	Explain the basic principles of CRO, function generator, number system and Boolean algebra.
<b>CO6:</b>	Understand the basic concept of sensors and distribution of electrical energy in home.

### CO-PO Mapping

COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2											2			
CO2	3	2	2													
CO3	2	1	1													
CO4	2	1	1													
CO5	2	1	1													
CO6	1	1														
Avg.	2.16	1.33	1.16													

#### Unit – I

[12 hrs]

**DC Circuits & Network Theorems:** Introduction to electrical terminology, Ohm's Law, Equivalent Resistance, Star-delta transformation, Source conversion, Ideal and practical sources; Kirchhoff's Law, Mesh and Nodal Analysis; Thevenin's theorem excited by independent sources.

**Single Phase AC Circuits:** AC Fundamentals: RMS & Average value, Complex algebra, AC through pure R, L, C, series RL & RC circuits.

#### Unit - II

[10 hrs]

**Three-Phase AC Circuits:** Comparison between 1-ph & 3-ph AC circuit, phase sequence, Balanced Star & Delta connection, Relation between line and phase quantities.

**Elementary concept of DC & AC machines:** Construction and working of DC Generator and motor, EMF equation, Types of DC machines, Applications, Single phase transformers: Construction, principle of working, e.m.f equation;

#### Unit – III

[10 hrs]

**Semiconductor Diodes:** Introduction; Ideal Diode; Semiconductor Materials; Energy Levels; Extrinsic Materials- *n*- and *p*-Type; Semiconductor Diode; Resistance Levels; Diode Equivalent Circuits; Zener Diode.

**Diode Applications:** Half-Wave Rectification; Full-Wave Rectification, Clipper, Clamper.

#### Unit – IV

[10 hrs]

**Digital Electronics Fundamentals:** Binary, Octal, Hexadecimal and Decimal Number System and their Conversion; 1's and 2's Complements; Logic gates: AND, OR, NOT, Universal Gates,

**Electronic Instrumentation:** Introduction; Basic Principle; Digital Oscilloscope; Block

Diagram of Cathode Ray Oscilloscope, function generator.

**Unit – V**

**[8 hrs]**

**Introduction to Sensors:** - Temperature sensors, Light sensors, Force sensors, Displacement sensors, Motion sensors, Sound sensors, Piezoelectric Sensors

**Introduction to Power System & Domestic Wiring:**

Generation of electricity (Hydro, Thermal and Nuclear power plant); General layout of electrical power system and functions of its elements, Meter board, Fuse, MCB, Earthing (pipe & plate earthing), House wiring, Electric shock & precautions.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**1. Reference Text Books:**

2. *E. Hughes, "Electrical and Electronics Technology", Pearson, 2012.*
3. *B.L. Thereja, A.K. Thereja, „Electrical Technology“Volume-I, S. Chand.*
4. *Electronic Devices and Circuit Theory by Robert L Boylestad and Louis Nashelsky, 11<sup>th</sup> Edition, Prentice Hall.*
5. *Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020*
6. *S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.*
7. *Digital Design by M. Morris Mano, 5<sup>th</sup> Edition, Pearson Education.*
8. *B.L. Thereja, A.K. Thereja, „Electrical Technology“Volume-I, S. Chand.*
9. *S. Parker Smith: "Problems in Electrical Engineering" Asia Publications*
10. *Schaum's Outline of Basic Electrical Engineering.*
11. *Handbook of Modern Sensors: Physics, Designs, and Applications Paperback – 19 September 2014 by Jacob Fraden (Springer)*

Lab Code	Name of the Lab	L	T	P	C
<b>23BBSES10101</b>	<b>Basic Electrical and Electronics Engineering Laboratory</b>	0	0	2	1

Course Outcomes: *Upon successful completion of this course, students should be able to:*

CO1	Explain the concept of network theorems and apply them to laboratory Measurements using different measuring devices.
CO2	Measure power and power factor in ac circuits using different lamps
CO3	Understand and identify different parts of AC and DC machines.
CO4	Verify the characteristics of diodes, transistors, digital electronic components Experimentally and able to use oscilloscope, signal generator to measure amplitude and frequency of different waveforms.
CO5	Demonstrate the operating principle and VI characteristics of Semiconductor diode and transistor.
CO6	Understand the concept of various logic gates

#### CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	1	1		2											
CO2	3	2	2		2											
CO3	2	1	2													
CO4	2	2	2		2											
CO5	2	2	2		2											
CO6	1	1	2													
Avg.	2.16	1.6	2		1.3											

#### SYLLABUS

List of experiments/demonstrations:

##### Electrical Part:

##### Experiments: (Any 4 Experiments) :

1. Study of different electrical equipment's (Voltmeter, Ammeter & Wattmeter)
2. Verification of Thevenin's Theorem.
3. To study the connection and working of fluorescent lamp and to learn about the improvement of power factor using capacitor.
4. Calculation of current, voltage and power in series R-L-C circuit excited by single-phase AC supply and calculation of power factor.

5. Connection and testing of a single-phase energy meter.
6. VI Characteristic of an incandescent lamp.
7. Study of various parts of DC & AC machines.

**Electronics Part: (Any 4 Experiments):**

1. Familiarization of electronic components and devices (testing of semiconductor diodes and transistors using digital multimeter)
2. Study and use of oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.
3. V-I characteristics of semiconductor diode and determining its DC and AC resistance.
4. Studies on half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectifier output.
5. V-I characteristic of an n-p-n or p-n-p transistor, DC biasing the transistor in common-emitter configuration and determination of its operating point (i.e., various voltages and currents).
6. Study and Truth table verification of different logic gates.
7. Studies on Clipper and Clamper along with their corresponding waveforms

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C	QP
23BBSES10002	ELEMENTS OF MECHANICAL ENGINEERING	3	1	0	4	

**Pre - Requisite: Math and Physics**

**Course Educational Objectives**

CEO1	To understand the Basics of Forces and Force Analysis.
CEO2	To apply the established engineering methods to complex engineering problem.
CEO3	To understand the fundamental Concepts of thermodynamics and to distinguish the components and working principle of heat engine and determine the COP of heat pump and refrigerator.
CEO4	To impart basic knowledge on automation and basic codes in CNC machining, to study different properties of Fluids.

**Course outcomes: At the end of the course, the student will be able to:**

CO1	To analyze mechanical engineering systems using vectorial representation of forces and moments.
CO2	To analyze and apply the concept of centroid and centre of gravity.
CO3	To apply the concept of friction and ability to solve problem related to the same.
CO4	To apply the basic concept of thermodynamics, its properties and to generate the ability to differentiate different forms of energy i.e. heat and work.
CO5	To apply first law of thermodynamics to closed and flow systems. To realize the need of second law of thermodynamics in nature.
CO6	To understand the fundamental concepts of viscosity, surface tension, pressure (absolute and gauge), CNC coding and FMS.

**CO-PO & PSO Mapping**

COs	PROGRAMME OUTCOMES								PSOs					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3												
CO2	3	3												
CO3	3	3												
CO4	3	2												
CO5	3	3												
CO6	2	1												
Avg.	2.8	2.5												

**SYLLABUS**

**UNIT:1****[10 hours]****STATICS OF PARTICLES**

Force System: Force, Parallelogram Law, Free body diagram, Determination of reactions, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system.

Concept of Centre of Gravity: Basic definition of Centroid and centre of gravity, use of axis of symmetry, determination of centroid of simple figures (like triangle, rectangle, etc), Centroid of composite sections.

**UNIT:2****[10 Hours]****ANALYSIS OF TRUSSES AND FRICTION**

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Friction: Laws of Friction - Angle of Friction-Angle of Repose, Numerical problems including ladder friction.

**UNIT:3****[10 Hours]****BASICS OF THERMODYNAMICS**

Fundamental Concepts and Definitions: Definition of Thermodynamics, System, surrounding and universe, Macroscopic & microscopic point of view. Property, State, Path, process, Cyclic process, Density, Specific volume, Pressure, temperature. Thermodynamic equilibrium, Quasi-static process, concept of ideal gas, Work and heat transfer, Zeroth law. First law of thermodynamics. Numericals based on simple formula.

**UNIT:4****[8 Hours]**

Application of first law in non-flow and flow processes. Steady flow energy equation, limitation of first law. Thermal reservoir, Statements of second law, Heat engine, COP of heat pump and refrigerator. Carnot cycle. Basic concepts of power plant and IC engines. Numericals based on simple formula.

**UNIT:5****[12 Hours]****FUNDAMENTALS OF FLUIDS**

Fluids: Properties of Fluid like Pressure, Viscosity, Capillary Effect, Surface Tension, Pascal's Law, and Bernoulli's Equation for incompressible fluid flow.

**ROBOTICS AND AUTOMATION**

Basic concepts of Robotics, Automation and its Classification, Numerical Control of machine tools, Introduction to CNC machine, Basic codes used in CNC, Introduction to Flexible manufacturing system.

**Teaching Methods: Chalk & Board, PPT, CNC machine Demonstrations****REFERENCE BOOK:-**

1. Engineering Mechanics by S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
2. Basic Mechanical Engineering by Agrawal & Agrawal, Wiley
3. S.Timoshenko, and D.H.Young, "Engineering Mechanics", TMG Hill Book,5th edition

4. Thermodynamics An Engineering Approach by Cengel & Boles, McGraw Hill
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. A text book of Fluid mechanics and Hydraulic machines by R K Bansal, Laxmi Publications, 2010
7. Computer aided Design and Manufacturing by Mikell P. Groover, McGraw-Hill Inc, 2007

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C	QP
23BBSHS10002	<b>Human Values and Professional Ethics (HVPE) B. Tech. First Semester (Non Credit Paper)</b>					
<p><b>1. BASIC CONCEPTS</b></p> <p>Introduction, Terminology, Moral and Morality, Ethics, Values, Spirituality, Stakeholders, Government Edicts, Religious Edicts, Social Edicts, Constitutional Edicts, Universality, Contextual Aspects, Context, Changing Scenario, Personal Ethics, Professional Ethics, Ethical Dilemmas, Life Skills, Life Skills (WHO), Emotional Intelligence, Ability – based Model (Salovey- Mayer, Model), Emotional Competencies (Goleman’s Model), Thoughts on Ethics, Indian Thoughts, Global Thoughts on Ethics, Value Education, Current Scenario, Objectives of value Education, Importance of value Education, Acquiring Values, Dimensions of Ethics, Setting Goals in Life.</p>						
<p><b>2. PROFESSION AND PROFESSIONALISM</b></p> <p>Introduction, Profession, Professional, Professionalism, Criteria, Characteristics, Responsibilities, Competencies, Expectations, Support, Professional Associations, Roles of a Professional, Professional Risks, Professional Accountability, Professional Success, Ambition and Satisfaction, Ethics and Profession, Image of a Profession</p>						
<p><b>3. ETHICAL THEORIES</b></p> <p>Introduction, Basic Ethical, Principles, Moral Development Theories, Piaget’s Theory, Elliot Turiel’s Domain Theory, Comparison of Moral Development Theories, Learning Moral Values, Classification of Ethical Theories, History, Classification, Some Basic Theories, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolutism, Moral Relativism, Ethical Egoism, Feminist Consequentialism, Comparison of Ethical Theories, Moral Issues, Variety of Moral Issues, Examples, Moral Dilemmas, Examples, Resolving Moral Dilemmas, Moral Autonomy, Religion and Ethics, Influence of Religion, Conflict with Ethics, Types of Enquiry, Descriptive or Factual Enquiry, Conceptual Enquiry, Normative Enquiry, Uses of Ethical Theories.</p>						
<p><b>4. ETHICS IN ENGINEERING PROFESSION</b></p> <p>Introduction, Engineering Profession, Technology and Society, Engineering as Social, Experimentation, Similarities between Engineering and Other Scientific Experiments, Differences, Engineering Professionals, Training, Skill Set, Life Skills, Innovation and Creativity, Professional Organizations, Professional Categories, Engineering Failures, Issues in Engineering Ethics, Ethical Obligations of Engineering Professional, Concept of safe Exit, Roles of Engineers, Engineers as Managers, Other Roles Played by Engineers, Balanced Outlook on Law.</p>						
<p><b>5. ENGINEER’S RESPONSIBILITY FOR SAFETY</b></p> <p>Introduction, Safety and Risk, Concept of Safety, Assessment of Risk, Risk Assessment Technique, Safety in</p>						

Engineering Products, Risk and Cost, Engineer's Responsibility for Safety, Product Safety, Mandatory Product Standards, (Australia), Designing for Safety, Product Costs, Probability of Safety and Risk, Risk- Benefit Analysis, Risk Cost and Management, Principles of Risk Management, Context Establishment, Identification, Severity and Probability of Risk, Strategies for Risk Management, Case Studies , Space Shuttle Challenger, Tamil Nadu Floods (2015), Bhopal Gas Tragedy, Other Tragedies, Classification of Disasters, Disaster Management Cycle, Disaster Management in India, Providing for Safe Exit, Major Ethical Issues.

## **6. RESPONSIBILITIES AND RIGHTS OF PROFESSIONALS**

Introduction, Rights and Responsibility as Citizens, Responsibilities, Rights, Professional Responsibilities, Collegiality, Loyalty, Confidentiality, Respect for Authority, Accountability, Pride of Profession, Pride of Employer, Conflict of Interest, Gifts and Bribes, Collective Bargaining, Occupational Crimes, Professional Rights, Rights of an Employee, Rights of a Professional, Whistle- blowing, Discrimination, Vishakha Guidelines and Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act 2013.

## **7. GLOBAL ISSUES**

Introduction, Current Scenario, Technology Revolution, Globalization and MNCs, Impact of Automation, International Trade, World Summits, Disaster Management (in 2015), Issues, Business Ethics, Corporate Governance, Finance and Accounting, Corporate Social Responsibility, Definitions, Concept, ISO and CSR, Scenario, CSR Rules in India, Case Studies, Kellogg's, Infosys Foundation, Tata Group of Companies, Environment Ethics, Environment, Challenge of Environmental Ethics, Anthropocentrism, Sustainable Development, Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethical Issues, Computer Ethics, Manufacturing and Marketing of Computers, Software, Cybercrimes, Data Stealing, Embezzlement, Hacking, Media Ethics, Roles of Media, Positive Aspects of Media, Negative Aspects of Media, Classification of Media, Support to Media, Accountability of Media, Regulation of Media, Factors in Media Ethics, Advertising Ethics, War Ethics, Weapons Development, Terrorism, Ethical Issues, Bioethics, Abortion, Euthanasia, Surrogacy, Cloning, Genetics, Research Ethics, Intellectual Property Rights, Why Intellectual Property Rights?, Purpose and Advantages on IPR, Domains of IPR, Professionals and Ethics.

## **8. ETHICAL CODES**

Introduction, Need for Ethical Codes, Sample Codes, Institution of Electrical and Electronics Engineers, National Society for Professional Engineers (USA), Board of Ethical Review, American Society of Civil Engineers, American Society for Mechanical Engineers. Computer Society of India, Codes from Other Professions, Medical Council of India, Observations, Advertising Standards Council of India, Corporate Codes, Tata Group of Companies, Development of Codes, Implementation of Codes, Limitation of Codes.

## **9. ETHICS AUDIT**

Introduction, Need of Ethics Audit, Ethics Profile of Organizations, Consideration for Ethics Audit, Manufacturing Unit, Educational Institution, Ethics Standards and Benchmarking, Objectives of Ethics Audit, Setting Ethics Standards, Ethics Assurance, Audit Brief, Ethics Auditors, Procedure for ethics Audit, Ethics Audit Report, Examples, Drug Manufacturing Unit, Educational Institution, Ethics Indices, Ethisphere Institute, FTSE4Good Index, Dow Jones Sustainability Index, Good Corporation Standard, Starting an Ethics Audit Programme.

### **10. HUMAN VALUES AND ATTITUDES**

Introduction, Terminology, Domains of Learning, Affective Domain Taxonomy, Human Values, Classification of Values, Values and Ethics, University of Values, Value System, Degeneration of Values, Importance of Values, Acquiring Values, Attitudes, Components of Attitude, Types of Attitude, Attitude Formation, Attitude Change, Importance of Correct Attitude, Values, Attitude, and Professionals.

### **11. ETHICAL LIVING**

Introduction, Needs of Life, Maslow's Hierarchy of Needs, Mc Celland's Theory, some Thoughts on Life, Four Orders of Nature, Anthrosophical View, Indian Philosophical Thoughts, Harmony in Life, Harmony with the self, Harmony with the Family, Harmony with Society, Harmony with Nature, Ethical Living, Why Ethical Living, Setting Goals in Life, Areas, Achieving Goals, Ethical Living for Professionals, Appendix Practical Tasks, Index, About the

### **RECOMMENDED BOOKS FOR REFERENCE:**

1. R. Subramanian, "Professional Ethics", Oxford University Press, New Delhi, 2013
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2013
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, 2003.
4. Daniel Albuquerque, "Business Ethics", Oxford University Press, New Delhi, 2013
5. Edmund G. Seebauer and Robert L. Barry, "Fundamentals of Ethics", Oxford University Press New Delhi, 2012.

Title of the subject						
Subject Code	First Year	L	T	P	C	QP
23BBSES10004	Dietetics and Nutrition	1	0	0	1	A
Course Educational Objective						
CEO1: Graduates can understand the importance of diet for good health						
CEO2: Graduates should know about balance diet, menu planning and critically evaluation of meal						
Course outcomes: At the end of the course, the student will be able to:						
CO1	Know about importance of health and balance diet					
CO2	Understand about composition of human diet and their function					
CO3	Have the knowledge on importance of macro and micro nutrients.					
CO4	Acquire knowledge on role of vitamins and minerals in food					
CO5	Know the digestive system of the human beings.					
CO6	Get an idea about menu planning and critically evaluation of meal					
<b>UNIT:1</b>						<b>10 Hours</b>
<p>Basic Aspects: Definition of the terms Health, Nutrition and Nutrients. Importance of food (Physiological, Psychological and social function of food) in maintaining good health. Classification of nutrients, Balanced diet, food groups. Balanced Diet: Definition, Importance of balanced diet, RDA for various nutrients- age, gender, physiological state.</p> <p>Macronutrients: Carbohydrates-Definition, Classification ( Mono, di and polysaccharides), Dietary Sources, Function- Excess. Lipids-Definition, Classification, Dietary Sources, Functions.</p>						
<b>UNIT:2</b>						<b>10 Hours</b>
<p>Protein-Definition, Classification based upon amino acid composition, Dietary sources, Functions, Methods of improving quality of protein in food(special emphasis on soya protein and whey protein), Evaluation of protein quality: PER, BV, NPU and Chemical score.</p> <p>Energy: Definition of Energy and Units of its measurement (Kcal), Energy contribution from macronutrients(carbohydrates, proteins, and fat), Factors affecting energy requirements, Concept of BMR, SDA, Factors affecting BMR, Thermic effect of food, Dietary Sources of energy, Concept of energy balance and the health hazards associated with Underweight, Overweight</p>						
<b>UNIT:3</b>						<b>8 Hours</b>
<p>Water: Definition, Dietary Sources (visible, invisible), Function of water, Role of water maintaining health (water balance)</p> <p>Dietary Fibre: Definition, Dietary Sources, Classification, Physiological effects of deficiency.</p>						

<p>Micronutrients: Vitamins-Definition and classification (water and fat soluble vitamins), Food Sources, function and significance of Fat soluble vitamins (Vitamin A, D, E, K), Water soluble vitamins (Vitamin C,Thiamine, Riboflavin, Niacin, Cyanocobalamin and Folic acid)</p>	
<b>UNIT:4</b>	<b>6 Hours</b>
<p>Minerals: Definition and classification (major and minor), Food Sources, functions and significance of calcium, Iron, Sodium, Iodine and Fluorine.</p> <p>Digestion: Digestion and Absorption, Mechanical and Chemical breakdown of food. Menu Planning- Planning of nutritionally balanced meals based upon the three food group system, Factor affecting food planning, Critical evaluation of few meals served at the Institutes/Hotels based on the principle of meal planning, Calculation of proximate principles and energy of 3 Indian and 3 Conti lunch menus, Critical evaluation and suggested improvement.</p>	
<b>UNIT:5</b>	<b>6 Hours</b>
<p>Food in day to day life: Principles of food preservation (Fruits- Squashes and jams, Vine &amp; Vegetables by Pickling), Nutrition in physical fitness. Immunomodulator foods.</p>	
<b>Teaching Methods: Chalk&amp; Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCs</b>	
<b>Ref. Books</b>	
<ol style="list-style-type: none"> <li>1. Food Science and nutrition- Sunetra Roday</li> <li>2. Food hygiene and sanitation -Sohna Roda</li> <li>3. Nutrition and Dietetics by Shubhangini A. Joshi</li> <li>4. BamjiMS (2019) Text book of Human Nutrition, 4<sup>th</sup>Edn, Oxford &amp; IBH Publishing Co Pvt. Ltd, ISBN 9788120417908.</li> <li>5. Food Science- Porter and Hotchkin</li> <li>6. Advanced Nutrition and Dietetics in Nutrition Support, Editor(s):Mary Hickson PhD RD, Sara Smith PhD RD, Kevin Whelan PhD RD FBDA</li> </ol>	

<b>CO-PO &amp; PSO Mapping</b>															
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	2	1	1	-	-	-	-	-	-	-	-	-	2	1	-
CO	1	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO	2	1	2	-	-	-	-	-	-	-	-	1	-	-	-
CO	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO	2	2	1	-	-	-	-	-	-	-	-	1	1	1	-
CO	2	1	2	-	-	-	-	-	-	-	-	1	1	2	-
Av	1	1.33	1.33	-	-	-	-	-	-	-	-	1.0	1.2	1.2	-



## **SYLLABUS**

### List of Experiment ( Any eight)

1. To study various safety precaution in workshop.
2. To study different hand tools and machine tools used in fitting.
3. To study various components and working principle of Standard centre Lathe machine.
4. To prepare a cylindrical job by Lathe machine (Facing, Taper Turning, Step Turning, Knurling )
5. To study and know the working principle of Shaper and Milling machine.
6. To prepare Lap joint, Butt joint, Corner joint and T-Joint with the help of Electric arc welding.
7. To Prepare a Lap joint with the help of Oxy-Acetylene gas welding.
8. To calculate the angle of the given tapered component by using sine bar and slip gauges.
9. To determine the flatness of a given surface plate.
10. To determine the surface roughness test of various components.
11. Calibration of LVDT by using micrometer.
12. Calibration of load cell by using proving ring.
13. Calibration of thermocouple by using thermometer.

### Reference book :

1. Elements Of Workshop Technology Vol 1 and 2 , by S. K. Hajra Choudhury
2. Laboratory Manual

SUBJECT CODE	TITLE OF THE SUBJECT											L	T	P	C
23BBSES10105	Engineering Graphics & Design Lab											1	0	2	2
<b>Pre - Requisite:</b>															
<b>Course Educational Objectives</b>															
CEO1	To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions														
CEO2	To enable students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing and basic of AUTOCAD.														
<b>Course outcomes: At the end of the course, the student will be able to:</b>															
CO1	Understand the basics of engineering drawing and method dimensioning in engineering systems.														
CO2	Prepare the orthographic projections of points and straight lines placed in various quadrants														
CO3	Demonstrate the ability of drawing orthographic projections of various planes & solids parallel, perpendicular and inclined to different planes.														
CO4	Sketch the isometric view of different planes and solids by showing all their features in 3D.														
CO5	Draw and interpret the sectioned views of solids														
CO6	Apply the software skills to prepare engineering drawings using AutoCAD														
<b>CO-PO &amp; PSO Mapping</b>															
COs	PROGRAMME OUTCOMES											PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3			1											
CO2	2		2	2											
CO3	2		2	2											
CO4	2		2	2											
CO5	2		2	2											
CO6	3		2		3										
Avg.	2.3		1.6	1.5	0.5										
<b>SYLLABUS</b>															

**UNIT:1**

Introduction: Drawing Instruments and their uses, BIS conventions, Types of line, Types of scale. Projections : Introduction, Types, Definitions - Planes of projection, reference line and conventions employed, Orthographic Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, projection of line inclined to one plane and both the planes.

**UNIT:2**

Orthographic Projections of Plane Surfaces (First Angle Projection Only):

Introduction, Definitions—projections of plane surfaces—triangle, square, rectangle, pentagon, hexagon and circle, planes in different positions by change of position method, projection of inclined planes.

Orthographic Projections of Solids (First Angle Projection Only) :

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

**UNIT:3**

Isometric Projections: Introduction, projection of plane-square, triangular, circle, method of point and four center method

Isometric projection of solids: projection of prisms, pyramids method of drawing non-isometric lines, box method , offset method, projection some typical solids.

**UNIT:4**

Sections and Development of Lateral Surfaces of Solids: Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

**UNIT:5**

Introduction to AUTO CAD: Layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

**Teaching Methods: Chalk& Board, Computer software(AUTO CAD)**

REFERENCE BOOK:-

8. Engineering Drawing - N.D. Bhatt & V.M. Panchal, Charotar Publishing House, Gujarat.
9. Computer Aided Engineering Drawing - S. Trymbaka Murthy, 4th Ed, University Press  
Engineering Drawing by N.S. Parthasarathy and Vela Murali Oxford University Press.
10. Engineering Graphics - K.R. Gopalakrishna, Subash Publishers Bangalore.
11. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer  
Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy  
Edition, Prentice-Hall of India Pvt. Ltd., New Delhi.
12. Computer Aided Engineering drawing, Prof. M. H. Annaiah, New Age International  
Publisher, New Delhi

**III Semester [Second Year]**  
**B. Tech in Computer Science and Engineering (2023 Admission)**

SN	CC	Sub Code	Name of the Subject	L	T	P	C	ISA	ESA
<b>THEORY</b>									
1	BS	23BCSBS23001	Discrete Mathematics	3	1	0	4	40	60
2	ES	23BCSES23001	Digital Electronics Circuits	3	0	0	3	40	60
3	PC	23BCSPC23001	Database Management Systems	3	0	0	3	40	60
4	PC	23BCSPC23002	Object Oriented Programming through Java	3	0	0	3	40	60
5	PE	23BCSPE23001	PE-I (From Bucket)	3	0	0	3	40	60
6	HS	23BBSHS23001	Intermediate communication skills and critical thinking	1	0	0	1		
			TOTAL	16	1	0	17	200	300
<b>PRACTICAL/SESSIONAL</b>									
7	ES	23BCSES23101	Digital Electronics Circuits Lab	0	0	2	1	30	20
8	PC	23BCSPC23102	Object Oriented Programming through Java Lab	0	0	2	1	30	20
9	PC	23BCSPC23101	Data Base Management Systems Lab	0	0	2	1	30	20
10	HS	23BBSHS23101	Intermediate communication skills and critical thinking lab	0	0	2	1	30	20
11	PST	23BCSPW23101	Summer Internship-I	0	0	0	1	30	20
12	MC	23BCSLP23101	Learning Project-I	0	0	0	1	50	0
			TOTAL	0	0	8	6	200	100
			<b>TOTAL</b>	<b>16</b>	<b>1</b>	<b>8</b>	<b>23</b>	<b>400</b>	<b>400</b>

**Professional Elective Bucket**

Sl.	Sem	Professional Elective I
1	23BCDPC23011	Introduction to Data Science
2	23BCDPC23012	Data Preparation and Analysis

<b>Subject Code</b>	<b>Name of the Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>Discrete Mathematics</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Course Educational Objectives</b>					
<b>CEO1</b>	To know logical equivalence and to apply in various proofs.				
<b>CEO2</b>	To know about relation and recurrence relation.				
<b>CEO3</b>	To study Boolean Algebra and its properties.				
<b>CEO4</b>	To know about Graphs and trees.				
Course Outcomes: Upon successful completion of this course, students should be able to:					
<b>CO1</b>	Understanding the concept of logic, groups, lattice. graphs and trees				
<b>CO2</b>	Memorize the logical gates, recurrence formulas and different types of graphs				
<b>CO3</b>	Evaluate the arguments, predicates and quantifiers, solution of recurrence relations, methods of solution				
<b>CO4</b>	Analyze recurrence relation by generating functions and groups, binary trees				
<b>CO5</b>	Categorize different types of graphs, and its property				
<b>CO6</b>	Solve the logical equivalences, Boolean algebra and pre order and post order of arithmetic Operations.				

### CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>	1	2														
<b>CO2</b>	2	3														
<b>CO3</b>	2	3														
<b>CO4</b>	2	3														
<b>CO5</b>	2	3														
<b>CO6</b>	2	3														
<b>Avg.</b>																

### SYLLABUS

<b>UNIT I - MATHEMATICAL LOGIC AND SET THEORY</b> <span style="float: right;"><b>(12 Hours)</b></span>
Propositional logic, Propositional Equivalence, Predicate Calculus, and Quantifiers Statement Calculus, Nested Quantifiers, Proof methods and Strategies, Mathematical Induction
<b>UNIT II- RECURRENCE RELATION</b> <span style="float: right;"><b>(12Hours)</b></span>
Recurrence relation, Solution to recurrence relation, Generating functions, Inclusion and exclusion principle Relation and their properties, Closure of relations, Equivalence relations, Partial order relations, posets
<b>UNIT III - BOOLEAN ALGEBRA AND LATTICES</b> <span style="float: right;"><b>(12 Hours)</b></span>
Lattices, Distributive and Complemented Lattices, Sub-lattices, Boolean Lattices and Boolean algebra, Boolean Functions and Boolean Expressions
<b>UNIT IV- GROUP THEORY</b> <span style="float: right;"><b>(12 Hours)</b></span>
Semi groups, Monoids, Groups, Subgroups, and Permutation groups, Normal subgroups, Homomorphism, isomorphism, Kernel.
<b>UNIT V- GRAPH THEORY</b> <span style="float: right;"><b>(12 Hours)</b></span>
Basic Definitions – Some Special Graphs – Matrix Representation of Graphs -- Paths and circuits – Eulerian Theorem, Hamiltonian Theorem, Graphs – connected graphs, Graph coloring , Trees - Spanning Trees - Rooted trees – Binary Trees, Minimum Spanning tree -Kruskal's algorithm , Prim's algorithm , Tree Traversal.

**Reference Books:**

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Sixth Edition, 2008, Tata McGraw Hill Education, New Delhi
2. C. L. Liu and D. Mohaptra, "Elements of Discrete Mathematics", Third Edition, 2008,
3. N. Deo, Graph Theory and Applications to Engineering and Computer Science, Prentice Hall of India
4. Discrete Mathematics by Schaum's Outlines(Second Edition)
5. Ralph P. Grimaldi," Discrete and Combinatorial Mathematics", Fifth Edition, 2005, Pearson Education, New Delhi.

Subject Code	Name of the Subjects	L	T	P	C									
	<b>Object Oriented Programming Through Java</b>	3	0	2	4									
<b>Course Educational Objectives</b>														
CEO 01	The model of object-oriented programming: abstract data types, encapsulation, inheritance and polymorphism													
CEO 02	Fundamental features of an object-oriented language like Java: object classes and interfaces, exceptions and libraries of object collections													
CEO 03	How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.													
CEO 04														
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>														
CO 01	Knowledge of the structure and model of the Java programming language.													
CO 02	Use the Java programming language for various programming technologies.													
CO 03	Develop software in the Java programming language.													
CO 04	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.													
CO 05	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.													
CO 06	Choose an engineering approach to solving problems, starting from the acquired knowledge of programming.													
<b>CO-PO &amp; PSO Mapping ( Articulation Matrix):</b>														
COs	PROGRAMME OUTCOMES												PSOs	
	01	02	03	04	05	06	07	08	09	10	11	12	01	02
01	3	1											1	
02	3	2											1	
03	2	2	2										2	
04	2	1	2										1	
05	2	1	3										1	
06	1	3	3										1	
Avg.														
<b>Syllabus</b>														
UNIT I													13 Hours	
<p>An introduction to Object Oriented Programming, Features of Object Oriented Programming Introduction to Java. Difference between C/C++ and Java,  Features of Java, First Java Program, Writing the java program, Compiling the program, JVM and its significance in executing a program, Architecture of JVM.  Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.  Java Tokens, Datatypes, Operators, Control Structures, Conditional Statements, Iteration Statement/Loops, Jumping Statements,  Java Arrays, 1-dimensional arrays, 2-dimensionanl arrays.</p>														
UNIT II													15 Hours	
<p>Introduction to Classes and Objects. Constructors, static Keyword, this Keyword, Array of Objects, Access Modifiers (Public, Private, Protected, Default).  Inheritance, Types of Inheritance and Java-supported Inheritance, super, Polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching.  Interfaces, Multiple Inheritance Using Interfaces, abstract classes.  String Handling in Java: String, StringBuffer, StringBuilder, StringTokenizer  Wrapper classes, Auto boxing and unboxing.</p>														

<b>UNIT III</b>		12 Hours
<p>Java API Packages, User-Defined Packages, Accessing Packages.  Error and Exception Handling, Types of exceptions Hierarchy of Exception classes, try, catch, finally, throw, throws, Commonly used Exceptions and their details ,User defined exception classes.  Multithreading, Thread in Java, Thread execution prevention methods. (yield(), join(), sleep()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread.  Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class.  IO Streams (java.io package), Byte Stream and Character Stream, Files and Random Access Files, Serialization.</p>		
<b>UNIT IV</b>		12 Hours
<p>Collection Frame Work (java.util), Util Package interfaces, List, Set, Map.  Applet Introduction, Life Cycle of an Applet, GUI with an Applet.  AWT : The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels – Scroll Pane, Menu, Scroll Bar.  Working with Frame class, Colour, Fonts and layout managers.  Event Handling: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes</p>		

Subject Code	Name of the Subject											L	T	P	C
	Database Management System											3	0	1	4
<b>Course Educational Objectives</b>															
Pre -Requisite: A student should have basic idea on programming and file systems.															
CEO 1	Gain a good understanding of the architecture and functioning of Database Management Systems as well as associated tools and techniques.														
CEO 2	Understand and apply the principles of data modeling using Entity Relationship and develop a good database design.														
CEO3	Understand the use of Structured Query Language (SQL) and its syntax														
CEO4	Apply Normalization techniques for effective database design.														
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>															
CO1	<i>Identify</i> and <i>Classify</i> the concepts of Database Management system, Data models and architecture of database, ER to Relational mapping concepts.														
CO2	<i>Applying</i> The constraints in database using different query languages like:- relational algebra and calculus <i>implementing</i> the Data definition and data manipulate languages in Database.														
CO3	<i>Compare</i> the different normal forms to <i>Apply</i> normalization process to construct consistent Database.														
CO4	<i>Design and Develop</i> the Database with concurrency control and recovery strategies to make complete Database without confliction and anomalies in concurrent access environment.														
CO5	<i>Develop</i> efficient storage scheme of saving and retrieving Records and Files														
CO6	<i>Apply</i> the principles of database transaction management, database recovery and security.														
<b>CO-PO &amp; PSO Mapping:</b>															
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	1												
CO2	3	2	1												
CO3	2	1	1												
CO4	2	1	2												
CO5	2	1	2												
CO6	3	2	1												
Avg.	2.5	1.33	1.33												
<b>SYLLABUS</b>															
<b>UNIT:1 (6 Hours)</b>															
<p><b>Introduction to database Systems:</b> advantages of database system over traditional file system, Basic concepts &amp; Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, &amp; Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components &amp; functions of DBMS, Data models.</p> <p><b>Entity-Relationship model:</b> Basic concepts, Design process, Constraints, Keys, Design issues, E-R Diagrams, weak entity sets, Extended E-R features – generalization, specialization, aggregation, Reduction to E-R database schema.</p>															

<p><b>UNIT:2</b> <span style="float: right;"><b>(10 Hours)</b></span>  <b>Relational Query Languages:</b> Relational Operations. Relational Algebra, Selection and projection set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Extended relation algebra operation</p>
<p><b>UNIT:3</b> <span style="float: right;"><b>(10 Hours)</b></span>  <b>Normalization:</b> Introduction, non-loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyce-Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and fourth normal form, Join dependencies and fifth normal form</p>
<p><b>UNIT:4</b> <span style="float: right;"><b>(10 Hours)</b></span>  <b>Transaction Concept:</b> Transaction properties (ACID), Transaction State, Schedules, Serializability (Conflict Serializability and View Serializability), Need for Concurrency, Concurrency Control- Lock based control, time stamping Protocol, Two Phase Locking, Dead lock in DBMS   <b>Recovery and Atomicity:</b> Log Based Recovery, Transaction Logs and Shadow Paging, Types of Recovery Techniques in DBMS, Rollback/Undo Recovery Technique, Commit/Redo Recovery Technique, Checkpoint Recovery, Backup Techniques</p>
<p><b>UNIT:5</b> <span style="float: right;"><b>(6 Hours)</b></span>  <b>Detailed Storage Architecture:</b> Storage Strategies: Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File &amp; Record Organization, File Organizations &amp; Indexes, Order Indices, B+ Tree Index Files, Hashing Data Dictionary</p>
<p>Teaching Methods: Chalk&amp; Board/ PPT/Video Lectures</p>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Sudarshan, Korth: Database System Concepts, 6th edition, McGraw-Hill Education</li> <li>2. Elmasari &amp; Navathe: Fundamentals of Database System, Pearson Education.</li> </ol>
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Elmasari &amp; Navathe: Fundamentals of Database System, Pearson Education.</li> <li>2. Ramakrishnan: Database Management Systems, McGraw-Hill Education.</li> <li>3. Andrew S. Tanenbaum: Modern Operating Systems, 3rd Edition, Pearson Education.</li> <li>4. Terry Dawson, Olaf Kirch: Linux Network Administrator's Guide, 3rd Edition O'Reilly</li> </ol>

Subject Code	SUBJECT NAME											L	T	P	C
	Introduction to Data Science											3	0	0	3
<b>Course Educational Objectives</b>															
CEO 01	Able to apply fundamental algorithmic ideas to process data														
CEO 02	Able to construct predictive models to classify new data set														
CEO 03	Learn to apply hypotheses and data into actionable predictions														
CEO 04	Document and communicate the results effectively to different stakeholders and effectively communicate the findings using visualization techniques.														
<b>Course Outcomes: : Upon successful completion of this course, students should be able to:</b>															
CO1	Understand the Foundations of Data Science. Conduct Data Acquisition and Pre-processing														
CO2	Describe the data using various statistical measures														
CO3	Work Collaboratively in Data Projects. Use Relevant Data Science Tools and Technologies														
CO4	Apply Data Modelling Techniques. Evaluate and Select the appropriate Model.														
CO5	Perform data reduction and apply visualization techniques														
CO6	Apply Data Science Skills to Real-World Problems. Continuously Learn and Stay Updated														
<b>CO-PO &amp; PSO Mapping ( Articulation Matrix):</b>															
COs	PROGRAMME OUTCOMES												PSOs		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	
01	3	2	-	-	-	-	-	-	-	-	-	-	-	-	
02	2	3	3	-	2	-	-	-	-	-	-	-	-	-	
03	2	3	2	-	2	-	-	-	2	-	-	-	-	-	
04	2	1	-	-	-	2	1	-	-	-	-	2	-	-	
05	2	2	3	-	-	-	-	-	-	-	-	-	-	-	
06	1	-	-	-	-	-	-	-	-	-	-	2	-	-	
Avg.															
<b>Syllabus</b>															
<b>UNIT I</b>												<b>(12 Hours)</b>			
Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues, Data Collection Strategies, Data Categorization: NOIR Topology.															
<b>UNIT II</b>												<b>(10 Hours)</b>			
Descriptive Statistics – Mean, Median, Standard Deviation, Skewness and Kurtosis. Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.															
<b>UNIT III</b>												<b>(8 Hours)</b>			
Model Selection and Evaluation using Visualization: - Simple and Multiple Regression, Polynomial Regression, Ridge Regression, Box Plots, Residual Plot, Distribution Plot, Pivot Table.															
<b>UNIT IV</b>												<b>(10 Hours)</b>			
Introduction hypothetical testing: -NULL(H <sub>0</sub> ) hypothesis and Alternative hypothesis, Type-I and Type-II error, Test statistics:- Z-statistics, T-statistics, Chi-Square Test, Correlation Statistics – ANOVA, correlation Analysis- Heat Map.															
<b>UNIT V</b>												<b>( 6 Hours )</b>			
Model evaluation Metrics: - Regression metrics and classification metrics– Cross Validation – Overfitting – Under Fitting and Testing Multiple Parameters by using Grid Search.															
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCs															

**Text Books:**

1. *Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.*
2. *Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.*

**Reference Book:**

1. *Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.*
2. *Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global*

		<b>DIGITAL ELECTRONICS</b>	<b>3-0-0</b>
<b>Pre-requisites (if any):</b>	Knowledge of Basic Mathematics & Basic Electrical and Electronics Engineering.		
<b>Course Objectives:</b>			
	To understand digital logic fundamentals, including binary systems and Boolean algebra.		
	To design and analyze combinational and sequential circuits, including logic gates, flip-flops, and counters.		
	To apply digital electronics in real-world applications, using simulation tools and programmable logic devices (PLDs).		
<b>Course Content</b>			
<b>Unit 1</b>		<b>(10 Hours)</b>	
<b>Number Systems and Codes:</b> Binary, Octal, Hexadecimal, and Decimal Number System and their Conversion; Representation of Signed Binary and Floating-Point Number; Binary Arithmetic using 1's and 2's Complements, Binary Codes - BCD Code, Gray Code, ASCII Character Code.			
<b>Boolean Algebra and Logic Gates:</b> Axioms and Laws of Boolean Algebra; Reducing Boolean Expressions; Logic Levels and Pulse Waveforms; Logic Gates; Boolean Expressions and Logic Diagrams; Canonical and Standard Forms.			
<b>Unit 2</b>		<b>(12 Hours)</b>	
<b>Gate-level Minimization:</b> K-maps - Two, Three, and Four Variable K-maps, Don't-Care Conditions; NAND and NOR Implementation; Other Two-Level Implementations, Exclusive-OR Function.			
<b>Combinational Logic:</b> Combinational Circuits; Analysis Procedure; Design Procedure; Adders; Subtractors; Parallel Binary Adders; Binary Adder-Subtractor; Binary Multiplier; Magnitude Comparator; Decoders; Encoders; Multiplexers; De-multiplexers.			
<b>Unit 3</b>		<b>(8 Hours)</b>	
<b>Synchronous Sequential Logic:</b> Sequential Circuits; Storage Elements: Latches, Flip-Flops, Master-Slave Flip-Flop; Conversion of Flip-Flops; Analysis of Clocked Sequential Circuits; Mealy and Moore Models of Finite State Machines; Design Procedure.			
<b>Unit 4</b>		<b>(8 Hours)</b>	
<b>Registers and Counters:</b> Shift Registers; Data Transmission in Shift Registers; SISO, SIPO, PISO, and PIPO Shift Registers; Counters; Asynchronous Counters; Design of Asynchronous Counters; Synchronous Counters; Design of Synchronous Counters; Ring Counter.			
<b>Unit 5</b>		<b>(6 Hours)</b>	
<b>Memory and Programmable Logic:</b> Introduction; Random-Access Memory; Memory Decoding; Error Detection and Correction; Read-Only Memory; Programmable Logic Array; Programmable Array Logic; Sequential Programmable Devices.			
<b>Text Books:</b>			
[1] M. Morris Mano, and Michael D. Ciletti, <i>Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog</i> . Pearson Education, Sixth Edition, 2017.			



<b>DIGITAL ELECTRONICS LABORATORY</b>		<b>0-0-2</b>
<b>Pre-requisites (if any):</b>	Knowledge of Basic Electrical and Electronics Engineering.	
<b>Course Objectives:</b>		
<input type="checkbox"/>	To gain hands-on experience with basic logic gates and combinational circuits.	
<input type="checkbox"/>	To implement and test combinational and sequential circuits.	
<input type="checkbox"/>	To utilize simulation tools for circuit design and testing.	
<b>Course Content</b>		
<b>List of Experiments:</b>		
<p>(At least 10 experiments should be done, Experiments No. 1 and 2 are compulsory, and out of the balance 8 experiments at least 3 experiments have to be implemented through both Verilog/VHDL and hardware implementation as per the choice of the student totaling to 6 and the rest 2 can be either through Verilog/VHDL or hardware implementation.)</p>		
<ol style="list-style-type: none"> <li>1. Digital Logic Gates: Investigate the logic behavior of AND, OR, NAND, NOR, EX-OR, EXNOR, Inverter, and Buffer Gates, use of Universal NAND/NOR Gate.</li> <li>2. Gate-Level Minimization: Two-level and multi-level implementation of Boolean functions.</li> <li>3. Combinational Circuits: Design, assemble, and test: adders and subtractors, code converters, gray code to binary, and 7-segment displays.</li> <li>4. Design, implement, and test a given design example with (i) NAND Gates only, (ii) NOR Gates only, and (iii) using the minimum number of Gates.</li> <li>5. Design with Multiplexers and De-multiplexers.</li> <li>6. Flip-Flop: Assemble, test, and investigate the operation of SR, D &amp; JK flip-flops.</li> <li>7. Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.</li> <li>8. Counters: Design, assemble, and test various ripple and synchronous counters - decimal counter, Binary counter with the parallel load.</li> <li>9. Memory Unit: Investigate the behavior of the RAM unit and its storage capacity - 16×4 RAM: testing, simulating, and memory expansion.</li> <li>10. Clock-Pulse Generator: Design, implement, and test.</li> <li>11. Parallel Adder and Accumulator: Design, implement, and test.</li> <li>12. Binary Multiplier: Design and implement a circuit that multiplies 4-bit unsigned numbers to produce an 8-bit product.</li> <li>13. Verilog/VHDL simulation and implementation of Experiments listed in Sl. No. 3 to 12.</li> </ol>		



Subject Code	Name of the Subject	L	T	P	C
	<b>Intermediate Communication Skills and Critical Thinking</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Educational Objectives</b>					
<b>CEO1</b>	To develop the communication skills and soft skills of the students.				
<b>CEO2</b>	To enhance employability and entrepreneurial skills.				
<b>CEO3</b>	To promote critical thinking.				
Course Outcomes: Upon successful completion of this course, students should be able to:					
<b>CO1</b>	Recognise the importance of LSRW skills.				
<b>CO2</b>	Develop effective listening skills.				
<b>CO3</b>	Demonstrate public speaking skills.				
<b>CO4</b>	Distinguish professional writing from general writing.				
<b>CO5</b>	Develop effective reading skills.				
<b>CO6</b>	Execute critical thinking.				

### CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>																
<b>CO2</b>																
<b>CO3</b>																
<b>CO4</b>																
<b>CO5</b>																
<b>CO6</b>																
<b>Avg.</b>																

### SYLLABUS

<b>UNIT-1 Comprehensive Listening Skills</b>	<b>(4 Hours)</b>
1.1 What and why	
1.2 Techniques for improving listening skills	
<b>UNIT-2 Public Speaking Skills</b>	<b>(4 Hours)</b>
2.1 Public speaking; what and why	
2.2 Overcoming stage fear	
2.3 Techniques for effective speaking skill	
<b>UNIT- 3 Stages of Writing</b>	<b>(4 Hours)</b>
3.1 Pre-Writing- selecting a topic	
3.2 Writing- Free Writing, Drafting	
3.3 Re-writing- Revision, editing, proof Reading	
<b>UNIT- 4 Effective Reading Skills</b>	<b>(3 Hours)</b>
4.1 What is Reading Comprehension	
4.2 Tips for effective reading	
4.3 Techniques and types.	
<b>UNIT-5 Critical Thinking Skills</b>	<b>(4 Hours)</b>
5.1 What and Why	
5.2 Critical thinking vs. Lateral thinking	
5.3 Ways to improve Critical Thinking	

**Teaching Methods:** Chalk & Board/PPT/Video Lectures

**Reference Books:**

1. Basic Communication Skills for Technology by Andrea J. Rutherford, Pearson Education Asia, Patparganj, New Delhi, 2001.
2. How to Read better and Faster by Norman Lewis, 4<sup>th</sup> Edition, Publisher: Crowell, 1978.
3. The Kabuliwala and other stories by Rabindranath Tagore, Maple Classics, 2019.
4. The Gift of Magi by O Henry, Candlewick Press, 2008.

Subject Code	Name of the Subject (3 <sup>rd</sup> Sem)	L	T	P	C	
	<b>Intermediate Communication skills and Critical thinking (Lab)</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	

### Course Educational Objectives

CEO1	To develop communication skills and soft skills of the students.
CEO2	To enhance employability and entrepreneurial skills.
CEO3	To promote critical thinking.

### Course Outcomes: Towards the end of the course, the students will be able to:

CO1	Recognise the importance of LSRW skills
CO2	Develop effective listening skills
CO3	Demonstrate public speaking skills
CO4	Distinguish professional writing from general writing
CO5	Develop effective reading skills
CO6	Execute critical thinking

### CO-PO & PSO

#### Mapping

C o s	PROGRAMME OUTCOMES															
	1	2	3	4	5	6	7	8	9	10	11	12				
CO1										3						
CO2											3					
CO3											3					
CO4											3					
CO5											3					
CO6									3			2				

### SYLLAYBUS

#### Comprehensive Listening (2 hours)

Activity- Summarizing a Passage

#### Comprehensive Listening (2 hours)

Activity- Listening to a short video/ Ted Talk and giving a brief.

#### Oral Presentation (2 hours)

Activity- Presenting seminar paper in a team and presenting to the class

#### Individual Oral Presentation (2 hours)

Activity- Preparing a seminar paper individually and presenting.

#### Persuasive Speaking (2 hours)

Activity- Individual/ Group Debate.

#### Situational Interviews (2 hours)

Activity- Answering hypothetical question in a mock interview	
<b>Video Resume</b>	<b>(2 hours)</b>
Activity- Preparing a digital resume	
<b>Professional e-mail</b>	<b>(2 hours)</b>
Activity- Writing e-mail for professional purpose	
<b>Minutes of the Meeting</b>	<b>(2 hours)</b>
Activity- Preparing minutes of mock meetings.	
<b>Memo Writing</b>	<b>(2 hours)</b>
Writing Memos for internal organization	
<b>Vocabulary Exercise</b>	<b>(2 hours)</b>
Activity- Playing word games in small groups.	
<b>Intermediate Reading Comprehension</b>	<b>(2 hours)</b>
Activity-Reading an Intermediate level passage/ poems and answer questions.	
<b>Preparing a Sales Pitch</b>	<b>(2 hours)</b>
Activity- Prepare a presentation on any product (real/imaginary) of choice and present a sales pitch	
<b>Critical Thinking Activity</b>	<b>(2 hours)</b>
Activit- critically analysis of Kabuliwala by Rabindranath Tagore OR The Gift of Magi by O Henry	
<b>Critical Thinking</b>	<b>(2 hours)</b>
Activity 2- Critically Analyse Stopping by the Woods in a Snowy Evening by Robert Frost OR Ozymondias by P.B Shelly.	
<b>Reference Books</b>	
1. An Introduction to Professional English and Soft Skills by B. K. Das et al., Cambridge University Press, 2009.	
2. Communicative English for Engineers and Professionals by Nitin Bhatnagar and Mamta Bhatnagar. Published by DK/Pearson, 2010.	
3. Practical English Usage . Michael Swan, OUP, 1995	

**IV Semester [Second Year]**  
**B. Tech in Computer Science and Engineering (2023 Admission)**

SN	CC	Sub Code	Name of the Subject	L	T	P	C	ISA	ESA
<b>THEORY</b>									
1	PC	23BCSPC24001	Fundamentals of Python Programming	3	0	0	3	40	60
2	PC	23BCSPC24002	Computer Organization & Architecture	3	0	0	3	40	60
3	PC	23BCSPC24003	Design and Analysis of Algorithms	3	0	0	3	40	60
4	PC	23BCSPC24004	Operating System	3	0	0	3	40	60
5	PE	23BCSPE24001	PE-II (From Bucket)	3	0	0	3	40	60
6	HS	23BBSHS24001	English Learning -II (Advance communication skills and professional Ethics)	1	0	0	1		
			<b>TOTAL</b>	16	0	0	16	200	300
<b>PRACTICAL/SESSIONAL</b>									
7	PC	23BCSPC24101	Fundamentals of Python Programming Lab	0	0	2	1	30	20
8	PC	23BCSPC24103	Design and Analysis of Algorithms Lab	0	0	2	1	30	20
9	PC	23BCSPC24105	Unix and Shell Programming Laboratory	0	0	2	1	30	20
10	HS	23BBSHS24101	English Learning -II (Advance communication skills and professional Ethics lab)	0	0	0	1	30	20
11	PST	23BCSLP24101	Learning Project-II	0	0	0	1	50	0
			<b>TOTAL</b>	0	0	6	5	170	80
			<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>6</b>	<b>21</b>	<b>370</b>	<b>380</b>

**Professional Elective Bucket**

Sl.	Sem	Professional Elective II
1	23BCDPE24011	Introduction to Soft Computing
2	23BCDPE24012	Fuzzy Logic & Applications

Subject Code	Name of the Subject	L	T	P	C
	<b>Computer Organization and Architecture</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Educational Objectives**

<b>CEO1</b>	Identify the functional units in a digital computer system,
<b>CEO2</b>	Distinguish between the various ISA styles and trace the execution sequence of an instruction through the processor.
<b>CEO3</b>	Compare different approaches used for implementing a functional unit and evaluate different computer systems based on performance metrics.
<b>CEO4</b>	Provide an outline of working principles of components of computer.

**Course Outcomes: : Upon successful completion of this course, students should be able to:**

<b>CO1</b>	Explain and illustrate the execution cycle of a program.
<b>CO2</b>	Classify the components of digital computer and designing of control and memory units with performance evaluation.
<b>CO3</b>	Compute different types of binary arithmetic operation. .
<b>CO4</b>	Identify the characteristics of memories and explain memory and IO devices working process.
<b>CO5</b>	Classify the concept of Parallelism
<b>CO6</b>	Explain memory and types and interrupts

**CO-PO & PSO Mapping**

COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>	1	1			1											
<b>CO2</b>	2	3			3											
<b>CO3</b>	3	2			2											
<b>CO4</b>	1	1			1											
<b>CO5</b>	2	2			1											
<b>CO6</b>	1	3			2											
<b>Avg.</b>																

**SYLLABUS**

**UNIT:1 (12 Hours)**  
 Functional Units of a computer, Operational concepts, Bus structures, Memory locations and addresses, Memory operations, Instructions, Instruction sequencing, addressing modes, Problem solving, Introduction to Microprocessor, Introduction to Assembly language, writing of assembly language programming, ARM Processor: The thumb instruction set, Processor and CPU cores, Instruction Encoding format, Memory load and Store instruction in ARM, Basics of IO operations.

**UNIT: 2 (12 Hours)**  
 Addition and subtraction of Signed numbers, Problem solving, Design of fast adders, Ripple carry adder and Carry look ahead adder, Multiplication of positive numbers, Problem Solving, Signed operand multiplication, Problem solving, Fast multiplication- Bit pair recoding of

Multipliers, Problem Solving, Carry Save Addition of summands - Problem Solving, Integer division – Restoring Division - Solving Problems, Non-Restoring Division- Solving Problems, Floating point numbers and operations- Solving Problems.

**UNIT:3**

**(12 Hours)**

Fundamental concepts of basic processing unit, Performing ALU operation, Execution of complete instruction, Branch instruction, Multiple bus organization, Hardwired control, Generation of control signals, Micro-programmed control, Microinstruction, Micro-program Sequencing, Micro instruction with Next address field, Basic concepts of pipelining, Pipeline Performance, Pipeline Hazards-Data hazards, Methods to overcome Data hazards, Instruction Hazards, Hazards on conditional and Unconditional Branching, Control hazards, Influence of hazards on instruction sets.

**UNIT:4**

**(12 Hours)**

Parallelism, Need, types of Parallelism, applications of Parallelism, Parallelism in Software, Instruction level parallelism, Data level parallelism, Challenges in parallel processing, Architectures of Parallel Systems - Flynn's classification, SISD, SIMD, MIMD, MISD, Hardware multithreading, Coarse Grain parallelism, Fine Grain parallelism, Uni-processor and Multiprocessors, Multi-core processors, Memory in Multiprocessor Systems, Cache Coherency in Multiprocessor Systems, MESI protocol for Multiprocessor Systems.

**UNIT:5**

**(10 Hrs)**

Memory systems -Basic Concepts, Memory hierarchy, Memory technologies, RAM, Semiconductor RAM, ROM, Types, Speed, size cost, Cache memory, Mapping Functions, Replacement Algorithms - Problem Solving, Virtual Memory, Performance considerations of various memories, Input Output Organization, Need for Input output devices, Memory mapped IO, Program controlled IO, Interrupts-Hardware, Enabling and Disabling Interrupts, Handling multiple Devices.

**Teaching Methods: Chalk& Board/ PPT/Video Lectures**

**Text Books:**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.
3. Kai Hwang and F.A. Briggs, "Computer Architecture and Parallel Processing", McGraw Hill.

**Reference Books:**

4. M. Morris Mano, "Computer System Architecture", PHI
5. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.
6. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
7. John L. Hennessy and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

Subject Code	Name of the Subject	L	T	P	C										
	<b>Design and Analysis of Algorithms</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>										
<b>Course Educational Objectives</b>															
<b>CEO1</b>	Analyze the asymptotic performance of algorithms														
<b>CEO2</b>	Demonstrate familiarity with major algorithms														
<b>CEO3</b>	Apply important algorithmic design paradigms and methods of analysis														
<b>CEO4</b>	Synthesize efficient algorithms in common engineering design situations														
Course Outcomes: Upon successful completion of this course, students should be able to:															
<b>CO1</b>	<i>Apply efficient algorithms to reduce space and time complexity of both recurrent and</i>														
<b>CO2</b>	<i>Solve problems using divide and conquer approaches</i>														
<b>CO3</b>	<i>Apply greedy and dynamic programming types techniques to solve polynomial time</i>														
<b>CO4</b>	<i>Create exponential problems using backtracking and branch and bound approaches</i>														
<b>CO5</b>	<i>Interpret various approximation algorithms and interpret solutions to evaluate P</i>														
<b>CO6</b>	<i>Create algorithms that are efficient in space and time complexities by using divide</i>														
<b>CO-PO &amp; PSO Mapping</b>															
<b>COs</b>	<b>PROGRAMMEOUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>	1	1	1												
<b>CO2</b>	2	2	2												
<b>CO3</b>	3	1	1												
<b>CO4</b>	3	1	1												
<b>CO5</b>	2	2	3												
<b>CO6</b>	1	3	2												
<b>Avg.</b>															
<b>SYLLABUS</b>															
<b>Unit I</b> <span style="float: right;"><b>(15Hrs)</b></span>															
Introduction-Algorithm Design, Fundamentals of Algorithms, Correctness of algorithm, Time complexity analysis, Insertion sort-Line count, Operation count, Algorithm Design paradigms, Designing an algorithm, And its analysis-Best, Worst and Average case, Asymptotic notations Based on growth functions, $O, O, \Theta, \omega, \Omega$ , Mathematical analysis, Induction, Recurrence relations- Solution of recurrence relations, Substitution method- Solution of recurrence relations, Recursion tree- Solution of recurrence relations.															
<b>Unit -II</b> <span style="float: right;"><b>(15Hrs)</b></span>															
Introduction-Divide and Conquer, Maximum Subarray Problem, Binary Search, Complexity of binary search, Merge sort, Time complexity analysis, Quick sort and its Time complexity analysis, Best case, Worst case, Average case analysis, Strassen's Matrix multiplication and its recurrence relation, Time complexity analysis of Merge sort, Largest sub-array sum, Time complexity analysis of Largest subarray sum, Master Theorem Proof, Master theorem examples, Finding Maximum and Minimum in an array, Time complexity analysis-Examples, Algorithm for finding closest pair problem, Convex Hull problem.															
<b>Unit – III</b> <span style="float: right;"><b>(10Hrs)</b></span>															
Introduction-Greedy and Dynamic Programming, Examples of problems that can be solved															

by using greedy and dynamic approach, Huffman coding using greedy approach, Comparison of brute force and Huffman method of encoding, Knapsack problem using greedy approach, Complexity derivation of knapsack using greedy, Tree traversals, Minimum spanning tree – greedy Kruskal's algorithm – greedy, Minimum spanning tree - Prims algorithm, Introduction to dynamic programming, 0/1 knapsack problem, Complexity calculation of knapsack problem, Matrix chain multiplication using dynamic programming, Complexity of matrix chain multiplication, Longest common subsequence using dynamic programming, Explanation of LCS with an example, Optimal binary search tree (OBST) using dynamic programming, Explanation of OBST with an example.

**Unit – IV**

**(10 Hrs)**

Introduction to backtracking - branch and bound, N queen's problem – backtracking, Sum of subsets using backtracking, Complexity calculation of sum of subsets, Graph introduction, Hamiltonian circuit – backtracking, Branch and bound - Knapsack problem, Example and complexity calculation, Differentiate with dynamic and greedy, Travelling salesman problem using branch and bound, Travelling salesman problem using branch and bound example, Time complexity calculation with an example, Graph algorithms, Depth first search and Breadth first search, Shortest path introduction, Floyd-Warshall Introduction, Floyd-Warshall with sample graph, Floyd-Warshall complexity.

**Unit – V**

**(10 Hrs)**

Introduction to randomization and approximation algorithm, Randomized hiring problem, Randomized quick sort, Complexity analysis, String matching algorithm – Examples, Rabin Karp algorithm for string matching - Example discussion, Approximation algorithm, Vertex covering, Introduction Complexity classes, P type problems, Introduction to NP type problems, Hamiltonian cycle problem, NP complete problem introduction, Satisfiability problem, NP hard problems – Examples.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**Text Book:**

1. *Introduction to Algorithms*, T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, 2nd Edition, PHI Learning Pvt. Ltd.
2. *Fundamentals of Algorithm*, Horowitz & Sahani:, 2nd Edition, Universities Press.

**Reference Book:**

1. *Algorithms, Design and Analysis*, H. Bhasin, First Edition, Oxford University
2. *Design and Analysis of Algorithm*, S. Sridhar, Oxford University Press
3. *Algorithms*, Sanjay Dasgupta, Umesh Vazirani, McGraw-Hill Education.

Subject Code	Name of the Subject										L	T	P	C	
	Operating System										3	0	2	4	
<b>Course Educational Objectives</b>															
<b>CEO1</b>	Provide an insight into the basic organization of computer systems.														
<b>CEO2</b>	Familiarize students with various components of an Operating System														
<b>CEO3</b>	Focus on fundamental problems and optimal solutions for resource management														
<b>CEO4</b>	Understand different possible solutions for handling deadlock situation.														
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>															
<b>CO1</b>	<i>Identify the need of an Operating system</i>														
<b>CO2</b>	<i>Know the Process management functions of an Operating system</i>														
<b>CO3</b>	<i>Understand the need of Memory Management functions of an Operating system</i>														
<b>CO4</b>	<i>Find the significance of Device management role of an Operating system</i>														
<b>CO5</b>	<i>Recognize the essentials of File Management part of an Operating system</i>														
<b>CO6</b>	<i>Gain an insight of Importance of an Operating system through practical</i>														
<b>CO-PO &amp; PSO Mapping</b>															
COs	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	1				1								
CO2	2	1	2				2								
CO3	1	1	3				3								
CO4	2	3	2				1								
CO5	3	1	1				1								
CO6	1	2	1				1								
Avg.															
<b>SYLLABUS</b>															
<b>UNIT:1 (14 Hours)</b>															
<p>Operating System Objectives and functions, Gaining the role of Operating systems, The evolution of operating system, Major achievements, Understanding the evolution of Operating systems from early batch processing systems to modern complex systems, OS Design considerations for Multiprocessor and Multicore, Understanding the key design issues of Multiprocessor Operating systems and Multicore Operating systems, PROCESS CONCEPT– Processes, PCB, Understanding the Process concept and Maintenance of PCB by OS, Threads – Overview and its Benefits, Understanding the importance of threads, Process Scheduling : Scheduling Queues, Schedulers, Context switch, Understanding basics of Process scheduling, Operations on Process – Process creation, Process termination, Understanding the system calls – fork(),wait(),exit(),Inter Process communication : Shared Memory, Message Passing, Pipe(),Understanding the need for IPC, PROCESS SYNCHRONIZATION: Background, Critical section Problem, Understanding the race conditions and the need for the Process synchronization</p>															

**UNIT:2****(12 Hours)**

**PROCESS SYNCHRONIZATION:** Peterson's solution, Synchronization Hardware, Understanding the two-process solution and the benefits of the synchronization hardware, Process synchronization: Semaphores, usage, implementation, Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms, Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem, Good understanding of synchronization mechanisms, Classical Problems of synchronization – Dining Philosophers problem (Monitor) Understanding the synchronization of limited resources among multiple processes, **CPU SCHEDULING:** FCFS,SJF,Priority, Understanding the scheduling techniques, CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling, Understanding the scheduling techniques, Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling, Understanding the real time scheduling, **DEADLOCKS:** Necessary conditions, Resource allocation graph, Deadlock prevention methods, Understanding the deadlock scenario, Deadlocks :Deadlock Avoidance, Detection and Recovery, Understanding the deadlock avoidance, detection and recovery mechanisms

**UNIT:3****(14 Hours)**

**MEMORY MANAGEMENT:** Memory Management: Logical Vs Physical address space, Swapping, Understanding the basics of Memory management, Contiguous Memory allocation – Fixed and Dynamic partition, getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems, Strategies for selecting free holes in Dynamic partition, Understanding the allocation strategies with examples, Paged memory management, Understanding the Paging technique. PMT hardware mechanism, Structure of Page Map Table, Understanding the components of PMT, Example : Intel 32 bit and 64 –bit Architectures, Understanding the Paging in the Intel architectures, Example : ARM Architectures, Understanding the Paging with respect to ARM, Segmented memory management, Understanding the users view of memory with respect to the primary memory, Paged segmentation Technique, Understanding the combined scheme for efficient management

**UNIT:4****(14 Hours)**

**VIRTUAL MEMORY–** Background, Understanding the need of demand paging, **VIRTUAL MEMORY –** Basic concepts – page fault handling, Understanding, how an OS handles the page faults, Performance of Demand paging, Understanding the relationship of effective access time and the page fault rate, Copy-on write, Understanding the need for Copy-on write, Page replacement Mechanisms: FIFO, Optimal, LRU and LRU approximation Techniques, Understanding the Pros and cons of the page replacement techniques, Counting based page replacement and Page Buffering Algorithms, To know on additional Techniques available for page replacement strategies, Allocation of Frames - Global Vs Local Allocation, Understanding the root cause of the Thrashing, Thrashing, Causes of Thrashing, Understanding the Thrashing, Working set Model, Understanding the working set model for controlling the Working set Model.

**UNIT:5****(14 Hours)**

**STORAGE MANAGEMENT:** Mass storage structure – Overview of Mass storage structure – Magnetic Disks, Understanding the Basics in storage management, Disk Scheduling, Understanding the various scheduling with respect to the disk, **FILE SYSTEM INTERFACE:** File concept, File access methods, Understanding the file basics, File sharing and Protection,

Emphasis the need for the file sharing and its protection, FILE SYSTEM IMPLEMENTATION: File system structure, To get the basic file system structure, Directory Implementation, Understanding the various levels of directory structure, FILE SYSTEM IMPLEMENTATION :Allocation methods, Understanding the pros and Cons of various disk allocation methods, FILE SYSTEM IMPLEMENTATION :Free space Management, Understanding the methods available for maintaining the free spaces in the disk, Swap space Management, Understanding the Low-level task of the OS.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**Text Books/References:**

1. *Operating System Principles*, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. *Operating systems - Internals and Design Principles*, W. Stallings, 6th Edition, Pearson.M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. *Modern Operating Systems*, Andrew S Tanenbaum 3rd Edition PHI.
4. *Operating Systems A concept - based Approach*, 2nd Edition, D. M. Dhamdhare, and TMH.
5. *Principles of Operating Systems*, B. L. Stuart, Cengage learning, India Edition.
6. *Operating Systems*, A. S. Godbole, 2nd Edition, TMH
7. *An Introduction to Operating Systems*, P.C.P. Bhatt, PHI.
8. *Operating Systems*, S, Haldar and A. A. Arvind, Pearson Education.
9. *Operating Systems*, R. Elmasri, A. G. Carrick and D. Levine, McGraw Hill.
10. *Operating Systems in depth*, T. W. Doeppner, Wiley.

Subject Code	Name of the Subject	L	T	P	C										
	<b>Introduction to Soft Computing</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>										
<b>Course Educational Objectives</b>															
<b>CEO1</b>	To introduce the concepts in Soft Computing														
<b>CEO2</b>	To introduce Fuzzy Logic based Systems														
<b>CEO3</b>	To introduce Neural Network based Systems														
<b>CEO4</b>	To introduce Genetic Algorithm based Systems and its hybrids														
Course Outcomes: Upon successful completion of this course, students should be able to:															
<b>CO1</b>	Understand the fundamental concepts of Soft Computing and differentiate between conventional and soft computing techniques														
<b>CO2</b>	Apply fuzzy logic concepts to solve real-world problems involving uncertainty and imprecision.														
<b>CO3</b>	Design and implement neural networks for pattern recognition and data analysis tasks.														
<b>CO4</b>	Use evolutionary algorithms for optimization and search problems in various domains.														
<b>CO5</b>	Integrate multiple soft computing techniques to develop hybrid systems for complex problem-solving.														
<b>CO6</b>	Analyze and evaluate the effectiveness of soft computing methods in various engineering and scientific applications.														
<b>CO-PO &amp; PSO Mapping</b>															
<b>COs</b>	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>	1	2	1												
<b>CO2</b>	2	2	2												
<b>CO3</b>	1	1	1												
<b>CO4</b>	1	3	1												
<b>CO5</b>	1	1	1												
<b>CO6</b>	1	1	3												
<b>Avg.</b>															
<b>SYLLABUS</b>															
<b>UNIT:1 Basics of Soft Computing &amp; Fuzzy Logic</b>												<b>(12 Hours)</b>			
Introduction to Soft Computing- Components of Soft Computing- Applications of Soft Computing - Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and parameterization. Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules –Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models –Tsukamoto Fuzzy Models.															
<b>UNIT:2 Neural Network</b>												<b>(10 Hours)</b>			
Concepts of Neural Network – Activation Functions – Architecture and characteristics of Neural Network - Supervised Learning Neural Networks – Perceptrons – Backpropagation Multilayer Perceptrons – ADALINE, MADALINE, Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks .															

<p><b>UNIT:3 Genetic Algorithm</b> <span style="float: right;"><b>(10 Hours)</b></span></p> <p>Fundamentals of Genetic Algorithms – Creation of offspring – Encoding – Fitness function – Reproduction – Inheritance operators – Crossover – Inversion and deletion – Mutation - GA – Applications.</p>
<p><b>UNIT:4 Neuro-Fuzzy Modelling</b> <span style="float: right;"><b>(10 Hours)</b></span></p> <p>Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN.</p>
<p><b>UNIT-5 Evolutionary Algorithms and Optimization Techniques</b></p> <p>Introduction to Evolutionary Algorithms: Genetic Algorithms, Genetic Programming, Operators in Evolutionary Algorithms: Selection, Crossover, Mutation, Hybrid Evolutionary Algorithms, Particle Swarm Optimization (PSO) and Ant Colony Optimization (ACO), Applications of Evolutionary Algorithms in Real-World Problems</p>
<p>Teaching Methods: Chalk&amp; Board/ PPT/Video Lectures</p>
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, Pearson, 2015.</li> <li>2. Samir Roy, Udit Chakraborty, “Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms”, Pearson, 2013</li> </ol>
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, 2009</li> <li>2. Kumar S.Ray, “Soft Computing and Its Applications, Volume Two: Fuzzy Reasoning and Fuzzy Control”, CRC Press, 2014</li> <li>3. Saroj Kaushik Sunita Tiwari, “ Soft Computing : Fundamentals Techniques &amp; Applications”, Tata McGrawHill, 2018</li> <li>4. Nunes Silva, I., Hernane Spatti, D., Andrade Flauzino, R., Liboni, L.H.B., dos Reis Alves, S.F., “Artificial Neural Networks - A Practical Course”, Springer, 2017</li> <li>5. N.P.Padhy, S.P.Simon, “Soft Computing with MATLAB Programming”, Oxford University Press, 2015</li> <li>6. Chakraverty, Snehashish, Sahoo, Deepti Moyi, Mahato, Nisha Rani, “Concepts of Soft Computing Fuzzy and ANN with Programming”, Springer, 2019.</li> <li>7. Jamshid Ghaboussi, “Soft Computing in Engineering”, 1st Edition, CRC Press, 2018</li> </ol>

Subject Code	Name of the Subject											L	T	P	C
	<b>Fundamentals of Python Programming</b>											<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>Course Educational Objectives</b>															
<b>CEO1</b>	To understand the basics of programming using Python.														
<b>CEO2</b>	To Construct and execute basic programs in Python.														
<b>CEO3</b>	To implement database connectivity, CGI, Multithreading and web development in python.														
<b>Course Outcomes:</b> Upon successful completion of this course, students should be able to:															
<b>CO1</b>	Understand the basic concept of Python like data types and syntax of programming.														
<b>CO2</b>	Use python programming with user defined & built-in methods, objects of Python.														
<b>CO3</b>	Design application using the concepts of file, database access and exception handling.														
<b>CO4</b>	Create practical and contemporary applications such as web applications and discrete-event simulations, data analysis and IoT devices.														
<b>CO5</b>	Use regular expressions and oops concepts														
<b>CO6</b>	Design Database and implement Mutlithreading.														
<b>CO-PO &amp; PSO Mapping</b>															
COs	<b>PROGRAMME OUTCOMES</b>														
	1	2	3	4	5	6	7	8	9	10	11	12			
CO1	3	1			1							1			
CO2	2	3	1	3	2							1			
CO3	2	3	3	3	2				1		1	2			
CO4	2	3	3	3	2				1		1	2			
CO5	1	2	2	1											
CO6	1	2	2	1											
Avg.															
<b>SYLLABUS</b>															
<b>UNIT:1</b>												<b>(8 Hours)</b>			
<p><b>Introduction:</b> Installation, First Python Program: Interactive Mode Programming, Script Mode Programming; Identifiers, Reserved Words, Lines and Indentation, Multi-Line Statements, Quotation &amp; Comments; Assigning Values to Variables, Multiple Assignment.</p> <p><b>Standard Data Types:</b> Numbers, Strings, Lists, Tuples, Dictionary; Data Type Conversion; Basic Operators: Arithmetic, Comparison, Assignment, Bitwise; Operators: Logical, Membership, Identity; Operators Precedence; Python Numbers &amp; Mathematical functions, Python Strings.</p>															
<b>UNIT:2</b>												<b>(10 Hours)</b>			
<p><b>Python Program Flow Control :</b> Conditional blocks using if, else and elif, Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block</p> <p><b>Python Functions, Modules And Packages:</b>Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules,Understanding Packages, Powerful Lamda function in python, Programming using functions, modules and external packages</p>															

**Python String, List And Dictionary Manipulations :** Building blocks of python programs, Understanding string in-built methods, List manipulation using in-built methods, Dictionary manipulation, Programming using string, list and dictionary in build functions

**UNIT:3** (12 Hours)

**Python File Operation :** Reading config files in python, Writing log files in python , Manipulating file pointer using seek, Programming using file operations, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines()

**Python Object Oriented Programming – OOPS:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes , Programming using OOPS support

**UNIT:4** ( 15 Hours)

**Python Regular Expression :** Powerful pattern matching and searching, Power of pattern searching using regex in python, Real time parsing of networking or system data using regex, Password, email, url validation using regular expression, Pattern finding programs using regular expression

**Python Exception Handling :** Avoiding code break using exception handling, Safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling

**Unit-5** (10 Hours)

**Python Database Interaction:** SQL Database connection using python, Creating and searching tables, Reading and storing config information on database, Programming using database connections

**Python Multithreading:** Understanding threads, forking threads, Synchronizing the threads, Programming using multithreading

**Python CGI Introduction :** Writing python program for CGI application, Creating menus and accessing files, Server client program

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**Text Books:**

1. *“Python: The Complete Reference”*, Martin C. Brown, McGraw-Hill/Osborne Media.
2. *“Learning Python”*, Mark Lutz, O’Reilly Media, Inc., Fifth Edition, 2013.

**Reference Books:**

1. *“Expert Python Programming”*, Tarek Ziad, Packt Publishing.
2. *“Python Essential Reference, David Beazley”*, Developer's Library, Sams Publishing.

Subject Code	Name of the Subject		L	T	P	C									
	Language Theory and Compiler Design		3	0	0	3									
<b>Course Educational Objectives</b>															
CEO1	To introduce the major concept areas of language translation and compiler design.														
CEO2	To enrich the knowledge in various phases of compiler and its use.														
CEO3	To provide practical programming skills necessary for constructing a compiler														
<b>Course Outcomes: : Upon successful completion of this course, students should be able to:</b>															
CO1	Understand the fundamental concepts and phases involved in the design and development of a compiler.														
CO2	Apply lexical and syntax analysis techniques for language translation using various parsing methods.														
CO3	Design and manage symbol tables and perform intermediate code generation for different programming constructs														
CO4	Implement semantic analysis and syntax-directed translation for type checking and expression evaluation.														
CO5	Develop code generation algorithms and optimize code for efficient memory and execution														
CO6	Use compiler generation tools to construct machine-dependent code and evaluate the effectiveness of various optimization techniques.														
<b>CO-PO &amp; PSO Mapping</b>															
Cos	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	2												
CO2	2	1	2												
CO3	1	1	3												
CO4	3	2	3												
CO5	1	1	3												
CO6	1	1	1												
Avg.															
<b>SYLLABUS</b>															
<b>UNIT:1 (12 Hours)</b>															
Introduction to Compiler Design and Lexical Analysis, Overview of Compilation and its Phases, Lexical Analysis: Role of a Lexical Analyzer, Finite Automata: Non-Deterministic (NFA) and Deterministic (DFA), Regular Expressions, Lexical Grammar, and Design of a Lexical Analyzer, Tools for Lexical Analysis: Lex and Flex.															
<b>UNIT:2 (12 Hours)</b>															
<b>Syntax Analysis:</b> Role of a Parser, Context-Free Grammars, and Languages, Parse Trees and Derivations, Ambiguous Grammar, Top-Down Parsing: Recursive Descent Parsing, LL(1) Grammars, Bottom-Up Parsing: Shift-Reduce Parsing, SLR Parsers, LR(1) Parsers, LALR Parsers, Error Handling, Reporting, and Recovery Techniques															
<b>UNIT:3 (10 Hours)</b>															
Syntax-Directed Translation and Semantic Analysis, Syntax-Directed Definitions (SDD), Inherited and Synthesized Attributes, Dependency Graphs and Evaluation Orders, Semantic Analysis: Semantic Rules and Attribute Grammars, Applications of Syntax-Directed Translation															

**UNIT:4****(10 Hours)**

**Intermediate Code Generation and Symbol Table Management:** Symbol Table: Structure, Attributes, and Scope Management, Intermediate Code Generation: Three Address Code, Quadruples, and Triples, Representations of Syntax Trees and DAG for Expressions, Type Checking, Type Conversions, and Control Flow Statements, Intermediate Code for Procedure Calls and Run-Time Environments

**UNIT:5**

**Code Generation and Optimization,** Code Generation: Basic Blocks, Flow Graphs, and Code Generation Techniques, Register Allocation and Assignment Techniques, Code Optimization: Peephole Optimization, Elimination of Local Common Sub-expressions, Flow Control Optimization, Removal of Redundant Code, and Unreachable Code, Introduction to Machine-Dependent Optimization

**Teaching Methods:** Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert

**Text Books:**

1. *Compilers – Principles, Techniques and Tools* Authors: Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman Publisher: Pearson

**Reference Books:**

1. *Morden Compiler Design*, D. Gallies, Pearson Education.
2. *Compiler Design in C*, Allen I. Holub, PHI

Subject Code	SUBJECT NAME	L	T	P	C
	<b>Data Mining and Data Warehousing</b>	3	0	1	4

### Course Educational Objectives

CEO 01	Understand the concepts of Association Rule Mining, Classification and Clustering algorithms.
CEO 02	Applying various data mining techniques such as classification, clustering, association rule mining.
CEO 03	Integrating data mining results into decision support systems and business intelligence applications to support decision-making.
CEO 04	Apply best practices in data handling, ensuring data privacy and security.

### Course Outcomes: : Upon successful completion of this course, students should be able to:

CO1	Understand and learn various Concepts and Techniques for gaining knowledge of fundamentals & techniques used for data mining and data warehouse.
CO2	Learn various data mining techniques such as classification, clustering, association rule mining using tools.
CO3	Develop skills in implementation of data mining algorithms on different datasets.
CO4	Enhance the analytical and decision making abilities based on interesting patterns generated using data mining techniques.
CO5	Gain knowledge on Outlier analysis techniques
CO6	Understand the importance of applying Data mining concepts in different domains

### CO-PO & PSO Mapping ( Articulation Matrix):

COs	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
1	2	1	0	0	0	0	0	0	0	2	0	0		
2	2	3	1	0	1	0	0	0	0	1	0	0		
3	1	2	3	3	1	0	0	0	1	0	1	0		
4	1	1	2	2	1	0	0	0	1	0	1	1		
Avg.														

### Justification of the Mapping:

CO	PO	Level	Justification
1	1	2	Understands the fundamental knowledge of statistics, mathematics, engineering basics on data mining and data warehouse.
1	2	1	Analyses smaller problems on classification, clustering, association rule mining.
1	10	2	Communicates using discussion on the different applications of data mining and warehouse in society.
2	1	2	Allows to learn engineering fundamentals and mathematics to analyse the data, and understand the basic concepts.
2	2	3	Enables students to identify, formulate, and analyze complex data problems
2	3	1	Enables students to design solutions for complex problems using classification, clustering, and association rule mining.
2	5	1	Learning the use of mining techniques and software tools for analysis and predictions.
2	10	1	Helps students effectively communicate their result findings in group discussions, and design documents.

3	1	1	It allows to understand basic principles and statistical knowledge during implementation of mining algorithms on different datasets.
3	2	2	It involves in analysing and demonstrating the problems using different datasets.
3	3	3	Developing skills for designing solutions for complicated problems for different application areas.
3	4	3	Conducting rigorous investigations, applying research-based knowledge, and experimenting to solve complex problems.
3	5	1	Involves in applying different modern tools, techniques for achieving desired results.
3	9	1	Engages in collaborative learning activities in a team or in individual while working with project problems
3	11	1	Allows a student to demonstrate about their project knowledge as team member or leader through presentations, reflecting foundational proficiency in communication.
4	1	1	Allows to give keen observations on basic concepts during implementations and pattern generations.
4	2	1	Analysing, formulating and reviewing the problem by observing data visualization
4	3	2	Designing solutions for complex problems by enhancing analytical and decision-making abilities through data mining techniques.
4	4	2	Learn investigating complex problems by using experimenting and research based on interesting patterns generated
4	5	1	Involves in utilizing modern tools, techniques, and resources, while actively engaged in analysis of the interesting patterns.
4	9	1	Allows to analyse the decision making patterns with group discussions in a team.
4	11	1	It enables to learn preparing models for decision making, demonstrate project knowledge with team effort, improves presentation skills.
4	12	1	It builds self-confidence and Curiosity to do more projects on predictions for different applications.

### Syllabus

<b>UNIT I</b>	12 Hours
<b>Introduction to Data Mining:</b> Data Mining Technologies, Major issues in Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data	
<b>Data Preprocessing:</b> Data Integration, Data Cleaning, Data Transformation, Data Reduction, Data Discretization and Data Summarization.	
<b>UNIT II</b>	12 Hours
<b>Introduction to Data Warehousing:</b> The Compelling need of Data Warehousing, Basic Concepts of Data Warehouse, Data Warehouse Architecture, Data Warehouse Models, ETL Operations, Meta Data in the Data Warehouse, Trends in Data Warehousing, Data Warehouse Modelling, OLAP Vs OLTP, Data Cube, Schemas for Multidimensional Data models, Data Warehouse Design and Usage.	
<b>UNIT III</b>	12 Hours
<b>Introduction to Mining Frequent Pattern:</b> Associations, <b>Correlations:</b> Market Basket Analysis, Apriori Algorithm, FP-Growth Algorithm, Mining Various kinds of association rules, from association rule mining to correlation analysis.	

**Classification:** Classification by Decision Tree Induction, Bayes Classification Methods, Rule Based Classification, KNN Classifier, Logistic Regression, Support Vector Machine.

**UNIT IV**

12 Hours

**Introduction to Cluster Analysis:** Types of Data in Cluster Analysis

**Categorization of major clustering methods:** K-means Clustering, K-medoid Clustering, Agglomerative Clustering, Hierarchical Clustering, DBSCAN Clustering. Clustering Graph and Network Data, **Anomaly Detection:** Outlier Analysis, Statistical Analysis, Distance Based Analysis, Clustering Based Analysis, **Text Mining:** Text Preprocessing, IF-IDF, Text Classification, Text Clustering, **Web mining:** Web content mining, Web structure mining, Web usage mining, Applications of Data Mining in different area.

**UNIT-V**

[8 hours]

Challenges of outlier detection, Outlier detection methods: Introduction, Supervized and Semi-supervised methods, Unsupervised methods, Statistical and Proximity based methods, Statistical approaches, Statistical data mining.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCs

**Text Books:**

3. Data Mining: Concepts and techniques: J. Han, M. Kamber, J. Pei, Elsevier
4. Data Warehousing Fundamentals: Paulraj Ponniah, Willey India.

**Reference Book:**

1. Data Mining –A Tutorial based primer by R.J.Roiger, M.W.Geatz, Pearson Education.
2. Data Mining & Data Warehousing Using OLAP: Berson, TMH.
3. Data Warehousing: Reema Thareja, Oxford University Press

<b>Subject Code</b>	<b>SUBJECT NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>Cloud Computing</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Educational Objectives**

CEO 01	Understand the rationale behind the cloud computing revolution
CEO 02	Introduce various models of cloud computing
CEO 03	Understand how to design applications on cloud and the role of security
CEO 04	Understand and design distributed systems for scalability

**Course Outcomes: Upon successful completion of this course, students should be able to:**

CO1	Understand the technical and business rationale behind cloud computing
CO2	Outline the model of cloud computing to use for solving a particular problem
CO3	Design and Build applications for the cloud and understand the security implications
CO4	Understand and Apply the fundamentals of distributed systems design to cloud computing
CO5	Design and develop cloud-based service applications using appropriate platforms and tools.
CO6	Explore and assess emerging trends in cloud computing for future-proofing cloud solutions.

**CO-PO & PSO Mapping s(Articulation Matrix):**

COs	PROGRAMME OUTCOMES												PSOs	
	01	02	03	04	05	06	07	08	09	10	11	12	01	02
<b>01</b>	3	1	1											
<b>02</b>	3	2	1											
<b>03</b>	3	2												
<b>04</b>	3	3	2											
<b>Avg.</b>														

**Justification of the Mapping:**

CO	PO	Level	Justification
1	1	3	It has the highest significance
1	2	1	It has the least significance
1	3	1	It has the least significance
2	1	3	It has the highest significance
2	2	2	It has an average significance
2	3	1	It has the least significance
3	1	3	It has the highest significance
3	2	2	It has an average significance
4	1	3	It has the highest significance
4	2	3	It has the highest significance
4	3	2	It has an average significance

**Syllabus**

<b>UNIT I</b>	<b>12 Hours</b>
<p>Cloud Computing: Introduction, Types of cloud: private, public and hybrid cloud. Hardware and Infrastructure: IaaS, PaaS, SaaS. public vs private clouds, Benefits and challenges of cloud computing, Virtualization : Types of Virtualization, Implementation Levels , Virtualization Structures , Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices ,Virtual Clusters and Resource management – Virtualization for Data-center Automation.</p>	
<b>UNIT II</b>	<b>14 Hours</b>
<p>Cloud infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources. Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages Benefits and challenges to Cloud architecture, Application availability, performance, security and disaster recovery; SLA Management: Types of SLA, Life Cycle of SLA, SLA Management</p>	
<b>UNIT III</b>	<b>10 Hours</b>
<p>Cloud Economics: Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g. Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat); Cloud Simulator: Benefits of CloudSim, Architecture of Cloud Sim, Installation procedures, Types of Scheduling Algorithms used in Cloud resource Management</p>	
<b>UNIT IV</b>	<b>10 Hours</b>
<p>Cloud security: Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security. Cloud based service, applications and development platform.</p>	
<b>UNIT V</b>	<b>10 Hours</b>
<p>Cloud Service Development and Emerging Trends: Cloud-based Service Applications, Platforms and Tools for Cloud Development, Development and Deployment of Cloud Services, Emerging Trends in Cloud Computing: Edge Computing, Serverless Computing, Containerization. Case Studies: Real-world Cloud Implementations and Best Practices, Future Directions: Quantum Cloud Computing and AI in the Cloud.</p>	
<p>Teaching Methods: Chalk&amp; Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCs</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill</li> <li>2. Gautam Shroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, [ISBN: 978-0521137355],2010</li> <li>3. Rajkumar Buyya, Christian Vecchiola, S.Tamarai Selvi, ‘Mastering Cloud Computing’, TMGH, 2013.</li> </ol>	

Subject Code	Name of the Subject		L	T	P	C									
	<b>Software Engineering</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>									
<b>Course Educational Objectives</b>															
<b>Course Outcomes: <i>Upon successful completion of this course, students should be able to:</i></b>															
<b>CO1</b>	Learn various software development process models and their suitability.														
<b>CO2</b>	Able to apply the methods of requirement elicitation.														
<b>CO3</b>	Learn Conventional Software Management and Evolution of Software Economics.														
<b>CO4</b>	Explain how a software process flows and understand Project Organizations and Responsibilities.														
<b>CO5</b>	Apply Agile methodologies and DevOps practices to enhance software development efficiency and collaboration														
<b>CO6</b>	Explore and integrate emerging trends and advanced techniques in software engineering for future-proof software solutions.														
<b>CO-PO &amp; PSO Mapping</b>															
Cos	PROGRAMMEOUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>		3				2				1	1				
<b>CO2</b>		2		3											
<b>CO3</b>	1		1		2										
<b>CO4</b>		1													
<b>Avg.</b>															
<b>SYLLABUS</b>															
<b>UNIT:1</b>									<b>(10 Hours)</b>						
Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models: The Waterfall Model, Incremental Process Models, The RAD Model, Prototyping Model, V- Model, Spiral Model, Agile and Scrum Model. COCOMO Model															
<b>UNIT:2</b>									<b>(12 Hours)</b>						
Software Requirements: Functional and Non-functional, User requirements, System requirements, Software Requirements Document, Requirement Engineering Process: Feasibility Studies, Requirement elicitation and analysis, Requirement validation, Requirements Management. CASE TOOL: Application on Documentation															
<b>UNIT:3</b>									<b>(12 Hours)</b>						
Design process: Design concepts, Design Model, Design Heuristic Architectural Design: Architectural Mapping using Data Flow Structure Chart design using DFD. Transform Analysis, Transaction Analysis: OOD Modeling Using UML, User Interface Design.															
<b>UNIT:4</b>									<b>(14 Hours)</b>						
Software implementation techniques: coding practices: Refactoring, Code Review, Code Inspection, Driver and Stub Module. Software Testing Fundamentals: Internal and external views of Testing- White Box Testing, Basis path testing, control structure testing. Black Box Testing: Regression Testing, Unit Testing, Integration Testing, Validation Testing, System Testing and Debugging. CASE TOOL: Test-Case Design, Software Reliability Measures and Growth Modeling: SEI CMM: Characteristics of Software Maintenance, Reverse Engineering, Re-engineering.)															
<b>UNIT-V</b>															
Emerging Trends and Advanced Topics in Software Engineering, Agile Software Development: Scrum, Kanban, Extreme Programming (XP), and Lean DevOps: Principles, Practices, and Tools , Cloud-Based															

Software Engineering and Microservices Architecture, Secure Software Development: Secure Coding Practices, Threat Modeling, and Vulnerability Analysis, Future Trends: AI in Software Engineering, Quantum Computing, and Green Software Engineering

**Teaching Methods:** Chalk& Board/ PPT/Video Lectures

**Text Book:**

1. *Fundamentals of Software Engineering, Rajib Mall, PHI, 2014.*
2. *Walker Rayce : Software Project Management, Pearson Education, 2005*

**Reference Book**

1. *Software Engineering, A Practitioner's Approach, Roger S. Pressman, TMG Hill.*
2. *Software Engineering, I. Sommerville, 9th Ed. , Pearson Education*
3. *Richard H.Thayer: Software Engineering Project Management, IEEE Computer Society, 1997*
4. *ShereK.D. : Software Engineering and Management, Prentice Hall, 1988*

SUBJECT CODE	SUBJECT NAME	L	T	P	C
	<b>Advanced Java Programming</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Educational Objectives

CEO1	Objective of this course is to provide the ability to design console based, GUI based and web based applications. Students will also be able to understand integrated development environment to create, debug and run multi-tier and enterprise-level applications.
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### Course Outcomes: : *Upon successful completion of this course, students should be able to:*

CO1	design and develop data driven web applications using JDBC, servlet and JSP API.
CO2	develop MVC based web applications using SpringBoot.
CO3	understand significance of Object Relational Mapping (ORM) in Java context.
CO4	construct ORM-based web applications using Hibernate.
CO5	
CO6	

### CO-PO & PSO Mapping ( Articulation Matrix):

Cos	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1	3				3						
CO2		3	2					3						
CO3	2													
CO4		2	2											
Avg.														

### SYLLABUS

#### UNIT:1 (12 Hours)

**Basics of JDBC:** Introduction to JDBC, Need of JDBC, JDBC Drivers (4 types), Architecture of JDBC, Components of JDBC (Classes and Interfaces).

**Programming with JDBC:** Creating a DATABASE (ORACLE) , First Program to connect to the DATABASE created, Loading the Driver, Establishing the Connection, Creating Statements (Statement/ PreparedStatement/ CallableStatement), Executing a SQL Query, Different types of SQL Queries.

**JDBC Program to retrieve data from DATABASE:** Introduction to Result Set, Result Set with Statement Interface, Result Set with PreparedStatement Interface, Updating and deleting data in database, ResultSetMetadata, Executing Stored Procedures Using Callable Statement.

#### UNIT:2 (12 Hours)

**Web Architecture:** Introduction to HTML, Describe the various HTML tags and their usage. Layout Tags, Semantic Tags, HTML table, forms, style, div.

**Introduction to Servlets:** What is Servlet, Advantage of Servlet Over Applets and CGI, Strengths of Servlet, Architecture of Web Application, Web Servers and its Containers, Role of servlet in Web application development, Understanding servlet-api, Understanding HTTP protocol and communication between HTML-SERVLET.

**Getting Deep to Servlets:** Types of Servlet, Difference between HttpServlet and GenericServlet, Life cycle of Servlets and different life cycle methods, Difference between doGet() and doPost(), Servlet Generating Html output, Collecting Client submitted data in a Servlet.

<p><b>Servlet communications:</b> Servlet to DBMS communication using type-4 connection, Servlet to DBMC communication using JDBC connection pooling, Servlet communication with other servlets (Servlet Chaining), Servlet communication with JSP or HTML page (sendRedirect()), Difference between sendRedirect() and RequestDispatcher forward(), Understanding ServletConfig.</p> <p><b>Conclusion to Servlets:</b> Servlet Filters and wrappers, Servlet Listeners, Session Tracking, Cookies, HttpSession, HTML hidden form filed element, URL rewriting, Annotation based servlet programs.</p>
<p><b>UNIT:3</b> <span style="float: right;"><b>(10 Hours)</b></span></p> <p><b>Java Server Pages:</b>Introduction to JSP, Scope of JSP, Anatomy of a JSP program, xecution of a JSP program, Significance of JSP Engine, Built in objects of JSP, Significance of JSP Elements, Scripting Elements, Scriptlets, Declaration, Expression, Directives and Action Elements, Page Directive, Include Directive, Taglib Directive, Forward action element, Include, Param, useBean with introduction to beans, setProperty, getProperty</p>
<p><b>UNIT:4</b> <span style="float: right;"><b>(14 Hours)</b></span></p> <p><b>Hibernate :</b> Introduction to Hibernate, Architecture of hibernate, Hibernate O/R mapping, Configuring hibernate development environment, Implementing hibernate O/R Mapping, Introduction to Hibernate Query Language (HQL)</p>
<p><b>UNIT-5</b></p> <p><b>Sping and SpringBoot :</b> Spring Basic, Spring IOC, Spring MVC, Spring MVC with Hibernate. Introduction to SpringBoot, SpringBoot Injection, dependency, autowired, SpringBoot JPA, SpringBoot Webapp MVC.</p>
<p>Teaching Methods: Chalk&amp; Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCs</p>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Advanced Java Programming, Uttam K. Roy, Oxford University Press.</li> </ol>
<p><b>Reference Book:</b></p> <ol style="list-style-type: none"> <li>1. Black book, Kogent Learning Solution Inc.</li> <li>2. Java 2: The Complete Reference by Herbert Schildt, Fifth Edition Paperback</li> </ol>

**VI Semester [Third Year]**  
**B. Tech in Computer Science and Engineering (2023 Admission)**

SN	CC	Sub Code	Name of the Subject	L	T	P	C	ISA	ESA
<b>THEORY</b>									
1	HS		Engineering Economics and Costing/ Optimization Engineering	2	0	0	2	30	70
2	PC		Introduction to Machine Learning	3	0	0	3	30	70
3	PC		Microprocessors and Microcontroller	3	0	0	3	30	70
4	PE		Professional Elective-IV (From Bucket)	3	0	0	3	30	70
5	PC		Introduction to Internet of Things	3	0	0	3	30	70
6	OE		Open Elective-II (From Bucket)	3	0	0	3	30	70
			<b>TOTAL</b>	<b>17</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>180</b>	<b>420</b>
<b>PRACTICAL/SESSIONAL</b>									
7	PC		Introduction to Internet of Things Lab	0	0	2	1	30	20
8	PC		Microprocessors and Microcontrollers Lab	0	0	2	1	30	20
9	PST		Minor Project Work-II	0	0	4	2	50	50
10	MC		Essence of Indian Knowledge Tradition	0	0	0	0	#100	
			<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>4</b>	<b>110</b>	<b>90</b>
			<b>TOTAL</b>	<b>17</b>	<b>0</b>	<b>8</b>	<b>21</b>	<b>290</b>	<b>510</b>

**Professional Elective Bucket**

Sl. No.	Sem	Professional Elective IV
1	VI	Digital Image Processing
2		Pattern Recognition
3		Introduction to Digital Signal Processing

**BUCKETS FOR OPEN ELECTIVES**

Sl. No.	Sem	Open Elective II
1	VI	Android Application Development using Kotlin
2		Mobile Computing
3		IOS Development

*# Assignment Based Assessment*

Subject Code	Name of the Subject	L	T	P	C
	<b>Introduction to Machine Learning</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Educational Objectives**

CEO1: Introduce Basics of Matrices, Random Variables and Distributions relevant for the study of Machine Learning Techniques

CEO2: Formulate a well defined machine learning problem with clear Metrics

CEO3: Familiarize with techniques for Dimensionality reduction and Computational Efficiency

CEO4: Understand the notions of Hypotheses Space, Hypotheses Structure and Search

**Course Outcomes: : Upon successful completion of this course, students should be able to:**

CO1 Identify and classify different categories of Data attributes, Dimensions, Sample sizes

CO2 Understand and Apply Supervised, Unsupervised Learning techniques

CO3 Discriminate classifications based on Logistic and Linear Regression and Function Estimation

CO4 Produce Rules and Associations for impactful recommendations from data

CO5 Apply Neural Networks and design the algorithms

CO6 Understand the applications of ML in various areas

**CO-PO & PSO Mapping**

Cos	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2														
CO2	3	2	2													
CO3	3	3														
CO4	2	3														
Avg.																

**SYLLABUS**

**UNIT:1**

**(12 Hours)**

**Introduction to Machine Learning**

Introduction ,Components of Learning , Learning Models , Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension. Understand your Data and Prepare Your Data For Analysis, Exploratory Data Analysis, Basic probability theory, Random variables, Probability distributions and Sampling Distributions, Markov models, Bayesian learning, Applications.

**UNIT:2**

**(10Hours)**

**Supervised and Unsupervised Learning**

Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression,

Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors.

Introduction to clustering, K-means clustering, K-Mode Clustering.

Feature Engineering: Dimensionality reduction: PCA, LDA Feature Scaling, and Feature Selection: Filter methods, Wrapper methods, Embedded methods.

<b>UNIT:3</b>	<b>(12 Hours)</b>
<b>Ensemble and Probabilistic Learning Model</b>	
Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models - The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods - Nearest Neighbour Smoothing, Efficient Distance Computations: the KD-Tree, Distance Measures.	
<b>UNIT:4</b>	<b>(14Hours)</b>
<b>Neural Networks</b>	
Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation Unsupervised learning, Partitional Clustering, Hierarchical Clustering, Density-based Clustering, Gaussian Mixture Models, Expectation Maximization. Introduction to reinforcement and explanation-based learning. ML applications in Computer Vision, Recommendation Systems: Case Study Approach	
<b>Unit-5</b>	<b>(10 Hours)</b>
<b>Advanced Topics and Applications in Machine Learning:</b> Reinforcement Learning: Markov Decision Process (MDP), Q-Learning, Deep Q-Networks (DQN), Natural Language Processing (NLP): Text Processing, Word Embeddings, and Transformers, Generative Models: Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), Model Evaluation and Hyperparameter Tuning: Cross-Validation, Grid Search, Random Search, Future Trends: Explainable AI, Federated Learning, and Quantum Machine Learning	
Teaching Methods: Chalk& Board/ PPT/Video Lectures	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Machine Learning, <i>Tom M. Mitchell,(2013), McGraw-Hill Education (INDIAN EDITION)</i></li> <li>2. Hands-On Machine Learning with Scikit-Learn and TensorFlow, <i>AurélienGéron, (2017) O'Reilly</i></li> <li>3. Introduction to Machine Learning with Python A guide for data scientists, <i>Andreas, C. Muller &amp; SarahGuido,(2016)O'Reilly</i></li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. <i>EthemAlpaydin, (2013), Introduction to Machine Learning, 2nd Ed., MIT Press.</i></li> </ol>	

Subject Code	Name of the Subject	L	T	P	C										
	<b>Android App Development Using Kotlin</b>	4	0	1	4										
<b>Course Educational Objectives</b>															
CEO1	This course covers the fundamentals of Kotlin Programming and Android programming using the Android SDK. Topics discussed in this course include: fundamental concepts in Android programming - activities and intents, designing user interface using views, data persistence, content providers, messaging and networking, location-based services, and developing android services.														
Course Outcomes: Upon successful completion of this course, students should be able to:															
CO1	demonstrate their understanding of Kotlin Programming.														
CO2	demonstrate their understanding of the fundamentals of Android operating systems, development trends and Android platform.														
CO3	Design kotlin based stand android application.														
CO4	Develop android application using API and database.														
CO5	Implement different types of Menus														
CO6	Usage of Data Storage and SOLLite														
<b>CO-PO &amp; PSO Mapping</b>															
COs	PROGRAMME OUTCOMES														
	1	2	3	4	5	6	7	8	9	10	11	12			
CO1	3	1			1							1			
CO2	2	3	1	3	2							1			
CO3	2	3	3	3	2				1		1	2			
CO4	2	3	3	3	2				1		1	2			
Avg.															
<b>SYLLABUS</b>															
<b>UNIT:1</b>							<b>(8 Hours)</b>								
Introduction to Kotlin: Kotlin Architecture, Basic syntax, Kotlin Comments, Kotlin Keywords, Defining variable, Use of variables, Data types- (Booleans, Strings, Arrays, Ranges), Operators, Control Flow, if... else expression, for loops, While loops, Break and Continue, functions in Kotlin, user defining functions. Kotlin Collections (Lists, Sets, Maps), Kotlin objects and Classes, Constructors, Inheritance, Interface, Visibility Control, Extension, Data Classes, Sealed Class, Generics, Delegation, Destruction, Exception Handling.															
<b>UNIT:2</b>							<b>(15 Hours)</b>								
Introduction to Android: Introduction to Android Operating System, Android Architecture, Core Building Blocks, Android Emulator, Application Structure, Setting up development environment, Dalvik Virtual Machine & .apk file extension, AndroidManifest.xml, uses-permission & uses-sdk, Resources & R.java o Assets, Layouts & Drawable Resources, Fundamentals: Basic Building blocks - Activities, Services, Broadcast, Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents & Intent Filters Android API levels (versions & version names), User Interface Architecture: Application context, intents, Activity life cycle, Services, Android widgets, UI widgets, Working with Buttons, Toast, Custom Toast, Toggle Button, Check Button, Custom Check Button, Radio Button, Dynamic Radio button, Alert Dialog, Android Views: Text view, Autocomplete Text view, List View, Custom List View, Rating Bar, WebView Seek Bar, Date Picker, Time Picker, Analog and Digital, Progress Bar, Android Layouts: Linear Layout, Relative Layout, Table Layout, Table Layout with Frame Layout, Search View, Search View on Toolbar, Edit Text with Text Watcher.															

<b>UNIT:3</b>	<b>(10 Hours)</b>
Switchers: Switch, Dynamic Switch, Text Switcher, Dynamic Text Switcher, Image Switcher, Dynamic Image Switcher. Spinner: Spinner, Dynamic Spinner, Dynamic TextClock, Chronometer, Dynamic Chronometer, Notifications, Android Toast, Dynamic RadioGroup, Android Slide Up/Down in Kotlin, Scroller: Vertical Scroll, View Horizontal Scroll View, Image Switcher, Image Slider, View Stub, XML Parsing using DOM Parser, XML Parsing using SAX Parser, Kotlin Android XMLPullParser	
<b>UNIT:4</b>	<b>(10 Hours)</b>
Menu : Option menu, Context menu, Sub menu, menu from xml, menu via code, Examples. Navigation: Create a fragment, Define navigation paths, Start an external activity, Kotlin Regex: Regular Expressions, Kotlin Annotations, Adapters, Android Recycler View, Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources	
<b>UNIT:5</b>	
Data Storage: Shared Preferences, Android File System, Internal storage, External storage, SQLite Firebase. Common Android APIs: Using Android Data and Storage APIs etc.	
Teaching Methods: Chalk& Board/ PPT/Video Lectures	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Bruce Eckel and Svetlana Isakova (2021), “Atomic Kotlin”, Mindview LLC, Crested Butte, CO</li> <li>2. WeiMeng Lee (2012), “Beginning Android Application Development”, Wrox Publications (John Wiley, New York) (For 1 to 5 units).</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Ed Burnette (2010), “Hello Android: Introducing Google's Mobile Development Platform”, The Pragmatic Publishers, 3rd edition, North Carolina USA</li> <li>2. Reto Meier (2012), “Professional Android 4 Application Development”, Wrox Publications (John Wiley, New York).</li> <li>3. ZigurdMednieks, Laird Dornin, Blake Meike G, Masumi Nakamura (2011), “Programming Android: Java Programming for the New Generation of Mobile Devices”, OReilly Media, USA</li> </ol>	
<b>e-Contents:</b>	
<ol style="list-style-type: none"> <li>1. <a href="https://developer.android.com/kotlin">https://developer.android.com/kotlin</a></li> <li>2. <a href="https://developer.android.com/studio">https://developer.android.com/studio</a></li> </ol>	

Subject Code	Name of the Subject											L	T	P	C
	<b>Microprocessors and Microcontrollers</b>											<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Course Educational Objectives</b>															
<b>CEO1</b>	To Develop assembly language programs and basic concepts of the microprocessor and microcontroller														
<b>CEO2</b>	To provide solid foundation on interfacing the external devices to the microprocessor & microcontroller according to the user requirements in order to create novel products and solutions for the real time problems														
<b>CEO3</b>	To Familiar and Design of any type of embedded systems related to industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.														
<b>CEO4</b>	To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier in the field embedded systems.														
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>															
<b>CO1</b>	Understand the architecture of 8085, 8086 & 8051														
<b>CO2</b>	Understand and analyze different data transfer schemes and its applications														
<b>CO3</b>	To design circuits and Implement programs using microcontrollers.														
<b>CO4</b>	Understand the need & use of Interrupt structure in 8085, 8086 & 8051.														
<b>CO5</b>	Analyze and troubleshoot microprocessor and microcontroller systems.														
<b>CO6</b>	Apply microcontrollers in real-world embedded system applications.														
<b>CO-PO &amp; PSO Mapping</b>															
<b>Cos</b>	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>	3	1													
<b>CO2</b>	3	2													
<b>CO3</b>	2	2	1												
<b>CO4</b>	3	2													
<b>CO5</b>	1	1													
<b>CO6</b>	2	2													
<b>Avg.</b>															
<b>SYLLABUS</b>															
<b>UNIT:I (10 Hours)</b>															
<b>Introduction to 8 bit Microprocessors</b>															
Introduction to 8085 microprocessor, Architecture, Signal Descriptions ,Buses-Address bus ,data bus and control Bus ,Instruction format ,Instruction sets ,addressing Modes, Assembly Language Programming ,Timing diagram, stack and sub routine, Data Transfer Schemes ,Memory Interfacing and 8085 interrupts.															
<b>UNIT:2 (12 Hours)</b>															
<b>Advanced Microprocessor</b>															
Introduction to 8086 microprocessor, 8086 Architecture, Register Organization, signal descriptions, Memory Segmentation. Physical memory organization. Addressing Modes, instruction Set .Minimum and Maximum mode operation, Bus Cycle of minimum mode and maximum mode. Interrupts of 8086, Memory interfacing & Assembly Language Program.															

<p><b>UNIT:3 Peripheral Devices</b> <span style="float: right;"><b>(10 Hours)</b></span>          Programmable Peripheral Interface (8255), Programmable Interval Timer (8254) Programmable Interrupt Controller (8259A) - Programmable DMA Controller(8257),Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).</p>
<p><b>UNIT:4</b> <span style="float: right;"><b>(12 Hours)</b></span>  <b>8051 Microcontroller</b>          Overview of 8051 microcontroller. Architecture. I/O Ports. Memory organization, Addressing modes, data transfer instructions, Logical instructions, Arithmetic instructions, Branching (Jump &amp; Call ) instructions, Bit addressable instructions and special instructions, Interrupts and interrupt handler sub routines ( Interrupt Service Routines).Assembly language program.</p>
<p><b>UNIT-5</b> <span style="float: right;"><b>(10 Hours)</b></span>  <b>Advanced Microcontrollers and Embedded Systems:</b> Introduction to advanced microcontrollers: ARM, AVR, and PIC, Comparison of different microcontroller architectures, Embedded system design: Hardware/software co-design, RTOS basics, Application of microcontrollers in embedded systems, Case studies: Real-time applications using microcontrollers</p>
<p><b>Teaching Methods:</b> Chalk&amp; Board/ PPT/Video Lectures</p>
<p><b>Text Books:</b>  <i>1. Microprocessor Architecture, Programming and application with 8085, R.S. Gaonkar, PRI Penram International publishing PVT. Ltd., 5thEdition</i>  <i>2. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd edition 2006.</i>  <i>3. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.M C Kinlay, Pearson Education, Second Edition, 2008.</i></p>
<p><b>Reference Books:</b>  <i>1. Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096, Krishna Kant, PHI Publication, 2007.</i>  <i>2. Microprocessors and Interfacing, Programming and Hardware, Douglas V Hall, TMH Publication, 2006.</i>  <i>3. Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevananthan and S.K. Shah, Oxford University Press.</i></p>

<b>Subject Code</b>	<b>Name of the Subject</b>											<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	<b>Introduction to Digital Image Processing</b>											<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>Course Educational Objectives</b>																
<b>CEO1:</b> To provide deep understanding of basic concepts of digital image acquisition																
<b>CEO2:</b> T provide deep Understanding of various digital image enhancement techniques																
<b>CEO3:</b> Understand image restoration and segmentation methods																
<b>CEO4:</b> To provide understanding and implementation of image compression techniques																
<b>Course Outcomes: : Upon successful completion of this course, students should be able to:</b>																
<b>CO1</b>	Understand basics of digital images and tools for image processing															
<b>CO2</b>	Learn and implement image Enhancement techniques															
<b>CO3</b>	Understand and Learn image Restoration and Segmentation Methods															
<b>CO4</b>	Understand and implement Image Compression techniques															
<b>CO5</b>	Evaluate the performance of image processing techniques in various applications.															
<b>CO6</b>	Utilize software tools and programming languages to solve practical image processing problems.															
<b>CO-PO &amp; PSO Mapping</b>																
<b>Cos</b>	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>	3	2														
<b>CO2</b>	3	2	2													
<b>CO3</b>	3	3														
<b>CO4</b>	2	3														
<b>CO5</b>																
<b>CO6</b>																
<b>Avg.</b>																
<b>SYLLABUS</b>																
<b>UNIT:1 (14 Hours)</b>																
Introduction, Origin- Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, Introduction to Image processing toolbox in MATLAB, Tool box practice, Exploring functions, Introduction to Spatial Domain, Gray level transformations, Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering, Frequency Domain: Basics of filtering, Smoothing and Sharpening frequency domain filters, Smoothing and Sharpening frequency domain filters, MATLAB code for histogram equalization, MATLAB code for spatial and frequency domain filter.																
<b>UNIT:2 (12 Hours)</b>																
Noise models – Mean Filters – Order Statistics, Adaptive filters – Band reject Filters – Band pass Filters, Inverse Filtering – Wiener filtering Segmentation, Point, Line, and Edge Detection, Marr-Hildreth & Canny edge detector, Edge Linking and Boundary detection, Local & Regional processing-Region based segmentation, Morphological processing- Watershed segmentation algorithm, MATLAB code for restoring an image after degradation using adaptive and wiener filter, Edge detection operator																

<b>UNIT:3</b>	<b>(14 Hours)</b>
Wavelets – Subband coding – Multiresolution expansions, Fundamentals of Compression – Image Compression methods - Error Free Compression, Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding, Lossy Compression – Lossy Predictive Coding, Compression Standards- Huffman, Arithmetic coding, LZW coding, Run Length Encoding, Compression Standards, Huffman, Arithmetic coding, LZW coding, Run Length Encoding, Block Transform coding, Wavelet coding, JPEG standard, MATLAB code for image compression: Huffam coding, Arithmetic coding, wavelet coding.	
<b>UNIT:4</b>	<b>(10 Hours)</b>
Boundary representation – Chain Code, Polygonal approximation, signature, boundary segments, Boundary description – Shape number Fourier Descriptor, Regional Descriptor, Topological - Texture – Patterns and Pattern classes, Recognition based on matching, MATLAB code for image representation, MATLAB code for image recognition, MATLAB practice exercise.	
<b>UNIT-V</b>	<b>(10 Hours)</b>
<b>Applications and Advanced Topics</b> Introduction to advanced topics: machine learning in image processing, deep learning for image analysis, Applications in medical imaging, remote sensing, and computer vision, Case studies of image processing in real-world scenarios, Overview of current trends and future directions in digital image processing, Course project: Application of image processing techniques to a specific problem	
<b>Teaching Methods:</b> Chalk& Board/ PPT/Video Lectures	
<b>Text Books:</b> 1.Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.	
<b>Reference Books:</b> <i>1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.</i> <i>2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.</i> <i>3. William K Pratt, “Digital Image Processing”, John Willey, 2002.</i>	

Subject Code	Name of the Subject											L	T	P	C
	<b>Introduction to Internet of Things</b>											<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Course Educational Objectives</b>															
<b>CEO1</b>	The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IoT based projects.														
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>															
<b>CO1</b>	Understand internet of Things and its hardware and software components.														
<b>CO2</b>	Interface I/O devices, sensors & communication modules.														
<b>CO3</b>	Remotely monitor data and control devices.														
<b>CO4</b>	Develop real life IoT based projects.														
<b>CO5</b>															
<b>CO6</b>															
<b>CO-PO &amp; PSO Mapping</b>															
<b>COs</b>	<b>PROGRAMME OUTCOMES</b>														
	1	2	3	4	5	6	7	8	9	10	11	12			
<b>CO1</b>	3	1			1							1			
<b>CO2</b>	2	3	1	3	2							1			
<b>CO3</b>	2	3	3	3	2				1		1	2			
<b>CO4</b>	2	3	3	3	2				1		1	2			
<b>CO5</b>	2	2	3												
<b>CO6</b>	1	1	3												
<b>Avg.</b>															
<b>SYLLABUS</b>															
<b>UNIT:1 (8 Hours)</b>															
Introduction to IoT: - Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT. Domain-Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.															
<b>UNIT:2 (9 Hours)</b>															
Elements of IoT: - Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for CommunicationProtocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.															
<b>UNIT:3 (18 Hours)</b>															
IoT Application Development: - Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.															
<b>UNIT:4 (10 Hours)</b>															
IoT Case Studies: - IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.															

**UNIT-5****(10 Hours)**

**IoT Data Management and Analytics:** Data generation, acquisition, and processing in IoT, IoT data storage and management: Cloud storage, edge computing, and big data, Data analytics for IoT: Machine learning, predictive analytics, and real-time processing, Integration with cloud platforms: AWS IoT, Azure IoT, Google Cloud Io, Visualization and dashboards for IoT data.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**Text Books:**

1. VijayMadiseti, Arshdeep Bahga, "Internet of Things A Hands-On-Approach", 2014, ISBN:978 0996025515.
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs.
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi.

**Reference Books:**

5. AdrianMcEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN:978-1-118-43062-0 .
6. Daniel Kellmerit, "The Silent Intelligence: The Internet of Things". 2013, ISBN:0989973700
7. Adrian McEwen, "Designing the Internet of Things", Wiley.  
Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill.
8. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media.

**e-Books:**

9. Designing for the Internet of Things, O'Reilly, February 2015.
10. Getting Started with the Internet of Things, O'Reilly 4th edition, October, 2015.

**VII Semester [Fourth Year]**  
**B. Tech in Computer Science and Engineering (2023 Admission)**

SN	CC	Sub Code	Name of the Subject	L	T	P	C	ISA	ESA
<b>THEORY</b>									
1	PC		Computer Graphics	3	0	0	3	40	60
2	PC		Data Communication	3	0	0	3	40	60
3	PE		Professional Elective-V (From Bucket)	3	0	0	3	40	60
4	HS		Entrepreneurship Development	3	0	0	3	40	60
5	OE		Open Elective-III (From Bucket)	3	0	0	3	40	60
			TOTAL	15	0	0	15	200	300
<b>PRACTICAL/SESSIONAL</b>									
5	PC		Data Communication Lab	0	0	2	1	70	30
5	PST		Major Project Work-I	0	0	6	3	50	50
6	PST		Summer Industry Internship-III	0	0	0	1	0	50
			TOTAL	0	0	8	5	120	80
			<b>TOTAL</b>	<b>15</b>	<b>0</b>	<b>8</b>	<b>20</b>	<b>320</b>	<b>380</b>

**BUCKETS FOR PROFESSIONAL ELECTIVES**

Sl. No.	Semester	Professional Elective V
1	<b>VII</b>	Cryptography and Network Security
2		Information Security
3		Database Security

**BUCKETS FOR OPEN ELECTIVES**

Sl. No.	Semester	Open Elective III
1	<b>VII</b>	Data Analytics
2		Computer Vision
3		Intrusion Detection

Subject Code	Subject Code					L	T	P	C						
	<b>Computer Graphics</b>					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>						
<b>Course Educational Objectives</b>															
CEO1	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.														
CEO2	Introduce the use of geometric transformations on graphics objects and their application in composite form														
CEO3	Impart frame extraction with different clipping algorithms and transformation to a graphics display device.														
CEO4	Introduce projections and visible surface detection techniques for display of 3D scene on 2D screen and rendering of projected objects to naturalize the scene in 2D view.														
<b>Course Outcomes: : Upon successful completion of this course, students should be able to:</b>															
CO1	To <i>explain</i> the structure of modern computer graphics systems and <i>implement</i> its primitives														
CO2	To <i>design, develop</i> and <i>model</i> key algorithms for modeling and .														
CO3	Apply Graphics in greater depth to more complex courses like Image Processing, Virtual, Augmented Reality, etc														
CO4	To <i>visualize</i> surface detection and Virtual reality for a better visual effect.														
CO5	Desing Illumination models and implement them.														
CO6	Implement Animations in real time applications														
<b>CO-PO &amp; PSO Mapping</b>															
Cos	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2													
CO2	2	1	1												
CO3	1	2	2												
CO4	1	3	1												
CO5	1	2													
CO6	2	1													
Avg.															
<b>SYLLABUS</b>															
<b>UNIT:1</b>											<b>(10 Hours)</b>				
Overview of Graphics System: Video Display Units, Raster-Scan and Random Scan Systems, Graphics Input and Output Devices, monitor and work station. Graphics output Primitives: point and line, drawing Algorithms: DDA and Bresenham's, Circle drawing Algorithms: Midpoint Circle and Bresenham's filled area primitives.															
<b>UNIT:2</b>											<b>(12 Hours)</b>				
Two Dimensional Geometric Transformations: Translation, rotation, Scaling, Reflection, Shear, Matrix Representation, Composite Transformations, Transformation between coordinate systems. Window-to-View port Coordinate Transformation. Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland Hodgeman Algorithm).															
Three Dimensional Geometric and Modeling Transformations: Translation Rotation, Scaling, Reflections, shear, Composite Transformation. Projections: Parallel Projection and Perspective Projection.															

<b>UNIT:3</b>	<b>(10 Hours)</b>
Object representation: Spline Representation, Bezier Curves and B-Spline Curves. Fractal Geometry: Fractal Classification and Fractal Dimension. Visible Surface Detection Methods: Back-face Detection, Depth Buffer, A- Buffer, Scan- line Algorithm and Painters Algorithm.	
<b>UNIT:4</b>	<b>(12 Hours)</b>
Light pattern and Illumination Models: Aliasing and Anti aliasing, Half toning, Thresholding and Dithering, Basic Models, Displaying Light Intensities. Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading and Phong Shading.	
<b>UNIT-5</b>	<b>[10 Hours]</b>
Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, methods of controlling Animation, Morphing. Virtual Reality: Types of Virtual reality systems, Input and Output Virtual Reality devices	
Teaching Methods: Chalk& Board/ PPT	
<b>Text Books:</b>	
1. <i>Computer Graphics with Virtual Reality System, Rajesh K.Maurya, WileyDreamtech.</i>	
2. <i>Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education</i>	
<b>Reference Book:</b>	
1. <i>Computer Graphics Principle and Practice , J.D. Foley, A.Dam, S.K. Feiner, Addison, Wesley</i>	
2. <i>Procedural Elements of Computer Graphics- David Rogers (TMH)</i>	
3. <i>Computer Graphics: Algorithms and Implementations – D.P Mukherjee &amp; Debasish Jana (PHI)</i>	
4. <i>Introduction to Computer Graphics &amp; Multimedia – AnirbanMukhopadhyay</i>	

Subject Code	Name of the Subject	L	T	P	C	
	<b>Data Communication</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	

**Course Educational Objectives**

**Course Outcomes: Upon successful completion of this course, students should be able to:**

<b>CO1</b>	Understand the fundamental concepts and components of data communication and transmission media.
<b>CO2</b>	Analyze and apply data link layer protocols and error handling techniques for reliable communication.
<b>CO3</b>	Evaluate network layer protocols, routing algorithms, and IP addressing schemes.
<b>CO4</b>	Implement transport layer protocols and manage end-to-end communication effectively.
<b>CO5</b>	Identify and use application layer protocols for various data communication services.
<b>CO6</b>	Explore advanced topics in data communication and assess their impact on modern network architectures.

<b>CEO1</b>	To discuss the digital data communication techniques
<b>CEO2</b>	Gain knowledge on basic concepts of data communication layers, protocols and performance
<b>CEO3</b>	Understand a few representative protocols and network components
<b>CEO4</b>	To introduce the functions of different layers from deployed examples

**COURSE EDUCATIONAL OBJECTIVES:**

**CO-PO MAPPING**

Cos	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>	3	1														
<b>CO2</b>	3	1														
<b>CO3</b>	2	2														
<b>CO4</b>	2	3		1												
<b>CO5</b>	1	1														
<b>CO6</b>	2	2														
<b>Avg.</b>																

**SYLLABUS**

**UNIT:1 (14 Hours)**

**Introduction to Computer Networks,** Components, Devices, Topology, OSI model, layers in OSI model, TCP/IP Model, Address types (Physical, Logical, Port, Application-Specific Addresses), Analog and Digital Signal. Transmission Media (Guided Media, Unguided Media).

**Physical Layer:** line encoding, Block coding, Binary data to Digital Signal Conversion, Digital to Analog Signal Conversion, Analog to Analog Signal Conversion, Analogue to Digital Signal conversion. Digital Transmission types (Serial and Parallel), Transmission Modes (Simplex, Half-Duplex and Full-Duplex), Multiplexing (FDM, TDM, WDM, CDM).

**UNIT:2 (10 Hours)**

**Switching and Types:** Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

**Data link layer:** Introduction, Error Detection and Correction techniques (Checksum, Cyclic Redundancy Check, Hamming Code (1-bit error rectification)), Framing, HDLC Frame Structure and

Types, HDLC (NRM, ABM, ARM), Point to Point Protocol, Flow and Error Control, Noiseless Channels protocols (Simplest, stop-and-Wait), Noisy Channels protocols (Stop-and-Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ),

**UNIT:3** (11 Hours)

**Medium Access sub layer:** Multiple Access - Random Access Protocols (ALOHA, CSMA (non-persistent, 1-persistent, p-persistent), CSMA/CD, CSMA/CA), Controlled Access Protocols (Reservation, Polling, Token Passing), Channelization techniques (FDMA, TDMA, CDMA).

**Network Layer:** Internetworking, IP Address, IPv4(Header structure, Class types, subnetting), IPv6 (Header structure, Address structure), IPV4 to IPV6 Address Mapping, Address Resolution Protocol, ICMP.

**UNIT:4** (10 Hours)

**Transport Layer:** User Datagram Protocol, Transmission Control Protocol, Process-To-Process Delivery, Congestion Control, Quality of Service.

**Application Layer:** Domain Name System - Address Resolution, TELNET, E-MAIL (SMTP, POP3), FTP, HTTP, HTTPS, Voice Over IP, Firewall.

**Unit-5** (10 Hours)

**Application Layer:** Domain Name System - Address Resolution, TELNET, E-MAIL (SMTP, POP3), FTP, HTTP, HTTPS, Voice Over IP, Firewall

**Teaching Methods:** Chalk& Board/ PPT/Video Lectures

**Text Book:**

1. *Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition TMH,2006.*
2. *Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.*

**Reference Book:**

1. *An Engineering Approach to Computer Networks-S.Keshav,2nd Edition, Pearson Education*
2. *Understanding communications and Networks,3rd Edition, W.A.Shay, Cengage Learning.*
3. *Computer and Communication Networks ,Nader F. Mir, Pearson Education*
4. *Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W. Ross, 3rd Edition, Pearson Education.*

Subject Code	Subject Code	L	T	P	C
	<b>Cryptography and Network Security</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Educational Objectives**

CEO1	Provide an Overview of Security Architecture and Number Theory used in Cryptography.
CEO2	Introduce and Explain Different Security Algorithms and their Implementation.
CEO3	Demonstrate Real-Time Security Threats & Security Types.
CEO4	Identification of different key Security Issues in Email, IP & Web Security and Its Solution.

**Course Outcomes: : Upon successful completion of this course, students should be able to:**

CO1	Explain and use the concept of Number Theory in Cryptography.
CO2	Design and implement of various Cryptography Algorithms.
CO3	Interpret and Compare Different types of Authentication Application.
CO4	Identify and Examine Key Security Issues in Email, IP and Web security.
CO5	
CO6	

**CO-PO & PSO Mapping**

Cos	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2														
CO2	3	2	2	3												
CO3	2	2	3	2												
CO4	3	2	2													
CO5	1	3	1													
CO6	2	1	1													
Avg.																

**SYLLABUS**

**UNIT:1 (10 Hours)**

**INTRODUCTION & NUMBER THEORY:** Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid’s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat’s and Euler’s theorem-Testing for primality-The Chinese remainder theorem- Discrete logarithms.

**UNIT:2 (14 Hours)**

**BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY:** Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

**HASH FUNCTIONS AND DIGITAL SIGNATURES:** Authentication requirement– Authentication function – MAC – Hash function – Security of hash function and MAC –MD5-SHA-HMAC–CMAC-Digital signature and authentication protocols–DSS–EIGamal–Schnorr.

**UNIT:3 (12 Hours)**

**SECURITY PRACTICE & SYSTEM SECURITY:** Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder –

Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

**UNIT:4** (10 Hours)

**E-MAIL, IP & WEB SECURITY:** E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IP Security: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding).

**UNIT-5** (10 Hours)

**Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

Teaching Methods: Chalk& Board/ PPT/Video Lectures

**Text Books:**

1. *“Cryptography and Network Security: Principles and Practice”* by William Stallings
2. *Cryptography and Network Security”* by Behrouz A.Forouzan, Debdeep Mukhopadhyaya

Subject Code	Name of the Subject	L	T	P	C	QP									
	<b>Data Analytics</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>A</b>									
<b>Course Educational Objectives</b>															
CEO1	Provide an insight into Data pre-processing, summarization, and visualization techniques.														
CEO2	Teach role of data analytics in business decision making.														
CEO3	Teach Model building and validation using various techniques.														
<b>Course Outcomes: Upon successful completion of this course, students should be able to:</b>															
CO1	Understand and build regression models and use them for prediction														
CO2	Analyze data to infer underlying patterns and formulate recommendations.														
CO3	Outline the scope and limitations of several state-of-the-art data analytics methods.														
CO4	Implement different data analytics models in a business environment.														
CO5															
CO6															
<b>CO-PO &amp; PSO Mapping</b>															
COs	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3													
CO2	3	3	2												
CO3	3	3	3												
CO4	3	2	3	2	2										
CO5															
CO6															
Avg.															
<b>SYLLABUS</b>															
<b>UNIT:1</b>							<b>(10 Hours)</b>								
<b>Predictive Analytics:</b> Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminate Analysis, Logistic regression, Perception learning algorithm.															
<b>UNIT:2</b>							<b>(10 Hours)</b>								
Neural Networks (NN), Support Vector Machines (SVM) and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest-Neighbor classifiers (Image Scene Classification).															
<b>UNIT:3</b>							<b>(10 Hours)</b>								
Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis.															
<b>Inferential Statistics and Prescriptive analytics</b> Assessing Performance of a classification Algorithm (t-test, McNemar's test, Paired t-test, paired F-test), Analysis of Variance, Creating data for analytics through designed experiments. Introduction to big data and Challenges for big data analytics.															
<b>UNIT:4</b>							<b>(10 Hours)</b>								
Implementation of following methods using R or Mat lab (One of the class tests with a weight age of 15 marks be used to examine these implementations): Simple and multiple linear regression, Logistic regression, Linear discriminate analysis, Ridge regression, Cross-validation and boot strap,															

fitting classification and regression trees, K-nearest neighbors, Principal component analysis, K-means clustering.

**UNIT-5**

**(10 Hours)**

**Advanced Data Analytics and Applications** Text Analytics and Natural Language Processing (NLP): Sentiment Analysis, Topic Modeling, Text Classification, Time Series Analysis: Forecasting Methods, ARIMA, Seasonal Decomposition, Anomaly Detection: Techniques and Applications, Ethical Considerations and Data Privacy: GDPR, Data Governance, Ethics in Data Analytics, Emerging Trends: Edge Analytics, Automated Machine Learning (AutoML), Data Analytics in IoT, AI-Driven Analytics

**Text Books:**

1. *Trevor Hastie, Robert Tibshirani, Jerome Friedman , The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition , Springer Verlag, 2009.*
2. *G. James, D. Witten, T. Hastie, R. Tibshirani- An introduction to statistical learning with applications in R, Springer, 2013.*
3. *E. Alpaydin, Introduction to Machine Learning, Prentice Hall Of India, 2010.*

**Reference Books:**

1. *C.M. Bishop –Pattern Recognition and Machine Learning, Springer, 2006*
2. *L. Wasserman-All of statistics*

Subject Code	Subject	L	T	P	C											
	<b>Entrepreneurship Development</b>	3	0	0	3											
<b>Course Educational Objectives</b>																
CEO1	Explore the entrepreneurial mindset and culture that has been developing in companies															
CEO2	Examine the entrepreneurial process involved in both pursuing an entrepreneurial venture within a large company and the creating and managing a new enterprise for implementation of an entrepreneurial venture.															
CEO3	Discuss the dynamics of participating on a business team and the power inherent in a team relative to individual effort															
CEO4	Provide the background and tools necessary to understand and participate in the entrepreneurial process within a large company, in a new venture or as an investor															
<b>Course Outcomes</b>																
CO1	Understand the concepts of entrepreneurship and skills required to be an entrepreneur															
CO2	Identify the Business Opportunities to and evaluate the feasibilities of the Project;															
CO3	Understand the formalities for setting up of a new venture and know the concepts of															
CO4	Evaluate different financial institutions supporting small scale industry.															
CO5	Develop skills of managing Finance, Marketing and HR of a business organization															
CO6	Analyze the impact of emerging trends in entrepreneurship on the global business															
<b>CO-PO &amp; PSO Mapping</b>																
COs	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	1	2				3										
CO2	2	1				0		3			3					
CO3	1	2				0			2		2					
CO4	1	1				0					3					
CO5	1	1				0			3							
CO6	2	1														
AVG						0.6		0.6	1		1.6					
<b>SYLLABUS</b>																
<b>Unit – I</b>						<b>[10Hrs]</b>										
Concept of Entrepreneurship, Motivation for Economic Development and Entrepreneurial Achievement, Enterprise and Society Why and how to start Business – Entrepreneurial traits and skills, Mind Vrs Money in Commencing New Ventures, Entrepreneurial success and failures, Environmental dynamics and change. Entrepreneurial Process Step by step approach to entrepreneurial start up Decision for Entrepreneurial start up.																
<b>Unit - II</b>						<b>[10Hrs]</b>										
Identifying the Business opportunity - Business opportunities in various sectors, formalities for setting up small enterprises in manufacturing and services, Environmental pollution and allied regulatory and non-regulatory clearances for new venture promotion in SME sector. Writing a Business plan, components of a B-Plan, determining Bankability of the project.																
<b>Unit – III</b>						<b>[10 Hrs]</b>										
Central / State level Institution promoting SME. Financial Management in small business. Marketing Management, problems & strategies Problems of HRM – Relevant Labour – laws. Sickness in Small Enterprises. Causes and symptoms of sickness – cures of sickness. Govt. policies on revival of sickness and remedial measures.																

**Unit – IV**

**Innovation and Growth Strategies:** Innovation and Creativity in Entrepreneurship: Techniques (Design Thinking, Blue Ocean Strategy), Processes, and Best Practices, Strategic Planning for Growth: Market Penetration, Market Development, Product Development, Diversification, Scaling up a Business: Processes, Challenges, and Strategies, Mergers and Acquisitions: Concept, Types, Benefits, and Challenges  
Case Studies: Successful Start-ups and Learnings from Failure

**Unit – V**

**Social Entrepreneurship and Sustainable Development-** Social Entrepreneurship: Definition, Importance, and Types, Role of Social Enterprises in Community Development, Sustainable Development Goals (SDGs) and Entrepreneurship, Green and Inclusive Entrepreneurship: Concepts, Practices, and Case Studies, Emerging Trends: Digital Entrepreneurship, Women Entrepreneurship, Rural Entrepreneurship

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCs

**Text Book:**

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 2009. Dollinger: Entrepreneurship, Pearson, 2009.

**Reference Book:**

1. Agarwal: Indian Economy, WishwaPrakashan 2009.
2. Dutt&Sundaram: Indian Economy,S.Chand, 2009
3. B D Singh.:Industrial Relations &Labour Laws, Excel, 2009.
4. ArunaKaulgud: Entrepreneurship Management by, Vikas publishing house, 2009.
5. Essential of entrepreneurship and small business management by Thomas W.Zimmerer& Norman M.Searborough, PHI-2009.
6. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2009

**VIII Semester [Fourth Year]**  
**B. Tech in Computer Science and Engineering (2023 Admission)**

SN	CC	Sub Code	Name of the Subject	L	T	P	C	ISA	ESA
<b>THEORY</b>									
1	PE		Professional Elective-VI (From Bucket)	3	0	0	3	40	60
2	OE		Open Elective-IV (From Bucket)	3	0	0	3	40	60
3	OE		Open Elective-V (From Bucket)	3	0	0	3	40	60
			TOTAL	9	0	0	9	120	180

<b>PRACTICAL/SESSIONAL</b>									
4	PST		Technical Seminar	0	0	2	1	0	50
5	PST		Major Project Work-II	0	0	6	3	50	50
			TOTAL	0	0	8	4	50	100
			<b>TOTAL</b>	<b>9</b>	<b>0</b>	<b>8</b>	<b>13</b>	170	280

**BUCKETS FOR PROFESSIONAL ELECTIVES**

Sl. No.	Semester	Professional Elective VI
1	<b>VIII</b>	Block Chain Technology
2		Malware Analysis
3		Cyber Law

**BUCKETS FOR OPEN ELECTIVES**

Sl. No.	Semester	Open Elective IV & V
1	<b>VIII</b>	Real Time Systems
2		Embedded Systems
3		E-Commerce & ERP
4		Cyber Security
5		Digital Forensics

<b>Subject Code</b>	<b>Name of the Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	<b>Malware Analysis</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	

**Course Educational Objectives**

**CEO1:** Understand the fundamentals of Dynamic and Static analysis & Gain knowledge about running malware in a virtual environment.

**CEO2:** Study about disassembly constructs and their structures.

**CEO3:** Study about new processors and file types using the IDA SDK

**CEO4:** Explore popular plug-ins that make writing IDA scripts easier, allow collaborative reverse engineering & understand how to best approach the subject of Android malware threats and analysis.

**Course Outcomes: Upon successful completion of this course, students should be able to:**

<b>CO1</b>	Gain knowledge about the different forms of malware.
<b>CO2</b>	Set up a safe virtual environment to analyze malware & navigate, comment, and modify disassembly
<b>CO3</b>	Use code graphing to quickly make sense of cross-references and function calls & Use IDA's built-in debugger to tackle hostile and obfuscated code.
<b>CO4</b>	Learn procedures for recognizing and analyzing Android malware threats quickly and effectively.
<b>CO5</b>	Implement Cross References using open sources
<b>CO6</b>	Learn Behavioral and Code Analysis

**CO-PO & PSO Mapping**

Cos	PROGRAMME OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>	3	2														
<b>CO2</b>	3	2	2													
<b>CO3</b>	3	3														
<b>CO4</b>	2	3														
<b>CO5</b>	1	1														
<b>CO6</b>	2	2														
<b>Avg.</b>																

**SYLLABUS**

**UNIT:1 (14 Hours)**

The Goals of Malware Analysis, Malware Analysis Techniques, Types of Malware, General Rules for Malware Analysis, Antivirus Scanning, Hashing- Fingerprint for Malware, Finding Strings, Packing Files, Detecting Packers with PEiD, Portable Executable File Format, Static, Runtime, and Dynamic Linking, Exploring Dynamically Linked Functions with Dependency Walker, Imported and Exported Functions, PotentialKeylogger.exe: An Unpacked Executable, Examining PE Files with PEview, Viewing the Resource Section with Resource Hacker, Using Other PE File Tools, PE Header Summary.

**UNIT:2 (12 Hours)**

The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Using Malware Analysis Machine, The Risks of Using VMware for Malware Analysis, Record/Replay: Running Your Computer in Reverse, Sandboxes: The quick-and-dirty Approach, Running Malware, Monitoring with

Process Monitor, Viewing Processes with process Explorer, Comparing Registry Snapshots with Regshot, Faking a Network, Packet Sniffing with Wireshark, Using INetSim, Basic Dynamic tools in practice, Reverse-Engineering, The x86 Architecture, Recognizing C Code Construct in Assembl

**UNIT:3** **(12 Hours)**

Disassembly Theory, The Why and how of Disassembly, Reversing and Disassembly tools, Getting started with IDA, IDA Data Displays, Disassembly Navigation, Disassembly manipulation, Recognizing Data Structure Use, Creating IDA Structures, Using Structure Templates, Importing New Structures, Using Standard Structures, IDA TIL Files, C++ Reversing Primer- The this Pointer, Virtual Functions and Vtables, The Object Life Cycle, Name Mangling, Runtime Type Identification, Inheritance Relationships, C++ Reverse Engineering References.

**UNIT:4** **(14 Hours)**

Cross-References, Function Calls, IDA graphics, Console mode IDA, IDA's Batch Mode, Customizing IDA's, Library Recognitions, Augmenting Function Information, Augmenting predefined functions, The Infamous Patch Program Menu, IDA Output Files and Patch Generation, IDA Scripting, IDA Software Development Kit, The IDA Application Programming Interface, Writing a Plug-in, Plug-in User Interface Options, IDA Loader Modules, Processor Module Architecture, Real World Applications- Vulnerability Analysis, Introduction to the Android Operating System and Threat, Malware Threats, Hoaxes, and Taxonomy, Open Source tools.

**UNIT-5** **(10 Hours)**

**Behavioral and Code Analysis:** Analyzing malware persistence mechanisms, Identifying and disabling malware communication channels, Understanding command-and-control (C2) infrastructures, Techniques for unpacking and decrypting malware.

**Exploit Development and Analysis:** Introduction to exploit development, Analyzing vulnerabilities and exploits, Understanding buffer overflows, heap sprays, and ROP chains, Case studies of famous exploits.

**Teaching Methods:** Chalk& Board/ PPT/Video Lectures

**Text Books:**

1. Michael Sikorski, *Practical Malware Analysis – The Hands-On Guide to Dissecting Malicious Software*, Kindle Edition, No Starch Press; 1 edition (1 February 2012), ISBN: 1593272901.
2. Chris Eagle, *The IDA Pro Book, 2nd Edition*, No Starch Press, 2011. ISBN-10: 1-59327- 2898.

**Reference Books:**

1. Ken Dunham, *Android Malware and Analysis*, Kindle Edition, Auerbach Publications. International Standard Book Number-13:978-1-4822-5220-0.

Subject Code	Name of the Subject											L	T	P	C
	Cyber Security											3	0	0	3
<b>Course Educational Objectives</b>															
<b>CEO1:</b> Learn to model the various types of threat															
<b>CEO2:</b> Understand the Information Assurance planning strategies.															
<b>CEO3:</b> Acquire knowledge by analyzing software systems.															
<b>CEO4:</b> Understand and apply different countermeasures and protect information & Perform vulnerability testing.															
<b>Course Outcomes: : Upon successful completion of this course, students should be able to:</b>															
<b>CO1</b>	Acquire the basic knowledge about the Information Assurance & Design an appropriate Policy for the organization.														
<b>CO2</b>	Deliver professional, ethical, legal, security and social issues and responsibilities in an effective manner.														
<b>CO3</b>	Develop risk management strategies for an enterprise.														
<b>CO4</b>	Provide the understanding of different security mechanisms used in various areas of computing & Apply the current technical concepts and practices in the core information technologies.														
<b>CO5</b>	Implement Security issues.														
<b>CO6</b>	Provide Information Assurance Awareness.														
<b>CO-PO &amp; PSO Mapping</b>															
<b>Cos</b>	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	3	3	-	-	-	-	-	2	-	-	-	-	-	-	-
<b>CO3</b>	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO4</b>	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO5</b>	1	2													
<b>CO6</b>	2	2													
<b>Avg.</b>															
<b>SYLLABUS</b>															
<b>UNIT:1 (14 Hours)</b>															
Information Assurance Basics, The Need for Information Assurance, Key Information Security concepts, Critical characteristics of Information, MSR model, Security in System lifecycle, NIST Approach to Securing SDLC, Security Professionals and Organizations, Communities of Interest, Information Security: Is it an art or Science?, Information Assurance Concepts : Defense in Depth, Information Assurance in Cyber Security, CIA Triangle, The Need for Security, Categories of Threats, Software Attacks types, Other vulnerabilities, Implications from Lack of Information Assurance.															
<b>UNIT:2 (12 Hours)</b>															
Information Security Planning, Information Security Governance, Policy, Standards and Practices, Policy Management, Information Security Blueprint, Continuity Strategies, Crisis Management, Information Asset Life Cycle, Plan, Do, Check, Act Model, Current Practices : Due Care and Due Diligence, Specific Laws and Regulations, International Laws and Acts, Standards and Best Practices, Plans for Information Assurance Strategy, Cryptology, Cipher methods, Cryptographic algorithms, Cryptographic tools, Protocols for secure communications.															

<p><b>UNIT:3</b> <span style="float: right;"><b>(12 Hours)</b></span>  Information Assurance Process : Managing Information Assurance, Information Security project management, Technical aspects of implementing Information Security, Non-Technical aspects of implementing Information Security , Structure of an Information Assurance, Organizational Maturity, Asset Management , APM Maturity mode, Overview of Risk Management, Risk Identification, Risk Assessment, Risk control, Quantitative vs Qualitative Risk management practices, Recommended risk control practices, Process , Secure design through threat modeling, Importance of Policy, Information Assurance Policy, Policy Development Steps.</p>
<p><b>UNIT:4</b> <span style="float: right;"><b>(10 Hours)</b></span>  Benefits of Incorporating Security Considerations, System Development Life Cycle, Information Assurance in System Development Life Cycle, Information Assurance in the Service Acquisition Life Cycle, Physical and Environmental Security Controls, Handling of Media.</p>
<p><b>UNIT-5</b> <span style="float: right;"><b>(10 Hours)</b></span>  Information Assurance Awareness ,Training, and Education (AT and E), Purpose, Benefits, AT and E : Design, Development, AT and E : Assessment, Types of Learning Programs, Employment Policies and Practices, Security considerations for temporary employees, consultants and other workers , Preventive Information Assurance Tools, positioning and staffing the security function, Credentials for Information Security Professionals, Access control benefits, Access control Techniques, Administration.</p>
<p><b>Teaching Methods:</b> Chalk&amp; Board/ PPT/Video Lectures</p>
<p><b>Text Books:</b>  1. Michael E. Whitman and Herbert J. Mattord, “Principles of Information Security”, 5th edition, 2015, Thomson Publications, ISBN 1111899134.  2. Steven Hernandez, Corey Schou, “Information Assurance Handbook: Effective Computer Security and Risk Management Strategies”, 1st Edition, 2014, McGraw Hill Osborne Media, ISBN: 0071821651, ISBN : 9780071821650.</p>
<p><b>Reference Books:</b>  1. William Stallings, “Cryptography and Network Security- Principles and Practice”, 6th Edition, 2013, Pearson, ISBN: 9780136073734..  2. Corey Schou, Dan Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw -Hill Edition, 2.</p>

<b>Subject Code</b>	<b>Name of the Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	<b>Real-Time Systems</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	

**Course Educational Objectives**

**CEO1:** Learn to model the various types of Real Time Systems

**CEO2:** Understand the Hardware Requirements.

**CEO3:** Acquire Languages on Real Time Systems

**CEO4:** Understand and apply different RTS.

**Course Outcomes:** : *Upon successful completion of this course, students should be able to:*

<b>CO1</b>	Explain the fundamentals of Real time systems and its classifications.
<b>CO2</b>	Understand the concepts of computer control and the suitable computer hardware requirements for real-time applications.
<b>CO3</b>	Describe the operating system concepts and techniques required for real time systems.
<b>CO4</b>	Develop the software algorithms using suitable languages to meet Real time applications.
<b>CO5</b>	Apply suitable methodologies to design and develop Real-Time Systems.
<b>CO6</b>	Design RTS and Development Methodologies.

**CO-PO & PSO Mapping**

<b>Cos</b>	<b>PROGRAMME OUTCOMES</b>												<b>PSOs</b>			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	3	3	-	-	-	-	-	2	-	-	-	-	-	-	-	-
<b>CO3</b>	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO4</b>	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO5</b>	1	2														
<b>CO6</b>	2	2														
<b>Avg.</b>																

**SYLLABUS**

**UNIT:1** **(14 Hours)**

**Introduction to Real-Time Systems:**

Historical background, Elements of a Computer Control System, RTS- Definition, Classification of Real-time Systems, Time Constraints, Classification of Programs.

Concepts of Computer Control:

Introduction, Sequence Control, Loop Control, Supervisory Control, Centralized Computer Control, Hierarchical Systems.

**UNIT:2** **(12 Hours)**

**Computer Hardware Requirements for Real-Time Applications:** Computer Hardware Requirements for Real-Time Applications: Introduction, General Purpose Computer, Single Chip Microcomputers and Microcontrollers, Specialized Processors, Process-Related Interfaces, Data Transfer Techniques, Communications, Standard Interface

<b>UNIT:3</b>	<b>(12 Hours)</b>
<b>Languages for Real-Time Applications:</b> Introduction, Syntax Layout and Readability, Declaration and Initialization of Variables and Constants, Cutlass, Modularity and Variables, Compilation of Modular Programs, Data types, Control Structures, Exception Handling, Low-level facilities, Co-routines, Interrupts and Device Handling, Concurrency, Real-Time Support, Overview of Real-Time Language.	
<b>UNIT:4</b>	<b>(10 Hours)</b>
<b>Operating Systems:</b> Introduction, Real-Time Multi-Tasking OS, Scheduling Strategies, Priority Structures, Task Management, Scheduler and Real-Time Clock Interrupt Handler, Memory Management, Code Sharing, Resource Control, Task Co-Operation and Communication, Mutual Exclusion.	
<b>UNIT-5</b>	<b>(10 Hours)</b>
Design of RTS- General Introduction: Introduction, Specification Docwnent, Preliminary Design. Single-Program Approach, Foreground/Background System. RTS Development Methodologies: Introduction, Yow-don Methodology, Ward and Mellor Method, Hately and Pirbhai Method	
<b>Teaching Methods:</b> Chalk& Board/ PPT/Video Lectures	
<b>Text Books:</b>	
<ul style="list-style-type: none"> <li>• <i>Real-Time Computer Control, Stuart Bennet, 2nd Edn. Pearson Education. 2008.</i></li> </ul>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. <i>"Real-Time Systems", C.M. Krishna, Kang G Shin, McGraw-Hill International Editions, 1997.</i></li> <li>2 <i>Real-Time Systems Design and Analysis, Phillip. A. Laplante, second edition, PHI, 2005.</i></li> <li>3. <i>Embedded Systems, Raj Kamal, Tata McGraw Hill, India, third edition, 2005.</i></li> </ol>	