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

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY,ODISHA
(GIET UNIVERSITY, GUNUPUR)
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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

Mission:

M1: Provide a professional learning environment to master the fundamental principles of computing, problem-solving skills, leadership qualities, team spirit, and entrepreneurial capabilities for serving the needs of industry, government, and society at large.

M2: To enable the graduates to use modern tools and technologies by strongly encouraging a culture of research, innovation, and hands-on learning in the area of computer science and information technology.

M3: Establish Industry–Institute Interaction programs through the involvement of the IT industry in the design of the curriculum and applied learning through internship opportunities.

Program Educational Objectives:

PEO1: Develop proficiency in the fields 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.

PEO2: Possess the ability to collaborate as team members and team leaders to facilitate technical solutions for computing systems with awareness and commitment to ethical responsibilities.

PEO3: Attain the ability to critically analyze the needs of society and provide innovative solutions in multidisciplinary areas by adopting technologies, leading to personal and professional growth as an entrepreneur

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PSO: Program Specific Outcomes

PSO1: Demonstrate practical competence and industry readiness by mastering a broad range of programming languages and open-source platforms through continuous exposure to value-added courses, training, and real-world applications.

PSO2: Apply analytical and programming skills to design, develop, and implement efficient computer-based systems of varying complexity in emerging domains such as artificial intelligence, big data analytics, and cybersecurity.

Program Outcomes

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost,net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.(WK8)

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at theforefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Society & Basic NeedsGoal

1: No Poverty – End poverty in all its forms everywhere.
2: Zero Hunger – End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.
3: Good Health and Well-Being – Ensure healthy lives and promote well-being for all ages.
4: Quality Education – Ensure inclusive, equitable quality education and promote lifelong learning.
5: Gender Equality – Achieve gender equality and empower all women and girls.
6: Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all. Economy & Infrastructure.
7: Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable, and modern energy.
8: Decent Work and Economic Growth – Promote sustained, inclusive economic growth and productive employment.
9: Industry, Innovation, and Infrastructure – Build resilient infrastructure, promote inclusive industrialization, and foster innovation.
10: Reduced Inequalities – Reduce inequality within and among countries.
11: Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, and resilient.
12: Responsible Consumption and Production – Ensure sustainable consumption and production patterns. Environment & Climate.
13: Climate Action – Take urgent action to combat climate change and its impacts.
14: Life Below Water – Conserve and sustainably use the oceans, seas, and marine resources.
15: Life on Land – Protect, restore, and promote sustainable use of terrestrial ecosystems and halt biodiversity loss. Peace & Global Partnership.
16: Peace, Justice, and Strong Institutions – Promote peaceful and inclusive societies, provide access to justice, and build effective institutions.
17: Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Course Category	**TC**	**%**	**CC**	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Basic Science courses	18	11.0	BS	7	7	4	-	-	-	-	-
Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	27	16.5	ES	12	11	4	-	-	-	-	-
Humanities and Social Sciences including Management courses	17	10.4	HS	3	3	2	2	2	2	3	-
Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	1	0.6	MC	0	1	-	-	0	0	-	-
Professional core courses	52	31.7	PC	-	-	8	15	11	11	7	-
Professional Elective courses relevant to chosen specialization/branch	18	11.0	PE	-	-	3	3	3	3	3	3
Project work, seminar and internship in industry or elsewhere	16	9.8	PST	-	-	2	1	3	2	4	4
Open subjects – Electives from other technical and /or emerging subjects	15	9.1	OE	-	-	-	-	3	3	3	6
TOTAL	**164**	**100**		**22**	**22**	**23**	**21**	**22**	**21**	**20**	**13**

Course Category	**TC**	**%**	CC	1st	2nd	3rd	4th	5th	6th	7th	8th
Basic Science courses	15	9.1	BS	7	4	4	-	-	-	-	-
Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	30	18.3	ES	11	15	4	-	-	-	-	-
Humanities and Social Sciences including Management courses	17	10.4	HS	3	3	2	2	2	2	3	-
Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	1	0.6	MC	1	0	-	-	0	0	-	-
Professional core courses	52	31.7	PC	-	-	8	15	11	11	7	-
Professional Elective courses relevant to chosen specialization/branch	18	11.0	PE	-	-	3	3	3	3	3	3
Project work, seminar and internship in industry or elsewhere	16	9.8	PST	-	-	2	1	3	2	4	4
Open subjects – Electives from other technical and /or emerging subjects	15	9.1	OE	-	-	-	-	3	3	3	6
TOTAL	**164**	**100**		**22**	**22**	**23**	**21**	**22**	**21**	**20**	**13**

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	CIA	ESE
				L	T	P			
			THEORY						
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
PRACTICAL / SESSIONAL									
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
TOTAL CREDIT							22		

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	CIA	ESE
				L	T	P			
			THEORY						
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
PRACTICAL / SESSIONAL									
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
TOTAL CREDIT							22		

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	1	2
CO 01	3	2		1	1							2	2
CO 02	3	2		1								2	2
CO 03	2	3	1	2								1	2
CO 04	2	3	1	2	1							1	2
CO 05	2	3	1	2	1							1	2
CO 06	2	2	1	2	1							2	2
AVG	2.3	2.5	1.0	1.7	1.0							1.5	2.0

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

UNIT II - MULTIVARIABLE CALCULUS (12 Hours)

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.

UNIT III - FIRST ORDER DIFFERENTIAL EQUATIONS (10 Hours)

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.

UNIT IV- HIGHER ORDER DIFFERENTIAL EQUATIONS (14 Hours)

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

UNIT V - FOURIER SERIES (12 Hours)

Fourier series, Dirichlet's conditions, Fourier series expansion of functions of with period 2π, Fourier series expansion of functions with arbitrary period, Half Range Fourier expansion.

Text Books:

1. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Willey
2. Differential Calculus by Santi Narayan and P.K .Mittal, S.Chand Publications
3. Higher Engineering Mathematics by B.V.Ramana, McGraw Hills Education

Reference Books:

1. Higher Engineering Mathematics by B.S Grewal: Khanna Publishers, New Delhi.
2. Advanced Engineer Mathematics by N. P. Bali & Manish Goyal
3. Advanced Engineer Mathematics by H. K. Dass , S. Chand & Company .LTD
4. Differential Calculus by J. Sinha Roy & S. Padhi.
5. Differential Calculus" by Vinay Kumar, 3rd Edition 2021, Mc Graw Hill

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	
23BBSBS11001	**Engineering Mathematics-I**	3	1	0	4	

Course Educational Objectives	
CEO1	Concept about the sets, tautology, contra positive and truth table.
CEO2	To use matrices, determinants and techniques for solving system of linear equations inLinear Algebra.
CEO3	To Provide the standard methods for differentiation.
CEO4	To Provide the standard methods for integration.

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

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2		1	1							2	2
CO 02	3	2		1								2	2
CO 03	2	3	1	2								1	2
CO 04	2	3	1	2	1							1	2
CO 05	2	3	1	2	1							1	2
CO 06	2	2	1	2	1							2	2
AVG	2.3	2.5	1.0	1.7	1.0							1.5	2.0

SYLLABUS

UNIT I- LOGIC AND SET THEORY (12 Hours)

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 equation s 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, 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.

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	
23BBSBS12001	**Engineering Mathematics-II**	**3**	**1**	**0**	**4**	

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 applicationsin 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	1	2
CO 01	3	2		1								2	1
CO 02	3	2	1	1								2	2
CO 03	2	3	1	2								1	2
CO 04	2	3	1	2	1							1	2
CO 05	2	2	1	2	1							2	2
CO 06	2	3	1	2	1							1	2
AVG	2.3	2.5	1.0	1.7	1.0							1.5	1.8

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 Char pit'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	
23BBSBS12001	**Engineering Mathematics-II**	3	1	0	4	

	Course Educational Objectives
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.
	Course Outcomes: Towards the end of the course students will be able to :
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 theconcept 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.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2		1								2	1
CO 02	3	2	1	1								2	2
CO 03	2	3	1	2								1	2
CO 04	2	3	1	2	1							1	2
CO 05	2	2	1	2	1							2	2
CO 06	2	3	1	2	1							1	2
AVG	2.3	2.5	1.0	1.7	1.0							1.5	1.8

SYLLABUS

UNIT -I CO-ORDINATE GEOMETRY (12 Hours)

Straight Lines: 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.

Circles : 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.

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 (1st Sem.)	L	T	P	C	
23BBSHS11001	**Communicative English and Soft Skills**	2	0	0	2	

Course Educational Objectives

CEO1	To promote communication skills and soft skills.
CEO2	To enhance the employ ability and entrepreneurial skills

Course Out comes: 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

CO-PO Mapping

COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	
CO 01	1	1						1	2	3		1	1	
CO 02	1	1						1	2	3		1	1	
CO 03		1		1	1			1	2	3	1	1	2	
CO 04		1	1	1	2			1	2	3	1	2	2	
CO 05			1					2	3	2	1	1	2	
CO 06					1			2	3	3	1	1	2	
AVG	1.0	1.0	1.0	1.0	1.3			1.3	2.3	2.8	1.0	1.2	1.7	

SYLLABUS

UNIT-1 Importance of English for Communication in the 21st Century (8hours)

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.

UNIT-2 English Vocabulary, Grammar & Usage (7hours)

2.1 Essential grammar (Tense, Active & Passive voice, Subject Verb Agreement)

2.2 Words often confused

2.3 Technical terms and one word substitutes

2.4 Sentence Structure and syntax

2.5 Common errors in English.

2.6 Difference between American, British and Indian English (Vocabulary based)

UNIT- 3 Introduction to Corporate Communication (8hours)

3.1 Seven C's communication and Ten C's of Non-communication.

3.2 Corporate Communication– Types, Characteristics, Importance.

3.3 Direction of corporate communication

3.4 Communication challenges in today' s work place: Advances in technology; Culturally diverse workforce; Team- based organizational Settings; Strategies to overcome these challenges

3.5 Use of ICT.

3.6 Challenges in today's workplace and how to overcome this.

UNIT-4 Basic Soft Skills Development. (7hours)

4.1 Soft Skills, Importance, Characteristics, Hard Skills v/s Soft Skills.

4.2 Importance soft skill, lateral thinking, networking skill, emotional intelligence.

4.3 Cross Cultural and Inter Cultural communication.

UNIT- 5 Corporate Etiquettes. **(6 hours)**

5.1 Email etiquettes.

5.2 Business Meeting Etiquettes

5.3 Telephone Etiquettes

Teaching Methods: Chalk & Board/ PPT/ Video Lectures

Reference Books:

1. Technical Communication-, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, 2015.
2. Business Communication Today by Bovee, Courtland L., Thill, JohnV.PrenticeHall, 2018.
3. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh. Pearson, 2010.
4. Oxford Guide to English Grammar byJ ohn East wood. Oxford University Press, 2003.
5. 365Ways to Change Your World by NormanVincentPealebyOrientPaperbacks,2019.
6. Soft Skills For Your Career by Kalyani Samantray Oxford University Press, 2016.

Lab Code	Name of the Lab (1st Sem)	L	T	P	C
23BBSHS11101	Communicative English and Soft Skills Laboratory	0	0	2	1

Course Educational Objectives

CEO1	To develop communication skills of the students.
CEO2	To develop vocabulary and usages kills 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.

Course Out comes :*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	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.

CO-PO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	1							1	2	3		1	1
CO 02			1					1	3	3		1	2
CO 03	1							1	2	2		1	1
CO 04			1					1	2	3		1	1
CO 05								2	2	3		1	1
CO 06			1					2	3	3	1	1	2
AVG	1.0		1.0					1.3	2.3	2.8	1.0	1.0	1.3

SYLLABUS

Motivational videos

Activity- Listening to videos and filling the gaps in a worksheet **(2 hours)**

Famous Speeches

Activity- Describing, paraphrasing and summarizing famous speeches. **(2 hours)**

Self-Evaluation

Activity–Evaluating self through assessments using British Council App **(2 hours)**

Listening for Pronunciation

Activity- Listening to ted talks and focusing on segmental sounds and intonation by articulating it. **(2 hours)**

Oral Presentation

Activity - Verbal presentation and speaking for 1 to 5 minutes. **(2 hours)**

Just a Minute

Activity –Speaking on any given topic for a minute (**2 hours)**

Story Telling

Activity- Analyzing and narrating a story. (2 hours**)**

PPT Presenting

Activity- Presentation and engaging topic with visual presentation. **(2 hours)**

News Article Reading

Activity - Regulating reading speed by loud reading and reading news article. **(2 hours)**

Reading story

Activity - Story reading with proper intonation. **(2 hours)**

Poem Recitation

Activity - Reading poems focusing on rhythm and specific reading skills. **(2 hours)**

Prose Reading

Activity- Reading prose focusing on the punctuations and pronunciation. **(2 hours)**

Basic Writing Skill

Activity - Focusing on basic writing skills by sequencing of thoughts and ideas. **(2 hours)**

Story Writing

Activity -. Writing a story using the given clues. **(2 hours)**

Precise Writing

Activity – Paraphrase a given passage **(2 hours)**

Article Writing

Activity- Writing newspaper article and magazines. **(2 hours)**

Teaching Methods: Chalk & Board/ PPT/Video Lectures

Text/ Reference Books:

2. *Form and Finesse, Business Communication and Soft skills by Shruti Das, Published by Orient Black Swan, 2022.*
3. *Business and Corporate Soft skills developed by RaiTech. University (PDF available)*
4. *Spoken English (with CD). Sasikumar V nd PVD hamija. New Delhi:Tata McGraw-Hill Education Pvt. Ltd.(2nd Ed.),2008.*

Subject Code	Title of the subject (2nd Sem)	L	T	P	C	
23BBSHS12001	Communicative English and Technical Communication	2	0	0	2	

Course Educational Objectives

CEO1	To develop communication skills and soft skills of the students.
CEO2	To enhance employability and entrepreneurial skills

Course Out comes: ***The students will be able to:***

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.

CO-PO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	1	1			1			1	1	2		1	1
CO 02		1	1		1			1	3	3	1	2	2
CO 03	1	1						1	1	2		1	1
CO 04			1		1			1	2	3	1	1	2
CO 05			1		1			1	3	3	1	1	2
CO 06		1	1					2	3	2	1	1	2
AVG	1.0	1.0	1.0		1.0			1.2	2.2	2.5	1.0	1.2	1.7

SYLLABUS

UNIT1IntroductiontoTechnicalCommunication (7hours)

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

UNIT2Skills for Career Making (8 hours)

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

2.6 Handling a Meeting

UNIT3TechnicalApproachtoReading **(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

UNIT4TechnicalWriting **(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. 4th Edition. Publisher: Crowell, 1978.
6. Soft Skills For Your Career by Kalyani Samantray OXFORDUNIVERSITY PRESS, 2016

Subject Code	Name of the Subject (2nd Sem.)	L	T	P	C	
23BBSHS12101	**Communicative English and Technical Communication Laboratory**	0	0	2	1	

Course Educational Objectives

CEO1	To develop communication skills and soft skills of the students.
CEO2	To enhance employability and entrepreneurial skills

Course Out comes: ***The students will be able to:***

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.

CO-PO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01			1		1			1	2	3		1	1
CO 02			1					1	3	3	1	1	2
CO 03		1	1					1	3	2	1	1	2
CO 04	1				2			1	2	2		1	1
CO 05								2	2	3	1	1	1
CO 06	1	1						1	2	2		1	1
AVG	1.0	1.0	1.0		1.5			1.2	2.3	2.5	1.0	1.0	1.3

SYLLABUS

Professional Writing **(2hours)**

Activity-Techniques to write Circular/notice writing

Resume Writing **(2hours)**

Activity- Types and format for writing an effective resume

Writing Cover Letter **(2hours)**

Activity- Techniques, types and format for writing over letter

Group Discussion **(2hours)**

Activity- Case study based, opinion based discussions

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

Reference Books:

1. Basic Communication Skills for Technology by Andrea J. Rutherford, Pearson Education Asia, Patparganj, New Delhi, 2001.
2. Business Communication by Varinder Kumarand 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 NormanLewis.4thEdition. Publisher: Crowell, 1978.
6. Soft Skills For Your Career by Kalyani Samantray OXFORDUNIVERSITY PRESS, 2016

Course Code	Course Title	L	T	P	C	QP
23BBSES11003	**Programming for Problem Solving**	5	0	0	3	

Pre -Requisite: computer basics.

Course Educational Objective

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.

CO-PO MAPPING

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			1							2	2
CO 02	3	3	2	1	2							2	3
CO 03	3	3	2	1	2							2	3
CO 04	3	3	2	2	2							2	3
CO 05	3	3	2	2	3							3	3
CO 06	3	3	2	2	3							3	3
AVG	3.0	2.8	2.0	1.6	2.2							2.3	2.8

UNIT- I **(9 Hours)**

Programming Basics: 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

UNIT- II **(9 Hours)**

Selection Control Statements: if, if..else, else if ladder, nested if, switch..case

Loop Control Statements: while, do-while and for loop, break, continue, nested loop.

UNIT- III **(9 Hours)**

1-D Array: declaration, initialization, array operations,

2-D Array: declaration, Initialization, 2-D array operations

Character arrays and Strings: 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**,** **e**num , 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, 7th edition, Tata McGraw-Hill
2) Let us 'C' by Yashwant Kanethekar, 16th edition, BPB Publications
3) Byron Gottfried, Schaum's Outline of Programming with C, 3rd edition, McGraw-Hill

References:

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

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

Course Educational Objective

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.

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.

CO-PO MAPPING

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			1							2	2
CO 02	3	3	2	1	2							2	3
CO 03	3	3	2	1	2							2	3
CO 04	3	3	2	2	2							2	3
CO 05	3	3	2	2	3							3	3
CO 06	3	3	2	2	3							3	3
AVG	3.0	2.8	2.0	1.6	2.2							2.3	2.8

Lab Experiment 1: Familiarization with programming environment

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.

Lab Experiment 2: Simple computational problems using arithmetic expressions.

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.

Lab Experiment 3:Simple computational problems using arithmetic expressions.

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 o6. 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 = $1-(x^2)/2! +(x^4)/4! – (x^6)/6! + (x^8)/8! – (x^{10})/10!....(x^n/n!)$

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 >=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>=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>=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, 7th edition, Tata McGraw-Hill
5) Let us 'C' by YashwantKanethekar, 16th edition, BPB Publications
6) Byron Gottfried, Schaum's Outline of Programming with C, 3rd edition, McGraw-Hill

References:

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

Course Code	Course Title	L	T	P	Credits	QP
23BBSES12003	**THEORY SYLLABUS DATA STRUCTURES & ALGORITHMS**	**5**	**0**	**0**	3	

Pre -Requisite: Basic knowledge of Algorithms

Course Educational Objective

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.

CO-PO MAPPING

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			1							2	2
CO 02	3	3	2	1	2							2	3
CO 03	3	3	2	2	2							3	3
CO 04	3	3	3	2	2							3	3
CO 05	3	3	3	2	3							3	3
CO 06	3	2	2	2	3							3	2
AVG	3.0	2.7	2.4	1.8	2.2							2.7	2.7

UNIT- II **(9 Hours)**

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 sortusing linear array.

UNIT- III **(9 Hours)**

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.

UNIT- IV **(9 Hours)**

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 & pre-order sequences, in-order & 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.

UNIT- V **(9 Hours)**

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 & DFS),. Hashing: Hashing Functions: Division, Mid-square, Folding methods.

Teaching Methods: Chalk& Board/ PPT

Text Books:

1. "Fundamental of Data Structure" (Schaums Series) Tata-McGraw-Hill.
2. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.
3. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication

Reference Books:

1. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.
2. "Data Structures and algorithms" by Narasimha Karumanchi, Career Monk Publications
3. "Data structures through C in depth" by S.K.Srivastava, BPB Publications

Course Code	Course Title	L	T	P	Credits	QP
23BBSES12003	**DATA STRUCTURES & ALGORITHMS LABORATORY**	**0**	**0**	**4**	**2**	

Pre -Requisite: Basic knowledge of Algorithms

Course Educational Objective

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.

Course Outcome: student can able to

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.

CO-PO MAPPING

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1		2							2	2
CO 02	3	3	2	1	2							2	3
CO 03	3	3	2	2	2							3	3
CO 04	3	3	2	2	3							3	3
CO 05	3	3	3	2	3							3	3
CO 06	3	3	3	2	3							3	3
AVG	3.0	2.8	2.2	1.8	2.5							2.7	2.8

Experiment 2: **(concepts of matrix and sparse matrix)**

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.

Experiment 3:**(Pointer, structure and DMA)**

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 1st 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 1st 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>=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.

Subject Code	Title of the subject	L	T	P	C	
23BBSBS10002	**Engineering Physics**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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.

Pre-requisites: Basic understanding of Basic Calculus, Complex numbers, and elementary understanding of Physics.

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

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.

CO-PO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2		1								1	1

CO 02	3	2		1								1	1
CO 03	3	2	1	1								1	1
CO 04	3	2	1	1	1							1	1
CO 05	3	2		1								1	1
CO 06	3	2	1	1								1	1
AVG	3	2	1	1	1							1	1

SYLLABUS

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
23BBSBS10102	**Engineering Physics Laboratory**	**0**	**0**	**2**	**1**	

Course Educational Objectives

CEO1	Providing fundamental information on basic instruments and their uses.
CEO2	To familiarize different apparatus and applications through different experiments.

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

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.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2		1										
CO 02	2		1										
CO 03	2		1										
CO 04	2		1										
CO 05	2		1										
CO 06	2		1										
AVG	2		1										

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	
23BBSBS10003	**Engineering Chemistry**	3	0	0	3	
Course Educational Objectives						
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.					
Course Outcomes: ***Upon successful completion of this course, students will be able to:***						
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.

CO-PO & PSO Mapping

SYLLABUS

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	2	1				1						
CO 02	3	2	2				2						
CO 03	3	3	2				1						
CO 04	2	3	2				2						
CO 05	2	2	1				1						
CO 06	3	2	1				1						
AVG	1.5	2.2	2.2				1.5						

UNIT:1 ATOMIC AND MOLECULAR STRUCTURE (10Hours)

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_2, N_2, O_2 & F_2, and Hetero diatomic molecule CO & NO.

UNIT:02 WATER CHEMISTRY (10Hours)

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**.**

UNIT:03 ELECTROCHEMISTRY (10Hours)

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.

UNIT:04 CORROSION (10Hours)

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.

UNIT:05 POLYMER CHEMISTRY (10Hours)

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.

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, 2ndedition, by R.Gopalan, D.Venkapaya & Sulochana Nagarajan, Vikas Publishing House Pvt. Ltd.
5. B. Tech Chemistry- IandII 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. by Samuel Glasstone, East West Press Private, Limited.
13. Polymer Science by V R Gowariker, N V Viswanathan, J Sreedhar, New Age International Publishers 2nd edition.

SYLLABUS FOR ENGINEERING CHEMISTRY LABORATORY

COMMON TO ALL BRANCHES

Lab Code	Name of the lab	L	T	P	C	QP
23BBSBS10103	**Engineering Chemistry Laboratory**	**0**	**0**	**2**	**1**	
Course Educational Objectives						
CEO	To train the students about the applications of chemical sciences in the field of engineering and technology					
Course Outcomes: ***Upon successful completion of this course, students should be able to:***						
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					
CO-PO & PSO Mapping						

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2		1										
CO 02	2		2				1						
CO 03	2		2				1						
CO 04	3		1				1						
CO 05	2		1				1						
CO 06	2		1				1						
AVG	1.5		1.5				1						

List of Experiments:

1. Determination of amount of OH^- and CO_3^{2-} present in supplied water sample.
2. Determination of total hardness of water.
3. Standardization of $KMnO_4$ using sodium oxalate.
4. Determination of ferrous ion in Mohr's salt by standardized $KMnO_4$.
5. Determination of percentage of dissolved oxygen in given water sample.
6. Estimation of available chlorine in bleaching powder/ chloride content.
7. Determination of rate constant of acid catalyzed hydrolysis of ester.
8. Preparation of drug (aspirin/Paracetamol).
9. Adsorption of acetic acid by charcoal.
10. Acid value of oil.
11. Determination of strength of HCl and CH_3COOH 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
23BBSES10001	**Basic Electrical and Electronics Engineering**	**3**	**0**	**1**	**3**

Course Educational Objectives:

CEO1:	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global andsocietal context.
CEO2:	To provide comprehensive idea about AC and DC circuit analysis, working principles and applications of basic machines in electrical engineering.
CEO3:	To expose the students in the field of analog and digital electronics engineering and to acquire the fundamental knowledge in the field.

Assessment Methods

Direct
1. Continuous assessment of skills 2. Class Test – 2Nos 3. Cycle Test – 2Nos 4. Semester End Examination
Indirect
1. Course End Survey

Course Outcomes:

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

CO1:	Analyze the circuits by applying network theorems like Mesh, Nodal analysis, and Thevenin's theorem and find various electrical parameters.
CO2:	Illustrate the single-phase and three phase AC circuits along with the concept of impedance parameters and power.
CO3:	Understand the working principle and applications of DC & AC machines.
CO4:	To acquire the knowledge about the characteristics and working principles of semiconductor diodes.
CO5:	Explain the basic principles of CRO, function generator, number system and Boolean algebra.
CO6:	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	1	2
CO 01	3	2		1								1	1
CO 02	3	2		1								1	1
CO 03	3	2	1	1	1							1	1
CO 04	3	2	1	1	1							1	1
CO 05	3	2		1	1							1	1
CO 06	3	2		1								1	1
AVG	3	2	1	1	1							1	1

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; The venin'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 Systemand 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, 11th Edition, Prentice Hall.*
5. *Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", SecondEdition, 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, 5th 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 – 19September 2014 by Jacob Fraden (Springer)*

Lab Code	Name of the Lab	L	T	P	C
23BBSES10101	**Basic Electrical and Electronics Engineering Laboratory**	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 amplitudeand 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	1	2
CO 01	3	2		1	2							1	1
CO 02	3	3	1	2	2							1	1
CO 03	3	2		1	1							1	1
CO 04	3	2	1	1	2							1	1
CO 05	3	2	1	1	2							1	1
CO 06	3	2		2	3							1	1
AVG	3.0	2.2	1.0	1.3	2.0							1.0	1.0

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 theimprovement 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 semiconductordiodes and transistors using digital multimeter)
2. Study and use of oscilloscope, signal generator to view waveforms and measureamplitude and frequency of a given waveform.
3. V-I characteristics of semiconductor diode and determining its DC and ACresistance.
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	1	2
CO 01	3	2		1								1	1
CO 02	3	2	1	1								1	1
CO 03	3	3	1	1								1	1
CO 04	3	2		1								1	1
CO 05	3	2		1								1	1
CO 06	3	2	1	1	1							1	1
AVG	3.0	2.2	1.0	1.0	1.0							1.0	1.0

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
23BBSHS11002	**Human Values and Professional Ethics (HVPE) B. Tech. First Semester (Non Credit Paper)**					

CO1	Understand basic concepts of ethics, values, morality, and emotional intelligence in personal and professional life.
CO2	Explain the meaning of profession, professionalism, and responsibilities of professionals.
CO3	Analyze ethical theories and moral development models for solving ethical dilemmas.
CO4	Understand engineering ethics and responsibilities of engineers towards safety, society, and environment.
CO5	Explain global ethical issues, corporate social responsibility, intellectual property rights, and media ethics.
CO6	Develop ethical attitudes, human values, and ethical living practices for professional and personal growth.

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01								3				1	
CO 02								3	2	2		1	
CO 03		1						3				1	
CO 04		1				2	2	3				1	
CO 05						2	2	3				1	
CO 06								3	2	2		1	
AVG		1				2	2	3	2	2		1	

1. BASIC CONCEPTS

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.

2. PROFESSION AND PROFESSIONALISM

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.

3. ETHICAL THEORIES

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 andEthics, Influence of Religion, Conflict with Ethics, Types of Enquiry, Descriptive or Factual Enquiry, Conceptual Enquiry, Normative Enquiry, Uses of Ethical Theories.

4. ETHICS IN ENGINEERING PROFESSION

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.

5. ENGINEER'S RESPONSBILITY FOR SAFETY

Introduction, Safety and Risk, Concept of Safety, Assessment of Risk, Risk Assessment Technique, Safety in 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, CollectiveBargaining, 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, Date 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, Implementationof 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 ofNature, 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 Author.

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, NewDelhi, 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.

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

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	1	1									2	1
CO 02	1	2	1									1	1
CO 03	2	1	2										
CO 04	1	1	1									1	
CO 05	2	2	1									1	1
CO 06	2	1	2									1	2
AVG	1.66	1.33	1.33									1.2	1.25

UNIT:1 **10 Hours**

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.

Macronutrients: Carbohydrates-Definition, Classification (Mono, di and polysaccharides), Dietary Sources, Function- Excess. Lipids-Definition, Classification, Dietary Sources, Functions.

UNIT:2 **10 Hours**

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.

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

UNIT:3 **8 Hours**

Water: Definition, Dietary Sources (visible, invisible), Function of water, Role of water maintaining health (water balance)

Dietary Fibre: Definition, Dietary Sources, Classification, Physiological effects of deficiency.

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)

UNIT:4 **6 Hours**

Minerals: Definition and classification (major and minor), Food Sources, functions and significance of calcium, Iron, Sodium, Iodine and Fluorine.

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.

UNIT:5 **6 Hours**

Food in day to day life: Principles of food preservation (Fruits- Squashes and jams, Vine & Vegetables by Pickling), Nutrition in physical fitness. Immunomodulator foods.

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

Ref. Books

1. Food Science and nutrition- Sunetra Roday
2. Food hygiene and sanitation -Sohna Roda
3. Nutrition and Dietetics by Shubhangini A. Joshi
4. BamjiMS (2019) Text book of Human Nutrition, 4thEdn, Oxford & IBH Publishing Co Pvt. Ltd, ISBN 9788120417908.
5. Food Science- Porter and Hotchkin
6. Advanced Nutrition and Dietetics in Nutrition Support, Editor(s):Mary Hickson PhD RD, Sara Smith PhD RD, Kevin Whelan PhD RD FBDA

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
22BBSES10106	**Engineering Workshop**	0	0	4	2

Pre - Requisite:

Course Educational Objectives

CEO1	To develop an appreciation for the importance of safety, ethics, and sustainability in engineering practice.
CEO2	To develop practical skills and knowledge in the field of mechanical engineering, including the ability to use hand and machine tools, read technical drawings, and fabricate simple

	components.
Course outcomes: At the end of the course, the student will be able to:	
CO1	Familiarity on various safety precautions in a workshop setting, including the ability to identify potential hazards and risks, and to develop appropriate safety measures to mitigate those risks.
CO2	Understanding of the various hand and machine tools used in fitting and the ability to select the appropriate tool for a given task.
CO3	Gain knowledge of the various components and working principles of a standard center lathe machine and developing skills in preparing a cylindrical job using a lathe machine, including facing, taper turning, step turning, and knurling operations.
CO4	Acquire skills in preparing different types of joints, including lap joint, butt joint, corner joint, and T-joint, using electric arc welding and oxy-acetylene gas welding.
CO5	Develop an understanding of the principles and techniques of calibration, including the ability to calibrate various instruments, such as LVDT, load cell, and thermocouple, using appropriate tools and techniques.
CO6	Acquire skills in surface roughness testing, including the ability to determine the surface roughness of various components using appropriate instruments and techniques.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2					2	1					1	
CO 02	3	2	1		2							2	
CO 03	3	2	2		2							2	
CO 04	2	1	2		1							2	
CO 05	2	2		1	3							2	1
CO 06	2		1										
AVG	2.3	1.8	1.5	1.0	2.0	2.0	1.0					1.8	1.0

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

Pre - Requisite:

Course Educational Objectives

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.

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

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

CO-PO & PSO Mapping

SYLLABUS

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	1										1	
CO 02	3	2	2									2	
CO 03	3	2	2									2	
CO 04	3	2	2	1								2	
CO 05	2	1	1		3							2	1
CO 06	3	2	2		1							2	
AVG	2.8	1.7	1.8	1.0	2.0							1.8	1.0

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
THEORY									
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
PRACTICAL/SESSIONAL									
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
			TOTAL	**16**	**1**	**8**	**23**	**400**	**400**

Professional Elective Bucket

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

Subject Code	Name of the Subject	L	T	P	C	
23BCSBS23001	Discrete Mathematics	3	1	0	4	

Course Educational Objectives

CEO1	To know logical equivalence and to apply in various proofs.
CEO2	To know about relation and recurrence relation.
CEO3	To study Boolean Algebra and its properties.
CEO4	To know about Graphs and trees.

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

CO1	Understanding the concept of logic, groups, lattice. graphs and trees
CO2	Memorize the logical gates, recurrence formulas and different types of graphs
CO3	Evaluate the arguments, predicates and quantifiers, solution of recurrence relations, methods of solution
CO4	Analyze recurrence relation by generating functions and groups, binary trees
CO5	Categorize different types of graphs, and its property
CO6	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	1	2
CO 01	3	2	–	1	–	–	–	–	–	1	–	2	1
CO 02	3	3	1	2	–	–	–	–	–	–	–	2	2
CO 03	3	3	2	1	–	–	–	–	–	–	–	2	2
CO 04	3	2	3	1	1	–	–	–	–	–	–	3	2
CO 05	3	2	2	1	–	–	–	–	–	–	–	2	2
CO 06	3	3	3	2	2	–	–	–	1	1	–	3	3
AVG	3	2.5	2.2	1.3	1.5				1	1		2.3	2.0

SYLLABUS

UNIT I - MATHEMATICAL LOGIC AND SET THEORY (12 Hours)

Propositional logic, Propositional Equivalence, Predicate Calculus, and Quantifiers Statement Calculus, NestedQuantifiers, Proof methods and Strategies, Mathematical Induction

UNIT II- RECURRENCE RELATION (12Hours)

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

UNIT III - BOOLEAN ALGEBRA AND LATTICES (12 Hours)

, Lattices, Distributive and Complemented Lattices, Sub-lattices, Boolean Lattices and Boolean lgebra, BooleanFunctions and Boolean Expressions

UNIT IV- GROUP THEORY (12 Hours)

Semi groups, Monoids, Groups, Subgroups, and Permutation groups, Normal subgroups, Homomorphism,isomorphism, Kernel.

UNIT V- GRAPH THEORY (12 Hours)

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 Subject	L	T	P	C
23BCSPC23002	**Object Oriented Programming Through Java**	3	0	2	4

Course Educational Objectives

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	

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

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.

CO-PO & PSO Mapping (Articulation Matrix):

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2	–	–	1	–	1	–	3	1
CO 02	3	3	3	2	2	–	–	–	1	–	–	3	3
CO 03	3	3	2	3	3	–	–	–	1	–	–	3	3
CO 04	3	2	3	2	3	1	–	–	2	1	–	3	3
CO 05	3	2	3	2	3	–	–	–	2	1	–	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	3.0	2.5	2.5	2.2	2.7	1.0	1.0	1.0	1.6	1.3	1.0	3.0	2.7

Syllabus

UNIT I		13 Hours
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-dimensioanl arrays.

UNIT II		15 Hours

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.

UNIT III		12 Hours

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.

UNIT IV		12 Hours

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

UNIT V		12 Hours

SWINGS: Introduction to Swings, Hierarchy of swing components. Containers, Top level containers - JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel,JTextField, JTextArea, JList, JComboBox, JScrollPane.
Java Database Connectivity(JDBC) : Introduction, JDBC Driver, Database connectivity steps, connecting with MySQL/Oracle.
Registering the driver, connecting with MySQL/Oracle database, preparing SQL statement.
JDBC : DriverManager, Connection, Statement, ResultSet, PreparedStatement, ResultSetMetadata
CRUD operation using JDBC.

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

Text Books:

1. E Balaguruswamy, 6th Edition, Programming with Java, McGraw Hill Education
2. R Nageswara Rao(2016), Core Java: An Integrated Approach, Dreamtech Press.
3. Herbalt Schelidt(2017), Java: The Complete Reference, McGraw Hill Education.

Reference Book:

1. SachinMalhotra/ SauravChoudhary, Second Edition, Programming in Java, Oxford Higher Education,
2. RashmiKanta Das, Core Java For Beginners, Vikas Publication.

Subject Code	Name of the Subject	L	T	P	C	
	Organizational Behavior	**3**	**0**	**0**		

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

CO1	Explain the basic concepts, models, and significance of Organizational Behavior.
CO2	Analyze individual behavior through personality, perception, attitudes, learning, and motivation theories.
CO3	Demonstrate understanding of group behavior, communication, leadership, teamwork, and conflict resolution.
CO4	Evaluate organizational structure, culture, power, politics, and organizational change.
CO5	Apply Organizational Behaviour concepts to solve workplace and organizational problems.
CO6	Develop managerial, communication, leadership, and ethical decision-making skills for organizational effectiveness.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2								2		2	
CO 02	3	3	2					1	2	2		3	2
CO 03	2	3	2					2	3	3	1	3	3
CO 04	2	3	3	2		1		2	2	2	2	3	2
CO 05	3	3	3	2	2	1		2	3	3	2	3	3
CO 06	2	2	3	2	2	2	1	3	3	3	3	3	3
AVG	2.5	2.6	2.6	2	2	1.33	1	2	2.6	2.5	2	2.8	2.6

SYLLABUS

UNIT:1 **(14 Hours)**

Introduction to Organizational Behaviour

Basic concepts: Definition, nature, scope and importance of Organizational Behaviour, Evolution of Organizational Behaviour, Models of Organizational Behaviour, Emerging challenges and opportunities in organizations, Foundations of individual behaviour, Personality and personality development, Perception and attribution, Attitudes and values, Learning theories, Emotional intelligence and its significance in organizations.

UNIT:2 **(12 Hours)**

Motivation and Individual Behaviour

Concept of motivation, Motivation process, Maslow's Need Hierarchy Theory, Herzberg's Two-Factor Theory, McGregor's Theory X and Theory Y, McClelland's Need Theory, Vroom's Expectancy Theory, Goal Setting Theory, Job satisfaction, Job enrichment, Stress management, Work-life balance, Employee engagement and well-being.

UNIT:3 **(12 Hours)**

Group Behaviour and Leadership

Basic concepts of groups, Types of groups, Stages of group development, Team building and team effectiveness, Communication process and barriers, Leadership concepts and theories, Leadership styles, Power and politics, Conflict management techniques, Negotiation process, Decision-making in organizations.

UNIT:4 **(10 Hours)**

Organizational Structure, Culture and Change

Organizational structure and organizational design, Formal and informal organizations, Organizational culture and climate, Organizational effectiveness, Organizational change, Resistance to change, Change management models, Organizational development interventions, Contemporary issues in Organizational Behaviour, Ethics, Diversity and Inclusion, Remote and hybrid workplace behaviour.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

- *Stephen P. Robbins and Timothy A. Judge,* ***Organizational Behaviour****, 18th Edition, Pearson Education.*
- *K. Aswathappa,* ***Organizational Behaviour****, Himalaya Publishing House.*

Reference Books:

1. *John W. Newstrom,* ***Organizational Behavior: Human Behavior at Work****, McGraw-Hill Education.*
2. *Udai Pareek,* ***Understanding Organizational Behaviour****, Oxford University Press.*
3. *P. Subba Rao,* ***Essentials of Organizational Behaviour****, Himalaya Publishing House.*
4. *Keith Davis and John W. Newstrom,* ***Human Behavior at Work****, McGraw-Hill.*

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC23001	**Database Management System**	**3**	**0**	**1**	**4**	

Course Educational Objectives

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 agood database design.
CEO3	Understand the use of Structured Query Language (SQL) and its syntax
CEO4	Apply Normalization techniques for effective database design.

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

CO1	***Identify*** and ***Classify*** the concepts of Database Management system, Data models and architectureof database, ER to Relational mapping concepts.
CO2	***Applying*** The constraints in database using different query languages like:- relational algebra andcalculus ***implementing*** the Data definition and data manipulate languages in Database.
CO3	***Compare*** the different normal forms to ***Apply*** normalization process to construct consistent Database.
CO4	***Design and Develop*** the Database with concurrency control and recovery strategies to make complete Database without confliction and anomalies in concurrent access environment.
CO5	***Develop*** efficient storage scheme of saving and retrieving Records and Files
CO6	***Apply*** the principles of database transaction management, database recovery and security.

CO-PO & PSO Mapping:

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2	–	–	1	–	1	–	3	1
CO 02	3	3	3	2	2	–	–	–	1	–	–	3	3
CO 03	3	3	2	3	3	–	–	–	1	–	–	3	3

CO 04	3	2	3	2	3	1	–	–	2	1	–	3	3
CO 05	3	2	3	2	3	–	–	–	2	1	–	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	3.0	2.5	2.5	2.2	2.7	1.0	1.0	1.0	1.6	1.3	1.0	3.0	2.7

SYLLABUS

UNIT:1 **(6 Hours)**

Introduction to database Systems: advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture,Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

Entity-Relationship model: 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.

UNIT:2 **(10 Hours)**

Relational Query Languages: 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

UNIT:3 **(10 Hours)**

Normalization: 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

UNIT:4 **(10 Hours)**

Transaction Concept: 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

Recovery and Atomicity: 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

UNIT:5 **(6 Hours)**

Detailed Storage Architecture: Storage Strategies: Detailed Storage Architecture, Storing Data,Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization,File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing Data Dictionary

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Sudarshan, Korth: Database System Concepts, 6th edition, McGraw-Hill Education
2. Elmasari&Navathe: Fundamentals of Database System, Pearson Education.

Reference Books:

1. *Elmasari&Navathe: Fundamentals of Database System, Pearson Education.*
2. *Ramakrishnan: Database Management Systems, McGraw-Hill Education.*
3. *Andrew S. Tanenbaum: Modern Operating Systems, 3rd Edition, Pearson Education.*
4. *Terry Dawson, Olaf Kirch: Linux Network Administrator's Guide, 3rd Edition O'Reilly*

Subject Code	SUBJECT NAME	L	T	P	C
23BCSPE23011	Introduction to Data Science	3	0	0	3

Course Educational Objectives

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.

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

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

CO-PO & PSO Mapping (Articulation Matrix):

COs	Programme Outcomes											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	1	–	–	1	–	1	–	2	1
CO 02	3	3	2	2	2	–	–	–	–	–	–	3	2
CO 03	3	3	3	2	3	–	–	–	1	–	–	3	3
CO 04	3	3	2	3	2	1	–	–	1	–	–	2	3
CO 05	3	3	3	3	3	–	1	–	1	1	1	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	3.0	2.8	2.3	2.3	2.3	1.0	1.0	1.0	1.3	1.3	1.0	2.7	2.5

Syllabus

UNIT I **(12 Hours)**

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.

UNIT II **(10 Hours)**

Descriptive Statistics – Mean, Median, Standard Deviation, Skewness and Kurtosis.
Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT III **(8 Hours)**

Model Selection and Evaluation using Visualization: - Simple and Multiple Regression, Polynomial Regression, Ridge Regression, Box Plots, Residual Plot, Distribution Plot, Pivot Table.

UNIT IV **(10 Hours)**

Introduction hypothetical testing: -NULL(H_0) 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.

UNIT V **(6 Hours)**

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.*
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*

23BCSES23003	**Digital Electronics**	**3-0-0**
Pre-requisites *(if any)*:	Knowledge of Basic Mathematics & Basic Electrical and Electronics Engineering.	

Course Objectives:

□	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).

Course Outcomes:

At the end of this course, students will be able to

- CO1: Define and analyze the number systems and conversions.
- CO2: Perform binary arithmetic with 1's and 2's complements and understand binary codes.]
- CO3: Apply Boolean algebra laws to simplify expressions and design logic circuits.
- CO4: Use K-maps for logic minimization and design combinational circuits.
- CO5: Analyze and design synchronous sequential circuits.
- CO6: Design shift registers, and counters, and understand RAM, ROM, and PLDs.

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	–	1	–	–	–	1	–	1	–	2	1
CO 02	3	3	2	1	1	–	–	1	–	–	–	2	2
CO 03	3	3	3	2	2	–	–	–	–	–	–	3	2
CO 04	3	3	3	2	2	1	–	–	1	–	–	3	3
CO 05	3	3	2	2	2	–	–	–	1	–	–	2	3
CO 06	3	2	3	2	3	1	1	–	1	1	1	3	3
AVG	2	2	2	2	2	2	2	2	2	2	2	2	2

Course Content

Unit 1		**(10 Hours)**

Number Systems and Codes: 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.

Boolean Algebra and Logic Gates: 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.

Unit 2		**(12 Hours)**

Gate-level Minimization: K-maps - Two, Three, and Four Variable K-maps, Don't-Care Conditions; NAND and NOR Implementation; Other Two-Level Implementations, Exclusive-OR Function.

Combinational Logic: Combinational Circuits; Analysis Procedure; Design Procedure; Adders; Subtractors; Parallel Binary Adders; Binary Adder-Subtractor; Binary Multiplier; Magnitude Comparator; Decoders; Encoders; Multiplexers; De-multiplexers.

Unit 3		**(8 Hours)**

Synchronous Sequential Logic: 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.

Unit 4		**(8 Hours)**

Registers and Counters: 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.

Unit 5 (6 Hours)

Memory and Programmable Logic: Introduction; Random-Access Memory; Memory Decoding; Error Detection and Correction; Read-Only Memory; Programmable Logic Array; Programmable, Array Logic; Sequential Programmable Devices

Text Books :

[1] M. Morris Mano, and Michael D. Ciletti, *Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog*. Pearson Education, Sixth Edition, 2017.

[2] M. Morris Mano, and Michael D. Ciletti, *Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog*. Pearson Education, Sixth Edition, 2017.

Reference books :

[1] John P. Uyemura, *A First Course in Digital Systems Design: An Integrated Approach*. Thomson Press (India) Ltd., India Edition, 2002.

[2] William H. Gothmann, *Digital Electronics: An Introduction to Theory and Practice*, PHI Learning Pvt. Ltd., New Delhi, Second Edition, 2006.

23BCSES23103	DIGITAL ELECTRONICS LABORATORY	0-0-2
Pre-requisites *(if any)*:	Knowledge of Basic Electrical and Electronics Engineering.	

Course Objectives:

□	To gain hands-on experience with basic logic gates and combinational circuits.	
□	To implement and test combinational and sequential circuits.	
□	To utilize simulation tools for circuit design and testing.	

Course Outcomes:

At the end of this course, students will be able to

- CO1: Investigate the behavior and application of various digital logic gates.
- CO2: Implement two-level and multi-level Boolean function minimization using universal gates like NAND and NOR.
- CO3: Design, assemble, and test combinational circuits.
- CO4: Assemble, test, and investigate flip-flops and shift registers, and design various types of counters
- CO5: Investigate RAM behavior and design memory units.
- CO6: Use Verilog/VHDL for simulation and implementation of combinational and sequential circuit designs

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	2	1	2	–	–	1	1	1	–	2	1
CO 02	3	3	2	2	2	–	–	–	1	–	–	2	2
CO 03	3	3	3	2	3	1	–	–	2	1	–	3	3
CO 04	3	3	3	2	3	1	–	–	2	–	–	3	3
CO 05	3	2	3	2	3	1	1	–	1	–	1	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	2	2	2	2	2	2	2	2	2	2	2	2	2

Course Content

List of Experiments:

(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.)

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.
2. Gate-Level Minimization: Two-level and multi-level implementation of Boolean functions.
3. Combinational Circuits: Design, assemble, and test: adders and subtractors, code converters, gray code to binary, and 7-segment displays.
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.
5. Design with Multiplexers and De-multiplexers.
6. Flip-Flop: Assemble, test, and investigate the operation of SR, D & JK flip-flops.
7. Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.
8. Counters: Design, assemble, and test various ripple and synchronous counters - decimal counter, Binary counter with the parallel load.
9. Memory Unit: Investigate the behavior of the RAM unit and its storage capacity - 16×4 RAM: testing, simulating, and memory expansion.
10. Clock-Pulse Generator: Design, implement, and test.
11. Parallel Adder and Accumulator: Design, implement, and test.
12. Binary Multiplier: Design and implement a circuit that multiplies 4-bit unsigned numbers to produce an 8-bit product.
13. Verilog/VHDL simulation and implementation of Experiments listed in Sl. No. 3 to 12.

Subject Code	Name of the Subject	L	T	P	C	
23BBSHS23001	Intermediate Communication Skills and Critical Thinking	3	0	0	3	

Course Educational Objectives

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

Course Outcomes: Upon successful completion of this course, students should 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

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01										**3**			
CO 02											**3**		
CO 03											**3**		
CO 04											**3**		
CO 05											**3**		
CO 06									**3**				
AVG									3	3	3		

SYLLABUS

UNIT-1 Comprehensive Listening Skills **(4 Hours)**

1.1 What and why
1.2 Techniques for improving listening skills

UNIT-2 Public Speaking Skills **(4 Hours)**

2.1 Public speaking; what and why
2.2 Overcoming stage fear
2.3Techniques for effective speaking skill

UNIT- 3 Stages of Writing **(4 Hours)**

3.1 Pre-Writing- selecting a topic
3.2 Writing- Free Writing, Drafting
3.3 Re-writing- Revision, editing, proof Reading

UNIT- 4 Effective Reading Skills **(3 Hours)**

4.1 What is Reading Comprehension
4.2 Tips for effective reading

4.3Techniques and types.

UNIT-5 Critical Thinking Skills **(4 Hours)**

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 NormanLewis, 4th 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	L	T	P	C	
23BBSHS23101	**Intermediate Communication skills and Critical thinking (Lab)**	**0**	**0**	**2**	**1**	

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

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01										3			
CO 02											3		
CO 03											3		
CO 04											3		
CO 05											3	2	
CO 06									3				
AVG									3	3	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 tothe 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
Video Resume **(2 hours)** Activity- Preparing a digital resume
Professional e-mail **(2 hours)** Activity- Writing e-mail for professional purpose

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

Course Code	Name of the Subject	L	T	P	Credits	
23BCSPC23102	**Object Oriented Programming Through Java Lab**		**0**	**2**	1	

Pre -Requisite: Basic knowledge of C language

Course Outcome: student can able to

CO1	Learn to use object orientation to solve problems and use java language to implement them
CO2	To experiment with the syntax and semantics of java language and gain experience with java programming Course Outcomes:
CO3	Ability to create user friendly interfaces
CO4	Ability to write portable programs which work in all environments
CO5	Ability to solve the problem using object oriented approach and design solutions which are robust
CO6	Ability to design GUI using AWT/Swing

CO-PO Mapping:

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	2	1	2	–	–	1	1	1	–	3	1
CO 02	3	3	3	2	2	–	–	–	2	1	–	3	3
CO 03	3	3	2	3	3	–	–	–	1	–	–	3	3
CO 04	3	3	3	2	3	1	–	–	2	1	–	3	3
CO 05	3	2	3	2	3	1	–	–	2	2	–	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	3.0	2.7	2.7	2.2	2.7	1.0	1.0	1.0	1.7	1.4	1.0	3.0	2.7

Experiment-1(I/O in Java)

Q 1. Write a Program that accepts two Strings as command line arguments and generate the output in the required format

Q 2. Write a Java program to find if the given number is prime or not.

Q 3. Write a program to print the sum of all the digits of a given number.

Q 4. Write a Java program to find if the given number is palindrome or not

Q 5. Write a program to print first 5 values which are divisible by 2, 3, and 5.

Experiment 2: (Array)

Q 1. Write a program to initialize an integer array and find the maximum and minimum value of the array.

Q 2. Write a program to initialize an integer array with values and check if a given number is present in the array or not.

Q 3. Write a program to find the largest 2 numbers and the smallest 2 numbers in the given array.

Q 4. Write a program to remove the duplicate elements in an array and print the same.

Q 5. Write a program to reverse the elements of a given 2*2 array. Four integer numbers needs to be passed as Command Line arguments.

Experiment 3:(Class, Object, Static method, Constructor)

Q 1 Create a class Box that uses a parameterized constructor to initialize the dimensions of a box. The dimensions of the Box are width, height, depth. The class should have a method that can return the volume of the box. Create an object of the Box class and test the functionalities.

Q 2. Create a new class called Calculator with the following methods:

1. A static method called powerInt(int num1,int num2)

This method should return num1 to the power num2.

2. A static method called powerDouble(double num1,int num2).
This method should return num1 to the power num2.
3. Invoke both the methods and test the functionalities.
Hint: Use Math.pow(double,double) to calculate the power.
Q 3 Design a class that can be used by a health care professional to keep track of a patient's vital statistics. The following are the details.
Name of the class - Patient
Member Variables -
patientName(String),height(double),width(double)
Member Function - double computeBMI()
The above method should compute the BMI and return the result. The formula for computation of BMI is weight (in kg) ÷ height*height(in metres).
Create an object of the Patient class and check the results.
Q 4 Create a class Author with the following information.
Member variables : name (String), email (String), and gender (char)
Parameterized Constructor: To initialize the variables
Create a class Book with the following information.
Member variables : name (String), author (of the class Author you have just created), price (double), and qtyInStock (int)
[Assumption: Each book will be written by exactly one Author]
Parameterized Constructor: To initialize the variables
Getters and Setters for all the member variables
In the main method, create a book object and print all details of the book (including the author details)

Experiment 4: (Inheritance and polymorphism)
Q 1. Create a class named 'Animal' which includes methods like eat() and sleep(). Create a child class of Animal named 'Bird' and override the parent class methods. Add a new method named fly(). Create an instance of Animal class and invoke the eat and sleep methods using this object. Create an instance of Bird class and invoke the eat, sleep and fly methods using this object.
Q 2. Create a class called Person with a member variable name. Save it in a file called Person.java
Create a class called Employee that will inherit the Person class.T he other data members of the Employee class are annual salary (double), the year the employee started to work, and the national insurance number which is a String.Save this in a file called Employee.java
Your class should have the necessary constructors and getter/setter methods. Write another class called TestEmployee, containing a main method to fully test your class definition.
Q 3. Create a school application with a class called Person. Create name and dateOfBirth as member variables.
Create a class called Teacher that inherits from the Person class. The teacher will have additional properties like salary, and the subject that the teacher teaches.
Create a class called Student that inherits from Person class. This class will have a member variable called studentId.
Create a class called College Student that inherits from Student class. This class will have collegeName, the year in which the student is studying (first/second/third/fourth) etc.
Create objects of each of this classes, invoke and test the methods that are available in these classes.
Q 4. Create a base class Fruit with name ,taste and size as its attributes.
Create a method called eat() which describes the name of the fruit and its taste.
Inherit the same in 2 other classes Apple and Orange and override the eat() method to represent each fruit taste.
Q 5. Write a program to create a class named shape. It should contain 2 methods, draw() and erase() that prints "Drawing Shape" and "Erasing Shape" respectively.

For this class, create three sub classes, Circle, Triangle and Square and each class should override the parent class functions - draw () and erase ().
The draw() method should print “Drawing Circle”, “Drawing Triangle” and “Drawing Square” respectively.
The erase() method should print “Erasing Circle”, “Erasing Triangle” and “Erasing Square” respectively.
Create objects of Circle, Triangle and Square in the following way and observe the polymorphic nature of the class by calling draw() and erase() method using each object.
Shape c=new Circle();
Shape t=new Triangle();
Shape s=new Square();

Experiment 5: (String and StringBuffer)

Q 1. Write a Program to check whether a given String is Palindrome or not.

Q 2. Write a java program that will concatenate 2 strings and return the result. The result should be in lowercase.

Q 3 Given a string, return a new string made of 'n' copies of the first 2 chars of the original string where 'n' is the length of the string.

Q 4. Write a java program that will return the first half of the string, if the length of the string is even. It should return null for odd length string.

Q 5. Write a java program that accepts a string and returns a new string without the first and last character of the input string.

Q 6. Given 2 strings, a and b, return a new string of the form short+long+short, with the shorter string on the outside and the longer string on the inside.

Q 7. Given a string, if the first or last chars are 'x', return the string without those 'x' chars, otherwise return the string unchanged.

Q 8. Write a Java program that accepts a string (with * in it). The program should return a new string in which the following characters are removed- *,the characters that are to the left and right of *.

Q 9. Given two strings, a and b, print a new string which is made of the following combination-first character of a, the first character of b, second character of a, second character of b and so on. Any characters left, will go to the end of the result.

Q 10. Given a string and an integer n, print a new string made of n repetitions of the last n characters of the string. You may assume that n is between 0 and the length of the string, inclusive.

Experiment 6: (Abstract class and Interface)

Q 1. Create a class called GeneralBank that acts as base class for all banks. This class has getSavingsInterestRate and getFixedDepositInterestRate methods, which returns the savings account interest rate and fixed deposit account interest rate that the specific bank gives. Since GeneralBank cannot say what percentage which bank would give, make these methods abstract.

Create two subclasses of GeneralBank called ICICIBank and KotMBank. Override the inherited methods from the base class. The following are the interest rates of these banks.

ICICIBank - Savings 4% Fixed 8.5% and

KotMBank - Savings 6% Fixed 9%.

Create a main method to test the above classes and their methods. Try one by one and observe your findings

a) ICICIBank i=new ICICIBank();

b) KotMBank k=new KotMBank();

c) GeneralBank g=new KotMBank();

d) GeneralBank g=new ICICIBank();

Q 2. Create an abstract class Compartment to represent a rail coach. Provide an abstract function notice in this class.
public abstract String notice();

Derive FirstClass, Ladies, General, Luggage classes from the compartment class. Override the notice function in each of them to print notice message that is suitable to the specific type of compartment.
Create a class TestCompartment.Write main function to do the following:
Declare an array of Compartment of size 10.
Create a compartment of a type as decided by a randomly generated integer in the range 1 to 4.
Check the polymorphic behavior of the notice method. [i.e based on the random number genererated, the first compartment can be Luggage, the second one could be Ladies and so on..]
Q 3. Create an abstract class Instrument which is having the abstract function play.
Create three more sub classes from Instrument which is Piano, Flute, Guitar. Override the play method inside all three classes printing a message
"Piano is playing tan tan tan tan " for Piano class
"Flute is playing toot toot toot toot" for Flute class
"Guitar is playing tin tin tin " for Guitar class
Create an array of 10 Instruments. Assign different type of instrument to Instrument reference.
Check for the polymorphic behavior of play method.
Use the instanceof operator to print which object is stored at which index of instrument array.

Q 4. Write an interface called Playable, with a method void play();
Let this interface be placed in a package called music.
Write a class called Veena which implements Playable interface. Let this class be placed in a package music.string
Write a class called Saxophone which implements Playable interface. Let this class be placed in a package music.wind
Write another class Test in a package called live. Then,
a. Create an instance of Veena and call play() method
b. Create an instance of Saxophone and call play() method
c. Place the above instances in a variable of type Playable and then call play()

Experiment 7 : (Exception Handling)
Q 1. Get an input String from user and parse it to integer, if it is not a number it will throw number format exception Catch it and print "Entered input is not a valid format for an integer." or else print the square of that number. (Refer Sample Input and Output).
Q 2. Write a program that takes as input the size of the array and the elements in the array. The program then asks the user to enter a particular index and prints the element at that index.
This program may generate Array Index Out Of Bounds Exception. Use exception handling mechanisms to handle this exception. In the catch block, print the class name of the exception thrown.
Q 3. Write a program that takes as input the size of the array and the elements in the array. The program then asks the user to enter a particular index and prints the element at that index. Index starts from zero.
This program may generate Array Index Out Of Bounds Exception or NumberFormatException . Use exception handling mechanisms to handle this exception.
Q 4. Write a program to accept name and age of a person from the command prompt(passed as arguments when you execute the class) and ensure that the age entered is >=18 and < 60. Display proper error messages.
Q 5. A student portal provides user to register their profile. During registration the system needs to validate the user should be located in India. If not the system should throw an exception.
Step 1: Create a user defined exception class named "InvalidCountryException".
Step 2: Overload the respective constructors.
Step 3: Create a main class "UserRegistration", add the following method,

void registerUser(String username,String userCountry) with the below implementation
• if userCountry is not equal to “India” throw a InvalidCountryException with the message “User Outside India cannot be registered”
• if userCountry is equal to “India”, print the message “User registration done successfully”
Invoke the method registerUser from the main method with the data specified and see how the program behaves.
Q 6. Write a Program to take care of Number Format Exception if user enters values other than integer for calculating average marks of 2 students. The name of the students and marks in 3 subjects are taken from the user while executing the program.
In the same Program write your own Exception classes to take care of Negative values and values out of range (i.e. other than in the range of 0-100)

Experiment-8 : (Wrapper class and file handling)

Q 1. Write a program to receive an integer number as a command line argument, and print the binary, octal and hexadecimal equivalent of the given number.
Q 2. Write a Java program that reads an integer number (between 1 and 255) from the user and prints the binary representation of the number. The answer should be printed as a String.
Q 3. Create an employee class with properties of your choice. Create an object of this class and also create a clone of the same. After making the clone, change the properties of the original employee object and print the properties of both the original and clone object and note down your observation.
Q 4. Write a program to count the number of times a character appears in a File.
Q 5. Write a program to copy contents from one file to another and check the output.
Q 6. Write a program to count the occurrences of each word in an input file and write the word along with its corresponding count in an output file.
Q 7. Create a class called Employee with properties name(String), dateOfBirth (java.util.Date), department(String), designation(String) and Salary(double).
Create respective getter and setter methods and constructors (no-argument constructor and parameterized constructor) for the same.
Create an object of the Employee class and save this object in a file called "data" using serialization.
Later using deserialization read this object and print the properties of this object.

Experiment-9 (Collection Framework)

Q 1. Write a Java program to create an ArrayList, add all the months of a year and print the same.
Q 2. 1) Create an application for employee management with the following classes:
a) Create an Employee class with following attributes and behaviors :
i) int empId
ii)String empName
iii)String email
iv)String gender
v)float salary
vi) void GetEmployeeDetails() -> prints employee details
b) Create one more class EmployeeDB with the following attributes and behaviors.
(i)ArrayList list;
ii) boolean addEmployee(Employee e) -> adds the employee object to the collection
iii) boolean deleteEmployee(int empId) ->delete the employee object from the collection with the given empid
iv) String showPaySlip(int empId) -> returns the payslip of the employee with the given empId
Provide implementation for all the methods and test your program.
Q 3. Develop a java class with a instance variable H1 (HashSet) add a method saveCountryNames(String CountryName) , the method should add the passed country to a HashSet (H1) and return the added HashSet(H1).
Develop a method getCountry(String CountryName) which iterates through the HashSet and returns the country if exist else return null.
NOTE: You can test the methods using a main method.

Q 4. Create a Collection called TreeSet which is capable of storing String objects. Then try these following operations :

a) Reverse the elements of the Collection.

b) Iterate the elements of the TreeSet using Iterator.

c) Check if a particular element exists or not.

Q5. 1. Develop a java class with a instance variable M1 (HashMap) create a method saveCountryCapital(String CountryName, String capital) , the method should add the passed country and capital as key/value in the map M1 and return the Map (M1).

Key- Country	Value - Capital
India	Delhi
Japan	Tokyo

2. Develop a method getCapital(String CountryName) which returns the capital for the country passed, from the Map M1 created in step 1.

3. Develop a method getCountry(String capitalName) which returns the country for the capital name, passed from the Map M1 created in step 1.

4. Develop a method which iterates through the map M1 and creates another map M2 with Capital as the key and value as Country and returns the Map M2.

Key – Capital	Value – Country
Delhi	India
Tokyo	Japan

5. Develop a method which iterates through the map M1 and creates an ArrayList with all the Country names stored as keys. This method should return the ArrayList.

NOTE: You can test the methods using a main method.

Q 59. Create a Collection "ContactList" using HashMap to store name and phone number of contacts added. The program should use appropriate generics (String, Integer) and have the following abilities:

a) Check if a particular key exists or not.

b) Check if a particular value exists or not.

c) Use Iterator to loop through the map.

Experiment 10: (AWT and Swing)

Q 1. Write a java program to create a frame containing three buttons (Yes, No, Close). When button yes or no is pressed, the message "Button Yes/No is pressed" gets displayed in label control. On pressing CLOSE button frame window gets closed.

Q 2. Write a Java program to create three radio buttons. When any of them is selected, an appropriate message is displayed.

Q 3. Write a Java program to create a combo box which includes list of subjects. Display the selected subject in the text field using Swing.

Q 4. Write a java program using swing to create a frame having three text fields. Accept number in first textfield and display previous number in second textfield and next number in the third textfield.

Q 5. Write a program to display "All The Best" in 5 different colors on screen. (Using AWT/Swing)

Experiment 11: (JDBC with MySQL/Oracle)

Q 1. Write a java program that connects to oracle/MySQL database, queries the inbuilt table "emp" and displays the first two columns (empno using column index and ename using column name) of all the rows.

Q 2. Develop a jdbc program containing main method, which should instantiate a class called DAOClass, which should contain methods called insert, delete, modify and display. Description of what each of these methods are expected to do is given below.

Necessary details required for executing these methods, are passed from command line argument. For e.g. If the name of the class containing the main method is JDBCCalls, then if you want to insert a record, you will execute this class as java JDBCCalls 1 101 "Ajit" "IV" "20-Nov-2001" 4000

Where 1 is the option for inserting the record and all other details are the values for the columns in each row of the student table. The structure of student table is given below. Similarly, for deleting a record, you have to execute the code as java JDBCCalls 2 101
where 2 is the option for deleting a record and 101 is the rollno of the student, whose record has to be deleted.
For modifying a record, you will use java JDBCCalls 3 101 4500, where 3 is the option for modifying a record and the 4500 is the new fee which needs to replace the old fee value.
For Displaying records, if the main class is executed as follows
java JDBCCalls 4 101
it should display only one record, that of the student with roll no. 101. 4 option is for displaying the record. If the main class is executed as java JDBCCalls 4 (without specifying the rollno.), it means that details of all the students should be displayed.

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
THEORY									
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		
			TOTAL	16	0	0	16	200	300
PRACTICAL/SESSIONAL									
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
			TOTAL	0	0	6	5	170	80
			TOTAL	**16**	**0**	**6**	**21**	**370**	**380**

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	
23BCSPC24001	**Fundamentals of Python Programming**	**3**	**0**	**2**	**4**	

Course Educational Objectives

Pre-Requisite: A student should have a basic idea of programming and file systems.

CEO1	To provide a solid foundation in Python programming language, enabling students to write, debug, and execute programs using basic programming constructs such as variables, data types, control structures, functions, and modules.
CEO2	To develop problem-solving skills through algorithmic thinking, allowing students to design and implement Python solutions for real-world problems using structured programming techniques.
CEO3	To introduce essential programming paradigms and tools in Python, including file handling, exception handling, and the basics of object-oriented programming (OOP), thereby equipping students for further study and application development.
CEO4	To enable students to apply Python in practical domains, such as data processing, simple graphical interfaces, or introductory data science, thereby promoting the use of Python as a tool for interdisciplinary problem solving.

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

CO1	Understanding the basic features of Python programming, Syntax Rules, Use of Operators, and built-in methods.
CO2	Solving different real-world problems by implementing concepts of control structures, functions, and packages.
CO3	Implementing different programming examples using files and object-oriented programming concepts.
CO4	Analyze and learn the concepts of debugging and multi-threading using complex programs
CO5	Develop case studies by using database connectivity and GUI for interactive applications
CO6	Design projects for solving real-world problems using key features of Python.

CO-PO & PSO Mapping:

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			2							2	
CO 02	3	3	2		2							2	
CO 03	3	3	2	1	2							2	1
CO 04	2	2	2	2	2							2	1
CO 05	2	2	2	1	3							2	2

CO 06	3	3	3	2	3							3	2
AVG	2.7	2.5	2.2	1.5	2.3							2.2	1.5

SYLLABUS

UNIT:1 **(12 Hours)**

Introduction: Python and its features, First Python Program, Identifiers, Reserved Words, Lines and Indentation, Multi-Line Statements, Quotation & Comments; Assigning Values to Variables, Multiple Assignment.

Data Types & Operators: Data Type Conversion; Basic Operators: Arithmetic, Comparison, Assignment, Bitwise; Operators: Logical, Membership, Identity; Operators Precedence, Mathematical functions, Input and Output Statements. Strings and built-in methods, Lists and built-in methods, Tuples and built-in methods, Set, and built-in methods Dictionary, and built-in methods;

UNIT:2 **(10 Hours)**

Python Program Flow Control: 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.

Python Functions, Modules, and Packages: Functions and their types, Types of arguments, Usage of the global variable, Recursive functions, Anonymous, Lambda, map, filter and reduce functions, Nested Functions, Generator and Decorator functions. Importing own and external modules, Understanding Packages: Creating and accessing packages.

UNIT:3 **(12 Hours)**

Python File Operation: Programming using file operations, Manipulating file pointer using seek, Understanding read functions: read(), readline(), and readlines(), Understanding write functions: write() and writelines(), Handling CSV files, Zipping and Unzipping of files.

Python Regular Expression: Powerful pattern matching, Power of pattern searching using regex in Python, Pattern finding programs using regular expression.

Python Object Oriented Programming – OOPS: Concept of class, object, and instances, Methods and its types, Inner class, Constructor, and destructors, Inheritance, overloading, and overriding.

UNIT:4 **(10 Hours)**

Python Exception Handling: Error, Exception and its Hierarchy, Usage of try, except, finally and else, Types of exception, Programming using Exception handling.

Python Multithreading: Understanding threads, sleep(), join() methods, Daemon Thread, Synchronizing the threads using lock, Programming using multithreading.

UNIT:5 **(10 Hours)**

Python Database Interaction: SQL Database connection using Python, Creating and searching tables, Reading and storing on the database, Programming using database connections. Case study : Oracle and MySQL database.

Python GUI Introduction: GUI application Using Tkinter, creating checkboxes, radio buttons, List Box, Buttons, menus and accessing files.

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", Dveloper's Library, Sams Publishing.*

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC24002	**Computer Organization and Architecture**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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

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

CO1	Understand the basics of instructions sets and their impact on processor design
CO2	Demonstrate an understanding of the design of the functional units of a digital computer system.
CO3	Develop and implement assembly language program for real time application.
CO4	Design a pipeline for consistent execution of instructions with minimum hazards
CO5	Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
CO6	Manipulate representations of numbers stored in digital computers.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2										2	
CO 02	3	2	2									2	
CO 03	3	3	2	1								2	
CO 04	3	3	2	2								2	1
CO 05	3	2	2	1	2							2	1
CO 06	3	3	2	2	1							3	1
AVG	3.0	2.5	2.0	1.5	1.5							2.2	1

SYLLABUS

UNIT:1 **(10 Hours)**

Fundamental of computer architecture and organisation: Functional Units of a Computer, Basic operational concepts, Bus structure, Memory Location and Byte Addressability, Instruction Set Architecture, RISC and CISC Architectures, Performance Metrics, Amdahl's Law.

UNIT:2 **(10 Hours)**

Assembly Language Program: Instruction, instruction format,types of instruction set, addressing mode, instruction sequencing, branching and some basic program, stack and sub-routine, Basic Input/Output operation.

UNIT:3 . **(10 Hours)**

Arithmetic Logic Unit: Design of Carry look ahead adder, Fast Adders, Binary Multiplication, Booth Algorithm, Fast Multiplication Method, Binary Division Methods, Floating Point Number Representation and its Arithmetic Operations.

UNIT:4 **(10 Hours)**

Basic Processing Unit: Components of the Processor, Data path and Control – Execution of a Complete Instruction, Hardwired and Micro Programmed Control Unit, Basic Concepts of Pipelining, Hazards and types of Hazard, Flynn's Classification, UMA, NUMA.

UNIT: 5 **(10 Hours)**

Memory and Peripheral Devices: Memory and its type, Memory hierarchy, Cache Memory, Mapping functions and performance, Virtual memory and Paging, Secondary Memory, Direct Memory Access, Interrupts, Need for Standard I/O Interfaces like PCI, SCSI, USB.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. *Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, "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.*

Reference Books:

3. *M. Morris Mano, "Computer System Architecture", PHI*
4. *William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.*
5. *John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.*

Subject Code	Name of the Subject	L	T	P	C	
	Computer Organization & Architecture Laboratory	**0**	**0**	**2**		

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

CO1	Demonstrate the execution of basic assembly language programs using arithmetic, logical, and data transfer instructions.
CO2	Implement assembly language programs involving looping, branching, and subroutines.
CO3	Perform memory manipulation, stack operations, and addressing mode implementation using assembly language.
CO4	Analyze processor architecture and instruction execution through practical experiments.
CO5	Develop and test assembly language programs for solving computational problems
CO6	Evaluate computer organization concepts through experiments involving processor architecture, memory organization, and I/O operations.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	2		3				2	1		3	2
CO 02	3	3	2	2	3				2	1		3	2
CO 03	3	3	3	2	3				2	2	1	3	3
CO 04	3	3	3	3	3				2	2	2	3	3
CO 05	3	3	3	3	3				3	2	2	3	3
CO 06	3	3	3	3	3	1		1	3	3	2	3	3
AVG	3.0	2.8	2.6	2.7	3	1		1	2.5	1.8	1.6	3	2.6

SYLLABUS

List of Experiments

1. Study of the assembler, linker, loader, debugger, and simulator environment.
2. Write and execute assembly language programs for arithmetic operations (addition, subtraction, multiplication, and division).
3. Write assembly language programs for logical operations (AND, OR, XOR, NOT) and bit manipulation.
4. Develop assembly language programs using conditional and unconditional branching instructions.
5. Write assembly language programs using looping constructs for repetitive computations.
6. Implement programs using procedures, subroutines, and stack operations.
7. Write assembly language programs for array manipulation, searching, and sorting techniques.
8. Demonstrate memory organization and addressing modes through assembly language programming.
9. Implement input/output operations and data transfer between memory and registers.
10. Study and simulate processor instruction execution, interrupt handling, and CPU organization using simulation tools.
11. Mini experiment: Develop an integrated assembly language application demonstrating arithmetic, memory access, branching, and input/output operations.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

- *Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian,* ***Computer Organization and Embedded Systems****, 6th Edition, McGraw-Hill.*
- *M. Morris Mano,* ***Computer System Architecture****, 3rd Edition, Pearson Education..*

Reference Books:

1. *John P. Hayes,* ***Computer Architecture and Organization****, McGraw-Hill.*
2. *Andrew S. Tanenbaum and Todd Austin,* ***Structured Computer Organization****, Pearson.*
3. *Barry B. Brey,* ***The Intel Microprocessors****, Pearson Education.*
4. *Ramesh S. Gaonkar,* ***Microprocessor Architecture, Programming and Applications with 8085****, Penram International Publishing.*

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC24003	**Design and Analysis of Algorithms**	**3**	**0**	**2**	**4**	

Course Educational Objectives

CEO1	Analyze the asymptotic performance of algorithms
CEO2	Demonstrate familiarity with major algorithms
CEO3	Apply important algorithmic design paradigms and methods of analysis
CEO4	Synthesize efficient algorithms in common engineering design situations

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

CO1	*Apply efficient algorithms to reduce space and time complexity of both recurrent and non-recurrent relations*
CO2	*Solve problems using divide and conquer approaches*
CO3	*Apply greedy and dynamic programming types techniques to solve polynomial time problems*
CO4	*Create exponential problems using backtracking and branch and bound approaches*
CO5	*Interpret various approximation algorithms and interpret solutions to evaluate P type, NP Type, NPC, NP Hard problems*
CO6	*Create algorithms that are efficient in space and time complexities by using divide conquer, greedy, backtracking technique*

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2										2	
CO 02	3	3	2									3	
CO 03	3	3	2	1								3	
CO 04	3	3	2	1								2	1
CO 05	3	3	2	1								3	1
CO 06	3	3	3	2								3	1
AVG	3.0	2.8	2.2	1.3								2.7	1.0

SYLLABUS

Unit I **(10Hrs)**

Introduction: Introduction to Algorithm, Definition, Characteristics of the algorithm, Performance Analysis of Algorithms: Space and Time Complexity, Correctness of Algorithms, Growth of Functions, Asymptotic Notations and Types, limit theorem. Stirling's Formula, **Recurrences:** Solution of recurrences by Substitution, Iteration, Masters method, Recursion Tree, and Change of variable method, Mathematical analysis for Recursive and Non-recursive algorithms, Amortized Analysis.

Unit -II **(10Hrs)**

Divide-and-conquer Paradigm: Binary search, Quick sort, Merge sort, Heap Sort, Priority Queue

Dynamic programming: General concept, Elements of dynamic programming, Applications: Matrix-chain Multiplication, Longest Common Subsequence, 0/1 Knapsack problem, Assembly- line Scheduling.

Unit – III **(10Hrs)**

Greedy Algorithms: General Concept, Elements of Greedy strategy, Applications: Activity Selection Problem, Fractional knapsack problem, Huffman codes.

Graph Algorithms: A data structure for disjoint sets, Disjoint set operations, Disjoint set forests, Graph Algorithms and their characteristics, Breadth-first search and depth-first search, Minimum Spanning Trees (Kruskal's and Prim's algorithms), single-source shortest paths (Bellman-ford Algorithm and Dijkstra's), All pair Shortest Path (Floyd-Warshall's Algorithm).

Unit – IV **(10 Hrs)**

String Matching Algorithms: Naive String-Matching Algorithm, The Rabin-Karp Algorithm, Knuth-Morris-Pratt Algorithm.

Backtracking: N-Queen problem, Sub Set Sum Problem, Hamiltonian Circuit Problem, Graph Coloring Problem

Unit – V **(10 Hrs)**

Branch and Bound: Assignment Problem, Travelling Salesman Problem.

Complexity Classes: Problem Classification P, NP, NPC, NP-Hard; Reducibility, NP Completeness, NP-Complete & NP-Hard, 3SAT, Vertex Cover, Clique, Approximation algorithms (Travelling Salesman Problem, Vertex Cover).

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, UmeshVazirani , McGraw-Hill Education**.**

Subject Code	Name of the Subject	L	T	P	C
23BCSPC24004	Operating System	3	0	2	4

Course Educational Objectives

CEO1	To understand the fundamental concepts, architecture, and techniques of Operating Systems.
CEO2	To learn about processes, CPU scheduling algorithms, and address issues related to Process Synchronization.
CEO3	To comprehend Memory Management mechanisms, with a focus on Deadlock principles and related challenges.
CEO4	To gain insights into the concepts of File Systems, secondary storage management, and Disk Scheduling techniques.

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

CO1	Understand the basic principles of operating systems, their functions, and various system architectures.
CO2	Understand and solve different process scheduling algorithms used in operating system and measure their performance.
CO3	Analyze and solve various process synchronization techniques and different methods of deadlock.
CO4	Design memory management systems and implement techniques like paging, segmentation, and virtual memory.
CO5	Evaluate file systems and mass storage structures for efficient data management and retrieval.
CO6	Understand different protection mechanisms to ensure the security and integrity of the operating system.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2										2	
CO 02	3	3	2									3	
CO 03	3	3	2	2								3	
CO 04	3	3	2	2								3	1
CO 05	3	2	2	1								2	1
CO 06	3	2	2	1	1							3	1
AVG	3.0	2.5	2.0	1.5	1.0							2.7	1.0

UNIT:I **(9 Hours)**

Operating Systems Objectives and functions, Computer System Organization and System Architecture, OS Structure, OS Operations, Evolution of Operating Systems: Batch Processing system, Multi programming system, Time sharing system, Multi Processing system, Distributed Systems, Clustered system, Real-Time Systems, Operating System Components, OS services, OS interfaces, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation.

UNIT:II **(9 Hours)**

Process concepts - The Process, Process State, Process Control Block, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria,

CPU Scheduling algorithms: First-Come, First-Served, Shortest Job First, Non-Preemptive Priority Scheduling , Shortest Remaining Time First, Round Robin, Priority Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling, Multiple-Processor Scheduling, Thread concept, Single and Multithreading Models

UNIT:III **(9 Hours)**

Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization: Producer-Consumer, Readers-Writers, The Dining Philosophers Problem, Monitors.

Memory Management and Virtual Memory: Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Tables, Segmentation, Segmentation with Paging,

UNIT:IV **(9 Hours)**

Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacment Algorithms, Allocation of Frames, Thrashing.

Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

File System Interface - The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection

UNIT-V **(9 Hours)**

File System Implementation, File System Structure, and Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance.

Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Scheduling algorithms: FCFS, SSTF, SCAN, C-SCAN, Look, Disk Management: Formatting, partitioning, raid structure, Swap space Management.

System Protection, Goals of Protection, Principles of Protection, Case studies in Linux, Windows.

Text Books:

TB 01: Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, Wiley Student Edition.

TB 02: Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

Reference Books:

RB01: Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.

RB02: Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, and TMH.

RB03: Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition

RB04: Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.

Subject Code	Name of the Subject	L	T	P	C	
23BCDPE24011	**Introduction to Soft Computing**	**3**	**0**	**0**	**3**	

Course Educational Objectives	
CEO1	To introduce the concepts in Soft Computing
CEO2	To introduce Fuzzy Logic based Systems
CEO3	To introduce Neural Network based Systems
CEO4	To introduce Genetic Algorithm based Systems and its hybrids
Course Outcomes: Upon successful completion of this course, students should be able to:	
CO1	***Define*** the Fuzzy Systems
CO2	***Analyze*** different neural network techniques

CO3	***Understand*** the Genetic algorithm concepts and its applications
CO4	***Identify*** the suitable hybrid soft computing technology to solve the complex problems
CO5	***Understand*** the concept of Swarm Intelligence
CO6	***Apply*** the evolutionary computing techniques in solving complex problems

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2	–	–	1	–	1	–	2	1
CO 02	3	3	2	2	3	–	–	–	1	–	–	3	3
CO 03	3	3	3	3	3	1	–	–	1	–	–	3	3
CO 04	3	3	3	3	3	–	–	–	1	–	–	3	3
CO 05	3	3	3	2	3	1	1	–	1	–	–	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	3.0	2.8	2.5	2.3	2.8	1.0	1.0	1.0	1.2	1.5	1.0	2.8	2.7

SYLLABUS

UNIT:1 Basics of Soft Computing & Fuzzy Logic (12 Hours)

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.

UNIT:2 Neural Network (10 Hours)

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 .

UNIT:3 Genetic Algorithm (10 Hours)

Fundamentals of Genetic Algorithms – Creation of offspring – Encoding – Fitness function – Reproduction – Inheritance operators – Crossover – Inversion and deletion – Mutation - GA – Applications.

UNIT:4 Neuro-Fuzzy Modelling (6 Hours)

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN.

UNIT:5 Swarm Intelligence (6 Hours)

Introduction to Swarm Intelligence, Ant Colony Optimization, Particle Swarm Optimization, Artificial Swarm Intelligence

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Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson, 2015.
2. Samir Roy, Udit Chakraborty, "Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms", Pearson, 2013

Reference Books:

1. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, 2009
2. Kumar S.Ray, "Soft Computing and Its Applications, Volume Two: Fuzzy Reasoning and Fuzzy Control", CRC Press, 2014
3. Saroj Kaushik Sunita Tiwari, " Soft Computing : Fundamentals Techniques & Applications", Tata McGrawHill, 2018
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
5. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015
6. Chakraverty, Snehashish, Sahoo, Deepti Moyi, Mahato, Nisha Rani, "Concepts of Soft Computing Fuzzy and ANN with Programming", Springer, 2019.
7. Jamshid Ghaboussi, "Soft Computing in Engineering", 1st Edition, CRC Press, 2018

Subject Code	Name of the Subject	L	T	P	C
23BBSHS24001	**Advanced Communication Skills and Professional Ethics**	**1**	**0**	**0**	**1**

Course Educational Objectives

CEO1	To develop communication skills and soft skills of the students.
CEO2	To enhance employability and entrepreneurial skills.
CEO3	To inculcate professional ethics.

Course Outcomes: ***The students will be able to:***

CO1	Develop ways to overcome barriers in professional communication
CO2	Formulate advanced speaking skills
CO3	Organize professional meetings and talks.
CO4	Develop professional writing skills for career growth
CO5	Understand the importance of ethics in professional life
CO6	Use technological aids for self learning

CO-POMapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01									2	3			
CO 02									2	3			
CO 03								2	2	3			
CO 04								3		2			
CO 05					2				1	2			
CO 06								2	3	3			

AVG					2.0			2.3	2.0	2.7			

SYLLABUS

UNIT-1Advance Listening Skills **(4hours)**

1.1 Barriers to effective listening at work place

1.2 Overcoming the barriers.

UNIT-2 Advance Speaking Skill **(3 hours)**

2.1 Barriers to the public speaking

2.2 Overcoming the barriers

UNIT-3 Advanced Writing Skills **(3hours)**

3.1 Barriers to professional writing.

3.2 Overcoming the barriers.

UNIT-4 Professional Ethics **(4hours)**

4.1 What is Professional ethics, importance

4.2 Plagiarism; Definition, Types, How to avoid.

4.3 Citation; What, Why

UNIT-5Technological Aids for Effective Communication **(4hours)**

5.1 What and why.

5.2Spell check, Grammarly, Quill-bot, Ithenticate, Turnitin

Teaching Methods: Chalk& Board/PPT/Video Lectures

Reference Books

1. Practical English Usage. Michael Swan, OUP,1995

2. Communication skills by Sanjay Kumar and Pushp Lata, Oxford University Press; Second Edition, 2015.

3. Advanced Communication English by Dr. O.V. Nachmuthu, The Cambridge Publishers; First Edition, 2011.

4. Professional Ethics in Engineering by Dr. C. Senthil Kumar, ARC Publications, 2017.

Subject Code	Name of the Subject	L	T	P	C	
23BBSHS24101	**Advanced Communication Skills and Professional Ethics (Lab)**	**0**	**0**	**2**	**1**	

Course Educational Objectives

CEO1	To develop communication skills and soft skills of the students.
CEO2	To enhance employability and entrepreneurial skills.
CEO3	To inculcate professional ethics.

Course Outcomes: The students will be able to:

CO1	Develop ways to overcome barriers in professional communication
CO2	Formulate advance speaking skills
CO3	Organise professionals meetings and talks.
CO4	Develop professional writing skills for career growth
CO5	Understand the importance of ethics in professional life
CO6	Use technological aids for self learning

CO-PO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01									2	3			
CO 02									2	3			
CO 03									3	3			
CO 04								2	2	3			
CO 05					2				1	2			
CO 06									3	3			
AVG					2			2	2.2	2.8			

SYLLABUS

Listening Scientific Documentaries **(2 hours)**

Activity- Write down the important points in the documentaries

Listening to a play/ short film **(2 hours)**

Activity- summarize it in your own words

Spontaneous Speaking **(2 hours)**

Activity- Extempore

Hosting a Meeting **(2 hours)**

Activity- Hosting a mock meeting in a given topic

Teach a class **(2 hours)** Activity-Giving lecture on any topic of choice to the class
Give a Ted Talk **(2 hours)** Activity- Prepare and Deliver a Ted Talk
Article Writing **(2 hours)** Activity- Analyze an article provided in class
Social media post **(2 hours)** Activity- reading social media post for a company
Learning the use of Job Portals **(2 hours)** Activity- Creating a profile Job Portal like linked in.
Evaluating Each Other (2 hours) Activity-Using Pad let to create a social wall and evaluate each other's walls.
Dialogue Writing (**2 hours)** Activity- Listening to a silent movie and writing dialogues/ plot.
Skit Writing **(2 hours)** Prepare a skit and perform in front of the class
Creative Writing **(2 hours)** Activity- Analyse a picture with a hidden theme and write a story based on it.
Business Proposal **(2 hours)** Activity- Techniques, types and practicing to write Business Proposal.
Role Play **(2 hours)** Activity- Panel interview, task based mock interviews.
Reference Books: 1. Communication skills by Sanjay Kumar and Pushp Lata, Oxford University Press; Second Edition, 2015. 2. Advanced Communication English by Dr. O.V. Nachmuthu, Cambridge Publishers; First Edition,

2011.
3. Advance English Communication Skills Lab by Lakshminarayanan, SCITECH Publications, 2009.

Course Code	Course Title	L	T	P	Credits	
23BCSPC24101	**Python Programming Lab**		**0**	**2**	1	

Pre -Requisite: Basic knowledge of C language

Course Outcome: student can able to

CO1	Develop and execute basic Python programs using variables, data types, operators, and control flow statements.
CO2	Apply functions and modular programming techniques to design reusable and well-structured code in Python.
CO3	Manipulate strings, lists, tuples, dictionaries, and sets to solve computational problems effectively.
CO4	Implement file handling operations for reading from and writing to different file formats using Python.
CO5	Use exception handling and debugging techniques to build robust and error-free Python programs.
CO6	Apply object-oriented programming concepts such as classes, objects, inheritance, and polymorphism to build modular and maintainable applications.

CO-PO Mapping:

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2			1	–	1	–	3	1
CO 02	3	3	2	2	2			–	1	–	–	3	2
CO 03	3	3	3	2	3			–	1	–	–	3	3
CO 04	3	3	2	2	3	1		–	1	–	–	3	3
CO 05	3	2	2	2	3		1	–	1	1	1	3	3
CO 06	3	3	3	3	3	1	1	1	2	2	1	3	3
AVG	3.0	2.7	2.2	2.0	2.7	1.0	1.0	1.0	1.2	1.3	1.0	3.0	2.5

Assignment - 01

1. WAP to enter two integers from the keyboard and perform all the arithmetic operations on them.
2. WAP to enter three sides of a triangle. Find out the area of the triangle.
3. WAP to enter an integer number and determine its binary, octal, and hexadecimal equivalents.
4. WAP to enter a quadratic equation's coefficients and find the equivalent roots.
5. WAP to enter a temperature in Fahrenheit and convert it into Celsius.
6. WAP to convert distance in meters to Kilometers.
7. WAP to enter time in minutes and print it in hour and minute format.
8. WAP to enter two numbers and swap them using bitwise operators.

Assignment – 02

1. WAP to enter a percentage and display the gradation system.
2. WAP to enter a 5-digit number and print the digits present at odd locations.
3. WAP to enter a number and check whether it is a palindrome number or not.

4. WAP to enter a number and check whether the number is a perfect number or not.
5. WAP to enter a 3-digit number and print all the prime factors of the number.
6. WAP to enter a string and print it in reverse also print the number of vowels and consonants in it.

Assignment – 03

1.WAP to print twin prime numbers present between 1 and N.
2.WAP to find the factorial of a number (without using math module).
3.WAP to check whether a year is a leap year or not.
4.WAP to check whether the string is symmetrical or palindrome.
5.WAP to read a sentence and print all the even-length words present in it.
6.WAP to read a string and remove all duplicates from it.

Assignment – 04

1.WAP to print the second largest and second smallest element in a list of 10 integers without using the sort function.
2.WAP to create two lists first list containing 5 integers and second list containing 5 strings.print both lists one element from each list combined at a time.
3.WAP to create an integer list of 20 elements increase the odd valued elements by 5.

Assignment – 05

1.WAP to enter a set and copy the content of the set into a new set one element at a time.
2.WAP to create a function that prints the first 15 terms of the Fibonacci series without using recursion.
3.WAP to create a function that takes list as argument and returns the even values of the list. Print the new list with even values.
4.WAP to check if a value is present in the list or not, using lambda function.
5. WAP to print the intersection of 2 arrays using lambda function.

Assignment – 06

1.WAP to print a matrix along with summation of row elements and column elements after entering a 3*3 matrix
2.WAP to print the transpose of a matrix of n*n order
3.WAP to triple all numbers in a given list of integers. Use map()
4.WAP to add three given list using python map and lambda
5.WAP to convert all the characters into uppercase and lowercase and eliminate duplicate letters from a given sequence. Use map() function.
6.WAP to convert a given list of integer and a tuple of integer in a list of string using map() function.

Course Code	Course Title	L	T	P	C	
23BCSPC24103	**Design and Analysis of Algorithms Lab**	**0**	**0**	**2**	1	

Pre -Requisite: Basic knowledge of C language

Course Outcome: student can able to

CO1	Implement algorithms based on brute force, divide and conquer, and greedy techniques to solve basic computational problems.
CO2	Apply dynamic programming and backtracking methods to develop optimized solutions for complex problems.
CO3	Design and implement graph algorithms such as BFS, DFS, shortest path, and minimum spanning tree.
CO4	Analyze the time and space complexity of algorithms through experimental and theoretical evaluation.
CO5	Demonstrate proficiency in selecting appropriate algorithmic strategies for given problems and justify their efficiency.
CO6	Develop the ability to work individually or in teams to design, implement, and test algorithmic solutions in a programming environment.

CO-PO Mapping:

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	2	1	2				1	1		3	2
CO 02	3	3	3	2	3				1			3	3
CO 03	3	3	3	3	3				1			3	3
CO 04	3	3	3	3	3	1			2			3	3
CO 05	3	2	3	2	3				1			3	3
CO 06	3	3	3	3	3	1	1	1	2	1	1	3	3
AVG	3.0	2.7	2.8	2.3	2.8	1.0	1.0	1.0	1.3	1.0	1.0	3.0	2.8

1. Implementation of different Recursive algorithms
   (a) Factorial () (b) GCD () (c) Power () (d) Tower_of_Hanoi ()
   (e) Fibonacci ()

2.Implementation of linear search and binary search

Using Divide and Conquer Technique 3. Write a program on the Merge Sort algorithm. 4. Write a program on the Quick Sort algorithm. 5. Write a program on Heap sort using a max heap.
Using dynamic programming 6. Implementation of Matrix-chain Multiplication algorithm. 7. Implementation of LCS algorithm.
Using a Greedy Approach 8. Write a program for solving the Activity Selection Problem 9. Write a program for solving the Fractional Knapsack Problem
Graph Algorithms 10. Implement DFS/ BFS for a connected graph. 11. Implement MST using Kruskal / Prim algorithm. 12. Implementation of Dijkstra's Single Source Shortest Path finding algorithm.
String Matching 13. Implementation of Knuth-Morris-Pratt String-Matching Algorithm. 14. Implementation of Rabin-Karp String-Matching Algorithm
Backtracking 15. Find out the solution to the N-Queen problem. 16. Find out the solution to Sub Set Sum Problem.

Course Code	Name of the Subject	L	T	P	C	
23BCSPC24105	**Unix and Shell Programming Laboratory**	**0**	**0**	**2**	**4**	
Pre -Requisite: Basics of Computer Science and the common operations for interaction.						
Course Educational Objective						
CEO1	To understand the fundamental concepts of operating system, architecture, and user interaction with Unix Operating System.					
CEO2	To learn about shell programming, process creation, termination and communication					
CEO3	To understand and implement synchronization, semaphore techniques, CPU Scheduling and Multi-Threading					
Course Outcomes: ***Upon successful completion of this course, students should be able to:***						
CO1	Understand the basic commands to interact with files, folders of UNIX Operating					
CO2	Understand and implement different shell programming concepts using UNIX Operating					

CO3	Implementing different system calls of operating system using programming and analyze their use.
CO4	Analyze the performance of various CPU scheduling algorithms and implement using a programming platform.
CO5	Understand the concepts of process synchronization.
CO6	Understand by simulating algorithms for deadlock prevention and avoidance.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	3	–	–	1	1	1	–	3	1
CO 02	3	3	2	2	3	–	–	–	1	–	–	3	2
CO 03	3	3	3	3	3	–	–	–	2	–	–	3	3
CO 04	3	3	3	3	3	1	–	–	1	–	–	3	3
CO 05	3	3	3	3	3	1	1	1	2	1	1	3	3
CO 06	3	3	3	3	3	1	1	1	1	1	1	3	3
AVG	3.0	2.8	2.5	2.5	3.0	1.0	1.0	1.0	1.3	1.0	1.0	3.0	2.5

Lab Experiment 1: Introduction on Linux/Ubuntu OS and Shell.

Introduction to Operating system and its functionalities.

Introduction to Linux Operating system, Booting process, Shell and Kernel, File system.

GUI Features and Command line interface of Linux.

Linux Basic commands : ls, clear, whoami, who, users, init 0, poweroff, shutdown, man, cal, date, time

Lab Experiment 2: Linux Advanced Commands.

vi, cat,pwd, wc, cd, mkdir, rmdir, cp,
mv, rm, chmod, sort, grep

Lab Experiment 3: Linux Shell Programming and practice of simple programs

shell programming: echo, printf, variable declaration and initialization, operators

1) Write a program to input 3 numbers and find their sum and average
2) Write a program to input radius of a circle and find the area and perimeter of it.
3) Write a program to input 3 sides of a triangle and then fine area of a triangle , where a,b,c are 3 sides,
   [Given formula: s=(a+b+c)/2 and area= sqrt(s*(s-a)*(s-b)*(s-c))]
4) Write a program to input principle amount, rate of interest and no. of terms and find the simple interest.
   [Given formula: si=(p*t*r)/100]

Lab Experiment 4: Shell Scripting using if..then..else..fi, if..then..fi, elif, case

1) Write a program to check whether a given number is even / odd / zero
2) A software company having a project team of 3 members namely SHIVAM, KIRAN and MIRA. Input their job experience in no. of years. Find the team member who is having highest experience.
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 o6. Display week day example: 0 for Sunday, 1 for Monday etc (use else if ladder).

Lab Experiment 5: Shell Scripting on while loop, for loop.

1) Write a Shell Script to print from A to Z using for loop
2) Write a Shell Script to print all odd numbers between 1 to 50
3) Write a program to test a number is prime or not.
4) Write a program to find the factorial of a given number.

Lab Experiment 6: Program on Process Creation, Execution, Inter Process Communication

1) Write a C program to demonstrate the use of the fork(), exec(), and getpid() system calls.
2) Simple Program: Inter-Process Communication Using Pipe

Lab Experiment 7: Simulation of FCFS CPU Scheduling Algorithm.

Write a C program to simulate First-Come, First-Served (FCFS) CPU scheduling for 4 processed. Accept the arrival time, burst time for each processes and Calculate the waiting time and turnaround time.

The program should Input: The program should accept the arrival time and burst time for each of the 4 processes.

Output: The program should display the following information for each process: Process number, Arrival time, Burst time, Waiting time, Turnaround time

Lab Experiment 8: Simulation of SJF CPU Scheduling Algorithm.

Write a C program to simulate Shortest Job First (SJF) CPU scheduling for 4 processes. Accept the arrival time, burst time for each processes and Calculate the waiting time and turnaround time.

The program should

Input: The program should accept the arrival time and burst time for each of the 4 processes.

Output: The program should display the following information for each process: Process number, Arrival time, Burst time, Waiting time, Turnaround time

Lab Experiment 9: Simulation of Round Robin CPU Scheduling Algorithm.

Write a C program to simulate Round Robin (RR) CPU scheduling for 4 processes. The program should:

Accept the arrival time and burst time for each process, as well as a time quantum (time slice).

Schedule the processes in a round-robin fashion, executing each process for the time quantum (or the remaining burst time, whichever is smaller).

1. Calculate the waiting time and turnaround time for each process.
2. Display the Gantt chart, waiting times, and turnaround times for all processes.

Lab Experiment 10: Simulation Of Banker's Algorithm for Deadlock Avoidance.

Write a C program to implement the Banker's Algorithm for Deadlock Avoidance. The program should:

1. Accept the number of processes and resources in the system.
2. Input the available instances of each resource, the maximum demand matrix, and the allocation matrix for each process.
3. Check if the system is in a safe state by calculating the 'need' matrix and attempting to find a safe sequence of processes.
4. Display whether the system is in a safe state and, if so, print the safe sequence of processes.

Lab Experiment 11: Process Synchronization (Producer-Consumer Problem)

Write a C program to simulate the synchronization of multiple processes using the Producer-Consumer Problem. The program should use a circular buffer of fixed size (BUFFER_SIZE) to simulate shared memory.

Synchronize the producer and consumer processes using:

1) Semaphores to manage buffer availability (empty and full).

2) A mutex lock to ensure mutual exclusion when accessing the buffer.
3) Create two threads: A Producer thread that generates items and places them into the buffer. A Consumer thread that retrieves and processes items from the buffer.

Lab Experiment 12: Programs for FIFO Page replacement Algorithm.

1) Write a C program to simulate the First-In-First-Out (FIFO) Page Replacement Algorithm. The program should take:
Inputs: the number of pages (n), the page sequence, the number of available page frames (no).
Display: the reference string, the state of page frames after processing each page, the total number of page faults.
2) Write a C program to simulate the Least Recently Used (LRU) Page Replacement Algorithm. The program should take:
Inputs: the number of pages (n), the page sequence, the number of available page frames (no).
Display: the reference string, the state of page frames after processing each page, the total number of page faults.

Text Books:

1) Unix Shell Programming, Yashavant Kanetkar, BPB Publications
2) Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, Wiley Student Edition.

References:

3) Introduction To Unix and Shell Programming, M.G.Venkateshmurthy, Pearson Education
4) Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.

V 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
THEORY									
1	HS	23BHSHS30002	Engineering Economics and Costing/ Optimization Engineering	2	0	0	2	40	60
2	PC	23BCSPC35002	Data Communication and Computer Networks	3	0	0	3	40	60
3	PC	23BCSPC35001	Data Mining and Data Warehousing	3	0	0	3	40	60
4	PE	23BCSPE35011	Professional Elective-III (From Bucket)	3	0	0	3	40	60
5	PC	23BCSPC35003	Theory of Computation	3	0	0	3	40	60
6	OE	23BCSOE35013	Open Elective-I (From Bucket)	3	0	0	3	40	60
			TOTAL	17	0	0	17	240	360
PRACTICAL/SESSIONAL									
7	PC	23BCSPC35102	Data Communication and Computer Networks Lab	0	0	2	1	30	20
8	PC	23BCSPC35101	Data Mining and Data Warehousing Lab	0	0	2	1	30	20
9	PST	23BCSPC35103	Minor Project -I	0	0	4	2	50	50
10	PST	23BCSPW35101	Summer Internship-II	0	0	1	1	0	50
11	MC		Constitution of India	0	0	0	0	#100	
			TOTAL	0	0	9	5	110	140
			TOTAL	**17**	**0**	**9**	**22**	**350**	**500**

Professional Elective Bucket

Sl. No.	Sem	Professional Elective III
1	V	Cloud Computing
2		Edge Computing
3		Cloud Security

BUCKETS FOR OPEN ELECTIVES

Sl. No.	Sem	Open Elective I
1	V	Advanced Java
2		Web Technology
3		Full Stack Development

Assignment Based Assessment

Subject Code	Subject Name	L	T	P	C
23BCSPC35001	**Data Mining and Data Warehousing**	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	1	2
CO 01	3	2	1	1	2	-	-	-	-	-	-	2	1
CO 02	3	3	2	2	3	1	-	-	1	1	1	2	2
CO 03	3	3	2	2	3	-	-	-	-	-	-	3	2
CO 04	3	3	3	2	3	-	-	-	1	1	-	3	3
CO 05	3	3	2	3	3	-	-	-	-	-	-	2	3
CO 06	2	2	2	2	3	1	1	1	2	2	1	3	3
AVG	2.8	2.7	2.0	2.0	2.8	1.0	1.0	1.0	1.3	1.3	1.0	2.5	2.3

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

UNIT I		12 Hours
Introduction to Data Mining: Data Mining Technologies, Major issues in Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data **Data Preprocessing:** Data Integration, Data Cleaning, Data Transformation, Data Reduction, Data Discretization and Data Summarization.		
UNIT II		12 Hours
Introduction to Data Warehousing: 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.		

UNIT III		12 Hours
Introduction to Mining Frequent Pattern: Associations, **Correlations**: 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.		
UNIT-V **[**8hours] **Text Mining:** Text Preprocessing, IF-IDF, Word Embeddings (Word2Vec), Text Classification, Text Classification (using ML), Text Clustering. **Web mining:** Web Mining: Web Scraping Basics, Web Content Mining, Web Structure Mining, Web Usage Mining, Mining Web Logs. **Real-world Applications:** E-commerce, Healthcare, Cyber security, social media, Education, and Business Intelligence.		
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		

Subject Code	Subject Name	L	T	P	C	
23BCSPE35011	**Cloud Computing**	**3**	**0**	**0**	**3**	

Course Educational Objectives	
CEO1	To understand the concepts of Cloud Computing and Taxonomy of Virtualization Techniques.
CEO2	To learn Cloud Computing Architecture.
CEO3	To acquire knowledge on Aneka Cloud Application Platform.
CEO4	To learn Industry Cloud Platforms.
Course Outcomes: : *Upon successful completion of this course, students should be able to:*	
CO1	Explain the fundamental concepts of cloud computing, virtualization techniques, and their role in enabling cloud infrastructure.
CO2	Analyze and compare cloud computing architectures, service models (IaaS, PaaS, SaaS), and deployment models (public, private, hybrid, community).
CO3	Design secure and scalable cloud-based applications considering web design, data management, and security mechanisms.
CO4	Evaluate enterprise cloud services and infrastructure scaling techniques, including disaster recovery and capacity planning.

CO5	Develop and deploy cloud applications using platforms like Aneka, and understand cloud programming frameworks.
CO6	Analyze real-world cloud applications and platforms such as Amazon Web Services, Google App Engine, and Microsoft Azure.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2	-	-	-	-	-	1	2	1
CO 02	3	3	2	2	3	1	-	-	1	1	1	2	2
CO 03	3	3	3	2	3	1	-	-	1	2	1	3	3
CO 04	3	3	2	3	3	2	1	1	1	1	2	2	3
CO 05	3	2	3	2	3	-	-	-	2	2	1	3	3
CO 06	2	2	2	2	3	1	1	1	2	2	2	3	3
AVG	2.8	2.5	2.2	2.0	2.8	1.3	1.0	1.0	1.4	1.6	1.3	2.5	2.5

1= Slight(low) 2=Moderate (Medium) 3=Substantial (High)

SYLLABUS

UNIT:1 **(10 Hours**

Introduction to Cloud: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments.

Virtualization: Introduction, Characteristics of Virtualized Environment, Types of Virtualizations, Implementation Levels, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management – Virtualization for Data-center Automation. role of virtualization in enabling the cloud,

UNIT:2 **(10 Hours)**

Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance.

Ready for the Cloud: Web Application Design, Machine Image Design, Privacy Design, Database Management, Data Security, Network Security, Host Security, Compromise Response.

UNIT 3: **(10 Hours)**

Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, and Integration as a service and Testing as a service.

Scaling a cloud infrastructure - Capacity Planning, Cloud Scale.

Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

UNIT 4: **(12 Hours)**

Aneka: Cloud Application Platform Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, Foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools.

UNIT 5: **(12 Hours)**

Cloud Applications: Scientific Applications – Health care, Geosciences and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google App Engine-Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL Azure.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill
2. GautamShroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978-0521137355],2010
3. RajkumarBuyya, Christian Vecchiola, S.TamaraiSelvi, 'Mastering Cloud Computing", TMGH, 2013.
4. George Reese Cloud Application Architectures, First Edition, O"Reilly Media 2009.

References

1. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum from Pearson 2010.
2. Cloud Computing 2nd Edition by Dr. Kumar Saurabh from Wiley India 2012.
3. Cloud Computing – web-based Applications that change the way you work and collaborate Online – Micheal Miller.Pearson Education.

Subject Code	Name of the Subject	L	T	P	C	
	Fuzzy Logic and Applications	**3**	**0**	**0**		

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

CO1	Understand the fundamentals of fuzzy sets, membership functions, linguistic variables, and fuzzy logic concepts.
CO2	Apply fuzzy set operations, fuzzy relations, fuzzy numbers, and fuzzy arithmetic to model uncertainty in engineering problems.
CO3	Design fuzzy rule-based systems using fuzzification, inference mechanisms, and defuzzification techniques.
CO4	Develop Mamdani, Sugeno, and Tsukamoto fuzzy inference systems for intelligent decision-making and control applications.
CO5	Apply fuzzy logic techniques in pattern recognition, clustering, image processing, robotics, healthcare, and industrial automation.
CO6	Analyze hybrid intelligent systems integrating fuzzy logic with neural networks, evolutionary computing, and modern AI applications.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	–	–	–	–	–	–	–	–	2	1
CO 02	3	3	2	2	1	–	–	–	1	–	–	3	2
CO 03	3	3	3	2	2	–	–	–	1	1	–	3	3
CO 04	3	3	3	3	2	1	–	–	1	1	–	3	3
CO 05	2	3	2	3	3	1	–	–	2	1	1	3	3
CO 06	2	2	2	2	3	1	1	–	2	1	1	2	3
AVG	2.6	2.6	2.1	2.2	2.3	1	1.0		1.4	1	1.3	2.6	2.3

SYLLABUS

UNIT:1

Fundamentals of Fuzzy Logic ***(10 Hours)***

Introduction to Artificial Intelligence and Soft Computing, Need for Fuzzy Logic, Crisp Sets and Fuzzy Sets, Classical Logic versus Fuzzy Logic, Uncertainty and Approximate Reasoning, Characteristics of Fuzzy Sets, Membership Functions—Triangular, Trapezoidal, Gaussian, Bell-shaped and Sigmoidal Membership Functions, Linguistic Variables, α-cuts, Strong α-cuts, Support, Core, Height, Convex and Normal Fuzzy Sets, Extension Principle, Basic Fuzzy Set Operations (Union, Intersection, Complement), De Morgan's Laws.

UNIT:2

Fuzzy Relations and Fuzzy Arithmetic ***(10 Hours)***

Cartesian Product of Fuzzy Sets, Fuzzy Relations, Composition of Fuzzy Relations, Max–Min Composition, Max–Product Composition, Equivalence and Similarity Relations, Fuzzy Numbers, Triangular and Trapezoidal Fuzzy Numbers, Arithmetic Operations on Fuzzy Numbers (Addition, Subtraction, Multiplication and Division), Ranking of Fuzzy Numbers, Possibility Theory, Necessity Measures, Fuzzy Decision Making.

UNIT:3

Fuzzy Inference Systems ***(10 Hours)***

Architecture of Fuzzy Inference Systems, Fuzzy Rule Base, Knowledge Representation, IF–THEN Rules, Fuzzification, Inference Mechanisms, Rule Evaluation, Aggregation Methods, Defuzzification Techniques—Centroid Method, Mean of Maximum (MOM), Bisector Method, Smallest and Largest of Maximum, Mamdani Fuzzy Model, Sugeno Fuzzy Model, Tsukamoto Fuzzy Model, Design of Fuzzy Controllers, MATLAB Fuzzy Logic Toolbox.

UNIT:4

Applications of Fuzzy Logic ***(10 Hours)***

Fuzzy Control Systems, Intelligent Decision Support Systems, Industrial Process Control, Washing Machine and Air Conditioner Controllers, Traffic Signal Control, Medical Diagnosis Systems, Pattern Recognition, Image Processing, Robotics, Smart Agriculture, Power Systems, Financial Forecasting, Fuzzy Clustering (FCM), Adaptive Neuro-Fuzzy Inference System (ANFIS), Fuzzy Expert Systems, Explainable AI using Fuzzy Logic, Emerging Applications of Fuzzy Logic in Machine Learning and Intelligent Systems.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

- *Timothy J. Ross,* ***Fuzzy Logic with Engineering Applications****, 4th Edition, Wiley.*
- *George J. Klir and Bo Yuan,* ***Fuzzy Sets and Fuzzy Logic: Theory and Applications****, Prentice Hall.*

Reference Books:

1. *Lotfi A. Zadeh,* ***Fuzzy Sets, Fuzzy Logic and Fuzzy Systems: Selected Papers****, World Scientific.*
2. *John Yen and Reza Langari,* ***Fuzzy Logic: Intelligence, Control and Information****, Pearson Education.*
3. *Kazuo Tanaka,* ***An Introduction to Fuzzy Logic for Practical Applications****, Springer.*
4. *Earl Cox,* ***The Fuzzy Systems Handbook****, Academic Press.*

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC35003	Theory of Computation	4	0	1	4	

Course Educational Objectives

CEO1	To introduce foundational concepts of alphabets, strings, formal languages, and grammars.
CEO2	To enable students to design and analyze deterministic and non-deterministic finite automata (DFA & NFA).
CEO3	To develop the ability to use regular expressions and grammars for recognizing regular languages and relate them with automata.
CEO4	To explore context-free grammars, parsing algorithms, and pushdown automata as models for language recognition
CEO5	To build understanding of Turing Machines, undecidability, and computational power limits.
CEO6	To introduce recursive function theory and NP-completeness concepts to assess problem solvability and complexity.

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

CO1	Understand formal languages, grammars, and design of various finite automata.
CO2	Apply regular expressions and finite automata in the context of language recognition and transformations.
CO3	Design and analyze context-free grammars and pushdown automata for language parsing.
CO4	Construct Turing machines and explore concepts of undecidability and context-sensitive languages.
CO5	Evaluate problems using recursive function theory and understand the limits of computation through NP-completeness.
CO6	Analyze and compare various automata models and understand their role in the Chomsky hierarchy.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	1	-	-	-	-	-	1	1	1
CO 02	3	3	2	2	2	-	-	-	-	-	1	2	2
CO 03	3	3	3	2	2	-	-	-	1	1	1	2	3
CO 04	3	3	2	3	2	1	-	-	-	-	2	1	3
CO 05	3	3	2	3	2	-	-	-	-	-	2	1	3
CO 06	2	2	2	2	2	1	1	1	2	2	2	2	3
AVG	2.8	2.7	2.0	2.2	1.8	1.0	1.0	1.0	1.5	1.5	1.5	1.5	2.5

SYLLABUS

UNIT:1 **(10 Hours)**

Mathematical preliminaries: Alphabet, String, Languages, Grammars, Strings and operations on strings.

Finite Automata: Definition, Basic model, Types of Finite Automata, Design of DFA, Design of NFA, NFA vs. DFA, Eliminating **ε**-transitions from NFA, NFA to DFA conversion, NFA or DFA as a language acceptor, Minimization of Finite Automata. Equivalence of two Finite Automata.

UNIT:2 **(12 Hours)**

Regular Expressions: Regular Set and Regular Expressions. Operators in Regular expressions, Building Finite Automata from Regular expression, Arden's theorem & Building Regular expression from Finite Automata, Pumping Lemma for Regular languages, Closure properties of Regular languages.
Grammar: Definition, Regular Grammar, Regular Grammar to Finite Automaton, Finite Automaton to Regular Grammar

UNIT:3 . (12 Hours)

Grammar: Designing Context Free Grammar, String Derivation, Parse Tree Construction, Ambiguous Grammar, Chomsky and Greibach Normal Forms, CYK parsing algorithm , ClosureProperties of CFL, Pumping Lemma for CFL, Introducing Non-Context Free Grammar, Chomsky Hierarchy.
Push Down Automata: Basic Model, Components, Moves of a PDA, ID of a PDA, Design of Deterministic PDA and Non-deterministic PDA, PDA to CFG and CGA to PDA conversion.

UNIT:4 (11 Hours)

Turing Machines: Basic Model, Components, move of a TM, ID of TM, Design of a TM, Variants Of Turing Machine, Recursively Enumerable Languages, Undecidable problems, Post correspondence problem as an Undecidable Problem. Linear Bounded Automata and Context Sensitive Languages.

UNIT: 5 (9 Hours)

Primitive Recursive functions: μ- Recursive functions, Cantor and Godel numbering, Ackerman's function, Excursiveness of Ackermann and Turing computable functions. Church Turing hypothesis, Recursive and Recursively Enumerable sets, NP Completeness: P and NP, NP complete and NP Hard problems.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. *Introduction to the theory of computation, Michael Sipser, Cengage Learning.*
2. *Formal Language and Automata Theory, C. K. Nagpal, Oxford University Press.*

Reference Books:

1. *Theory of Computer Science : Automata, Languages And Computation by byK L P Mishra and N Chandrasekaran*
2. *Introduction to Automata Theory, Languages and Computation: J. E. Hopcroft, J.D Ullman, Pearson Education.*

Subject Code	Subject Name	L	T	P	C
23BCSOE35013	Advanced Java Programming	4	0	0	4

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.

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 Spring Boot.
CO3	understand significance of Object Relational Mapping (ORM) in Java context.
CO4	construct ORM-based web applications using Hibernate.
CO5	Design and develop dynamic web applications using JSP, Servlets, and session management techniques.
CO6	Integrate front-end and back-end technologies to build complete multi-tier enterprise applications using Spring Boot and Hibernate.

CO-PO & PSO Mapping (Articulation Matrix):

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	3	-	-	-	-	-	1	3	2
CO 02	3	3	3	2	3	1	-	-	2	2	1	3	3
CO 03	3	3	3	2	3	-	-	-	2	2	1	3	3
CO 04	3	3	2	2	3	-	-	-	1	1	1	2	3
CO 05	3	3	3	2	3	1	-	-	2	2	2	3	3
CO 06	3	3	3	3	3	1	1	1	3	3	2	3	3
AVG	3.0	2.8	2.5	2.0	3.0	1.0	1.0	1.0	2.0	2.0	1.3	2.8	2.8

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/ Prepared Statement/ Callable Statement), 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 Prepared Statement Interface, Updating and deleting data in database, Result Set Metadata, 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, Understating HTTP protocol and communication between HTML-SERVLET.

Getting Deep to Servlets: Types of Servlet, Difference between Http Servlet and Generic Servlet, Life cycle of Servlets and different life cycle methods, Difference between do Get() and do Post(), Servlet Generating Html output, Collecting Client submitted data in a Servlet.

Servlet communications: 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 (send Redirect(), Difference between send Redirect() and Request Dispatcher forward(), Understanding ServletConfig.

Conclusion to Servlets: Servlet Filters and wrappers, Servlet Listeners, Session Tracking, Cookies, Http Session, HTML hidden form filed element, URL rewriting, Annotation based servlet programs.

UNIT:3 **(10 Hours)**

Java Server Pages: 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, use Bean with introduction to beans, set Property, get Property

UNIT:4 **(14 Hours)**

Hibernate : 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)

Spring and SpringBoot : Spring Basic, Spring IOC, Spring MVC, Spring MVC with Hibernate. Introduction to Spring Boot, Spring Boot Injection, dependency, autowired, Spring Boot JPA, Spring Boot Webapp MVC.

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

Text Books:

1. Advanced Java Programming, Uttam K. Roy, Oxford University Press.

Reference Book:

1. Black book, Kogent Learning Solution Inc.
2. Java 2: The Complete Reference by Herbert Schildt, Fifth Edition Paperback

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC35002	**Data Communication and Computer Networks**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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

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

COURSE EDUCATIONAL OBJECTIVES:

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

CO-PO MAPPING

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2	-	-	-	-	-	1	2	1
CO 02	3	3	2	2	3	-	-	-	1	1	1	2	2
CO 03	3	3	3	2	3	-	-	-	1	1	1	2	3
CO 04	3	3	2	3	3	1	-	-	1	1	2	2	3
CO 05	3	3	2	2	3	1	-	-	1	1	2	2	3
CO 06	2	2	2	2	3	1	1	1	2	2	2	3	3
AVG	2.8	2.7	2.0	2.0	2.8	1.0	1.0	1.0	1.2	1.2	1.5	2.2	2.5

SYLLABUS

UNIT:1 **(10 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 Impairement(Attenuation, Distortion, Noise), Data Rate Limits(Nyquist Bit rate, Shannon Capacity). Performance (Bandwidth , Throughput, latency, Jitter).

Transmission Media (Guided Media, Unguided Media).

UNIT:2 **(10 Hours)**

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

UNIT:3 **(10 Hours)**

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:4 **(10 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: Inter-networking, IP Address, IPv4(Header structure, Class types, sub-netting), IPv6 (Header structure, Address structure), IPV4 to IPV6 Address Mapping, Address Resolution Protocol, ICMP.

UNIT:5 **(10 Hours)**

Transport Layer: User Datagram Protocol, Transmission Control Protocol, Process-To-Process Delivery, Congestion Control and its Type, Quality of Service.
Application Layer: Domain Name System - Address Resolution, TELNET, E-MAIL (SMTP, POP3), FTP, HTTP.

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	Name of the Subject	L	T	P	C	
23BHSHS30002	**Engineering Economics and Costing**	**3**	**0**	**0**	**3**	

Course Educational Objectives

CEO1	To apply economic concepts to support engineering decision-making.
CEO2	To evaluate project feasibility using cost analysis and investment appraisal.
CEO3	To analyse financial and economic data for engineering projects.
CEO4	To understand the impact of macroeconomic factors on engineering and society.

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

CO1	Explain fundamental economic concepts, laws of demand and supply, and market equilibrium.
CO2	Calculate elasticity of demand, price/output under perfect competition, and perform break-even analysis.
CO3	Apply time value of money concepts and interest formulas to evaluate investment alternatives.
CO4	Analyse methods of depreciation and perform cost-benefit analysis for engineering projects.
CO5	Describe the role of banking, inflation, and national income in the economic environment affecting engineering decisions.
CO6	Interpret economic data and make informed recommendations for engineering economic decisions.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	1	-	-	-	-	-	1	1	1
CO 02	3	3	2	1	1	-	-	-	1	1	1	1	2
CO 03	3	3	2	2	2	-	-	-	1	1	2	1	2
CO 04	3	3	2	2	1	1	-	-	1	1	2	1	2
CO 05	2	2	1	1	1	1	1	1	2	2	2	1	1
CO 06	3	3	3	2	2	1	1	1	3	3	2	2	3
AVG	2.8	2.6	1.8	1.5	1.3	1.0	1.0	1.0	1.5	1.6	1.6	1.1	1.8

UNIT 1: Fundamentals of Microeconomics for Engineering Applications (10hrs)

Meaning, Nature, Scope of Engineering Economics**,** Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Law of supply and its exception, Determination of market equilibrium (Simple numerical problems to be solved). Law of variable proportion, Law of returns to scale

UNIT 02: Market Structures and Cost Analysis (6 hrs)

Cost and revenue function, Price and output Determination under perfect competition (Simple numerical problems to be solved), Break Even Analysis - Linear approach (Simple numerical problems to be solved)

UNIT 03: Time Value of Money and Investment Analysis (8hrs)

Time value of money – Application of interest formulas, Cash flow diagrams, Present worth method, Future worth method, Annual worth method, Internal rate of return method

UNIT 04: Project Evaluation and Depreciation (6 hrs)

Cost benefit analysis for public projects, Depreciation-Depreciation of capital assert, causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method)

UNIT 05: Overview of Banking, Inflation, and National Income (6hrs)

Functions of commercial bank, Functions of Central Bank. Inflation-Meaning of inflation, types, causes, measures to control inflation. National Income - Concepts of national income & Method of measuring national income.

Text Books:

1. Vengedasalam, Deviga. Madhavan, Karunagaran, Principles of Economics, Oxford University Press.
2. R. Paneer Seelvan, "Engineering Economics", PHI
3. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
4. Paul, R.R., Money, Banking and International Trade, Kalyni Publishers

Reference Books:

1. *Riggs,J.L., Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India*
2. *Park, Chan.S, "Fundamental of Engineering Economics", Pearson.*
3. *Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson*
4. *Thuesen, G.J., Fabrycky. Engineering Economy, PHI*

Subject Code	**Name of the Subject**	**L**	**T**	**P**	**C**	
	Digital Image Processing	**3**	**0**	**0**	**3**	

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

CO1	Understand basics of digital images and tools for image processing
CO2	Learn and implement image Enhancement techniques
CO3	Understand and Learn image Restoration and Segmentation Methods
CO4	Understand and implement Image Compression techniques
CO5	Analyze image representation, feature extraction, and pattern recognition techniques for image analysis and recognition.
CO6	Develop and implement digital image processing solutions using MATLAB for enhancement, restoration, segmentation, compression, and recognition of digital images.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2

CO 01	3	2		–	2	–	–	–	–	1	–	2	
CO 02	3	2	2	-	3	–	–	–		1	–	3	2
CO 03	3	3	2	2	3	–	–	–	1	2	–	3	3
CO 04	2	3	2	--	3		–	–	1	2	–	3	3
CO 05	3	3	3	2	3		–	–	2	2	1	3	3
CO 06	3	3	3	3	3	1		1	2	3	2	3	3
AVG	2.8	2.6	2.5	2.3	2.8	1.0		1.0	1.5	1.8	1.5	2.8	2.8

SYLLABUS

UNIT:1 (14 Hours)

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.

UNIT:2 (12 Hours)

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 operators.

UNIT:3(14 Hours)

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.

UNIT:4(10 Hours)

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.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

- *1.Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.*

Reference Books:

1.afael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.

2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

3. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.

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
THEORY									
1	HS	23BHSHS36001	Engineering Economics and Costing/ Optimization Engineering	2	0	0	2	30	70
2	PC	23BCSPC36002	Introduction to Machine Learning	3	0	0	3	30	70
3	PC	23BCSPC36003	Microprocessors and Microcontroller	3	0	0	3	30	70
4	PE	23BCSPE36011	Professional Elective-IV (From Bucket)	3	0	0	3	30	70
5	PC	23BCSPC36001	Introduction to Internet of Things	3	0	0	3	30	70
6	OE	23BCSOE36011	Open Elective-II (From Bucket)	3	0	0	3	30	70
			TOTAL	17	0	0	17	180	420
PRACTICAL/SESSIONAL									
7	PC	23BCSPC36101	Introduction to Internet of Things Lab	0	0	2	1	30	20
8	PC	23BCSPC36103	Microprocessors and Microcontrollers Lab	0	0	2	1	30	20
9	PST	23BCSPC36103	Minor Project Work-II	0	0	4	2	50	50
10	MC		Essence of Indian Knowledge Tradition	0	0	0	0	#100	
			TOTAL	0	0	8	4	110	90
			TOTAL	**17**	**0**	**8**	**21**	**290**	**510**

Professional Elective Bucket

Sl. No.	Sem	Professional Elective IV
1	VI	Ethical Software Engineering
2		Pattern Recognition
3		Digital Image Processing

BUCKETS FOR OPEN ELECTIVES

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

Subject Code	Name of the Subject	L	T	P	C	Q
23BCSOE36011	**Android App Development Using Kotlin**	4	0	1	4	A

Course Educational Objectives

CEO1	Understand and apply the fundamentals of Kotlin programming concepts, including object-oriented and functional features, for Android application development.
CEO2	Comprehend the architecture and core components of the Android operating system, including activities, services, intents, and content providers.
CEO3	Design and implement interactive Android user interfaces using layouts, widgets, menus, navigation, and modern UI components.
CEO4	Develop complete Android applications with data storage, networking, APIs, testing, and deployment practices following industry standards.

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

CO1	Explain and apply Kotlin language features such as data types, control structures, functions, collections, classes, inheritance, and exception handling.
CO2	Describe the Android OS architecture, application structure, lifecycle methods, and core building blocks of Android applications.
CO3	Design and develop Android user interfaces using layouts, views, widgets, dialogs, menus, and navigation components in Kotlin.
CO4	Implement dynamic UI components and advanced Android widgets such as RecyclerView, ListView, Spinner, Notifications, and Switchers.
CO5	Develop Android applications using data persistence mechanisms including Shared Preferences, file systems, SQLite, and Firebase.
CO6	Build, test, and deploy complete Android applications using Android APIs, adapters, preferences, and resource management techniques.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			2							3	
CO 02	2	2			2							2	
CO 03	2	3	3		3				1		1	3	2
CO 04	2	3	3	2	3				1		1	3	2
CO 05	2	3	3	2	3							3	3
CO 06	2	3	3	2	3							3	3
AVG	2.17	2.67	3	2	2.67				1		1	2.83	2.5

SYLLABUS

UNIT:1 **(10 Hours)**

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.

UNIT:2 **(10 Hours)**

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 o 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,

UNIT:3 **(10 Hours)**

Working with 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. 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

UNIT:4 **(10 Hours)**

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.

UNIT:5 **(10 Hours)**

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

Text Books:

1. Bruce Eckel and Svetlana Isakova (2021), “Atomic Kotlin”, Mindview LLC, Crested Butte, CO
2. WeiMeng Lee (2012), “Beginning Android Application Development”, Wrox Publications (John Wiley, New York) (For 1 to 5 units).

Reference Books:

1. Ed Burnette (2010), “Hello Android: Introducing Google's Mobile Development Platform”, The Pragmatic Publishers, 3rd edition, North Carolina USA
2. Reto Meier (2012), “Professional Android 4 Application Development”, Wrox Publications (John Wiley, New York).
3. ZigurdMednieks, Laird Dornin, Blake Meike G, Masumi Nakamura (2011), “Programming Android: Java Programming for the New Generation of Mobile Devices”, OReilly Media, USA

e-Contents:

1. https://developer.android.com/kotlin
2. https://developer.android.com/studio

Subject Code	Name of the Subject	L	T	P	C	
23BCSPE36011	**Ethical Software Engineering**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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

CO1	**Explain** the Software Development Life Cycle (SDLC), various process models, and professional codes of ethics.
CO2	**Apply** requirement engineering techniques and **interpret** intellectual property, privacy, and ethical laws in software development.
CO3	**Design** software solutions using UML/DFD models and **demonstrate** ethical coding, testing, and maintenance practices.
CO4	**Analyze** ethical and societal challenges in emerging technologies (AI, IoT, Blockchain, Cloud) with focus on accountability, fairness, and sustainability.
CO5	**Evaluate** global/national IT laws, governance frameworks, and **assess** real-world ethical case studies for compliance and professional responsibility.
CO6	**Explain** the Software Development Life Cycle (SDLC), various process models, and professional codes of ethics.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	2		1	2		3		1	1		
CO 02	2	3	2	1		3				1	1	1	
CO 03	2	2	1	2		3	1			1			
CO 04	2	3	1	2	1	3	2						
CO 05	1	3		3		3					1	1	1
CO 06	2			1					1			2	2
AVG	2	2.6	1.5	1.8	1	2.8	1.5	3	1	1	1	1.33	1.5

SYLLABUS

UNIT:1 Introduction to SDLC and Foundations of Software Engineering Ethics **(12 Hours)**
Introduction to SDLC and its Phases, & Process Models: Waterfall, Incremental, RAD, V-Model, Spiral, Agile & Scrum, COCOMO Cost Estimation Model, Introduction to Ethics: Morality, Laws, and Professional Codes, ACM/IEEE Software Engineering Code of Ethics, Responsibility of Software Engineers: Stakeholders, Public Interest, and Harm Mitigation, Case Studies: Therac-25, Boeing 737 Max, Ethical Decision-Making Models.

UNIT:2 **(12 Hours)**

Software Requirements Engineering and Ethics in Software Development Practices
Requirements Types: Functional & Non-functional, User & System Requirements, Requirement Engineering Process: Elicitation, Feasibility, Validation, Management, Intellectual Property: Copyrights, Patents, Trade Secrets, Privacy and Data Protection Laws (GDPR, HIPAA, etc.), Ethical Testing and Debugging, Software Licensing, Open Source Ethics, Plagiarism, Misrepresentation, Whistleblowing.

UNIT:3 Ethical Design, Implementation, and Testing **(10 Hours)**

Design Concepts: UML, DFD, Transform & Transaction Analysis, Interface Design, Coding, Practices: Refactoring, Reviews, Stubs, Clean Code Ethics, Testing Techniques: White-box, Black-box, Regression, Validation, Debugging, SEI-CMM Characteristics of Software Maintenance, Reverse Engineering, Re-engineering & Reliability Metrics, Ethical Dimensions: Security-by-design, accessibility, test-skipping, bug suppression.

UNIT:4 AI Systems and Emerging Technology Ethics **(8 Hours)**

Ethical Issues in Blockchain, IoT, and Cloud Computing, Human-Centered Design and Accessibility, Automation and Job Displacement, Digital Divide and Global Software Ethics, Green Computing and Sustainability, Bias & Discrimination in AI, Transparency (XAI), Accountability, Ethical AI Use Cases: Surveillance, Hiring, Criminal Justice.

UNIT:5 Case Studies, Legal Frameworks, and Governance **(8 Hours)**

Global IT Laws and Cyber Laws, National Ethical Guidelines (India: MeitY, NITI Aayog AI Principles), Organizational Ethics Frameworks, Case Study Analysis: Real-world Ethical Failures and Successes, Ethics Audits and Compliance.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Book:

1. Fundamentals of Software Engineering – Rajib Mall, PHI
2. Software Engineering: A Practitioner's Approach – Roger Pressman, McGraw-Hill
3. Ethics in Information Technology – George Reynolds, Cengage

Reference Books:

1. Artificial Intelligence: A Guide for Thinking Humans – Melanie Mitchell
2. Weapons of Math Destruction – Cathy O'Neil
3. IEEE/ACM Software Engineering Code of Ethics – https://ethics.acm.org/code-of-ethics/
4. EU AI Ethics Guidelines – https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai
5. NITI Aayog – Responsible AI – https://www.niti.gov.in/files/responsible-ai-for-all.pdf

Subject Code	SUBJECT NAME	L	T	P	C
	Artificial Neural Networks		4	0	3

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

CO 01	CO 01: Understand the components and functions of biological and artificial neurons and neural networks.
CO 02	Apply different activation and propagation functions and learning strategies in neural networks.
CO 03	Develop and implement supervised learning models like perceptron, back propagation, multilayer perceptron, and radial basis function networks.
CO 04	Design and train advanced neural network models such as recurrent networks and self-organizing maps.
CO 05	Assess the performance of neural network models using various metrics and techniques, and optimize models through regularization, hyperparameter tuning, and cross-validation.
CO 06	Implement artificial neural networks using modern machine learning frameworks and libraries, such as TensorFlow or PyTorch, and apply them to real-world datasets.

CO-PO & PSO Mapping (Articulation Matrix):

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			2							2	
CO 02	3	3	2		3				1	1		3	2
CO 03	3	3	3	3	3				1	2	1	3	3
CO 04	3	3	3	3	3				2	2	2	3	3
CO 05	3	3	3	3	3	1		1	2	3	2	3	3
CO 06	3	3	3	3	3	2	1	2	3	3	3	3	3
AVG	3	2.8	2.8	3	2.8	1.5	1	1.5	1.8	2.2	2	2.8	2.8

Justification of the Mapping:

CO	PO	Level	Justification
01	01	3	Understanding the motivation of ANN from Biological neuron is engineering acquiring engineering knowledge
02	02	2	Solve the problem with input neuron, weights and bias
03	01	3	Learning about Perceptron is Engineering Knowledge
03	02	2	Problem Analysis of neural network with Activation functions.
04	01	1	Engineering Knowledge
04	04	3	Investigation of complex problems of RNN.

Syllabus

UNIT I	10 Hours

Why neural network?, Basics of Artificial Neural Networks, A brief history of neural networks, Biological neural networks, The vertebrate nervous system: peripheral nervous

system, Cerebrum, cerebellum, diencephalon, brainstem, The Neuron, Components of Neuron, Electrochemical processes, Receptor cells - Various types, Information processing with the nervous system, Light Sensing organs, Neurons in living organisms, Transitions in technical neurons..		
UNIT II		10 Hours
Components of artificial neural networks, The concept of time in neural networks, Connections, Propagation function, Activation, Threshold value, Activation function, Common activation functions, Output function, Learning strategies, Network topologies: Feed forward networks, Recurrent Networks, Completely linked networks, Bias neuron, Representing Neurons, Orders of activation: Synchronous activation, Asynchronous activation, Input and output of data.		
UNIT III		12 Hours
Learning and training samples, Paradigms of learning, Using training samples, Gradient Optimization Procedure, Hebbian learning rule, Supervised learning network paradigms, The perceptron, Single layer perceptron, Linear Separability, Multilayer perceptron, Back propagation of error, Selecting learning rate, Resilient Back propagation, Adaptation of weights, Variations in Back propagation, Multilayer perceptron.		
UNIT IV		12 Hours
Radial basis functions, Information processing of an RBF network, Training of RBF networks, Growing of RBF networks, Compare multilayer perceptrons and RBF, Recurrent perceptron-like networks, Jordan Networks, Elman networks, Training recurrent networks, Unfolding in time, Teacher forcing, Recurrent back propagation, Evolutionary algorithms.		
UNIT V		12 hours
Unsupervised learning network paradigms, Structure of a self-organizing map (SOM), Functionality, Training, Topology function, Decreasing Learning Rate, Variations of SOMs, Neural Gas, Multi-SOM, Multi-Neural Gas, Growing neural gas, Adaptive resonance theory (ART), Task and structure of an ART network, Resonance, Learning process of an ART network.		
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS		
Text Books: David Kriesel, A BriefIntroduction to Neural Networks, dkriesel.com, 2005. GunjanGoswami, Introduction to Artificial Neural Networks, S.K. Kataria& Sons, 2012.		
Reference Book: Raul Rojas, Neural Networks: A Systematic Introduction, 1996. S. Sivanandam, Introduction to Artificial Neural Networks, 2003		

Subject Code	SUBJECT NAME	L	T	P	C
	Artificial Intelligence and Expert Systems	3	0	0	3

Course Educational Objectives

CEO 01	To understand Basic Concepts of Artificial Intelligence and Expert Systems.
CEO 02	To provide knowledge on Various Techniques and Tools involved in Artificial Intelligence.
CEO 03	Explain about AI techniques for knowledge representation, planning and uncertainty Management.

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

CO 01	Understand the Basics about Artificial Intelligence and Expert Systems.
CO 02	Understand the Programming Logics in Artificial Intelligence.
CO 03	Develop knowledge of decision making and learning methods
CO 04	Demonstrate the latest developments in Knowledge systems and Tools.
CO 05	Describe the use of AI to solve NLP problems.
CO 06	Understand the Knowledge about the Expert Systems.

CO-PO & PSO Mapping (Articulation Matrix):

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1		2					1		2	1
CO 02	3	3	2	2	3				1	2	1	3	2
CO 03	3	3	3	3	3				2	2	2	3	3
CO 04	3	3	3	3	3	1			2	2	2	3	3
CO 05	3	3	3	3	3	1			3	3	2	3	3
CO 06	3	3	3	3	3	2	1	1	3	3	3	3	3
AVG	3	2.8	2.5	2.8	2.8	1.3	1	1	2.2	2.1	2	2.8	2.5

Justification of the Mapping:

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

5	1	3	It has the highest significance
	2	3	It has the highest significance
	3	3	It has the highest significance
6	1	3	It has the highest significance
	2	2	It has an average significance
	3	2	It has an average significance

Syllabus

UNIT I		10 Hours

Introduction to AI: What is Artificial Intelligence? AI Technique, Types of AI (Strong AI & Weak AI), Agents and Environments, Level of the Model, Problem Spaces, and Search: Defining the Problem as a State Space Search-Water Jug Problem, Production Systems, Problem Characteristics, Production System Characteristics, and Issues in the Design of Search Programs.

UNIT II		08 Hours

Knowledge Representation: Representations and Mappings, Approaches to Knowledge Representation.

Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.

Symbolic Reasoning Under Uncertainty: Introduction to Non monotonic Reasoning, Logics for Non monotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, and Breadth-first Search.

UNIT III		08 Hours

Game Playing: The Mini-max Search Procedure, Adding Alpha-beta Cutoffs ,Iterative Deepening.

Planning: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Other Planning Techniques.

Understanding: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.

UNIT IV		08 Hours

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

Learning: Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning.

UNIT V		08 Hours

Expert Systems:

Architecture and Roles of Expert System-Typical Expert System Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

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

Text Books:

4. *ElaineRich,KevinKnight&ShivashankarBNair,ArtificialIntelligence,McGrawHill,3rded.,2009*
5. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2010.
6. Joseph C. Giarratano, Gary D. Riley, "Expert Systems: Principles and Programming",4th Edition, 2015

Reference Book:

3. *SKaushik, ArtificialIntelligence,CengageLearning,1sted.2011*
4. *IntroductiontoArtificialIntelligence&ExpertSystems,DanWPatterson,PHI.,2011*
5. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
6. Janakiraman, K. Sarukesi, 'Foundations of Artificial Intelligence and Expert Systems', Macmillan Series in Computer Science, 2000.

Subject Code	**Name of the Subject**	**L**	**T**	**P**	**C**	
	Software Engineering Lab	**3**	**0**	**0**	**3**	

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

CO1	Understand and Interpret the key activities for managing a software project and Compare different process models.
CO2	Analyze different types of software requirements and identify the suitable model for the new system.
CO3	Apply systematic procedure for software design.
CO4	Implement and test the software which will meet the software requirement specifications.
CO5	Develop software models and documentation using CASE tools, UML diagrams, and software configuration management techniques.
CO6	Design, implement, and manage software projects using modern software engineering practices, project management tools, and collaborative development methodologies.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	2	1	–	2	–	–	–	2	1	–	2	1
CO 02	3	2	1	2	2	–	–	–	2	1	–	3	2
CO 03	2	2	2	2	3	–	–	–	2	2	1	3	2
CO 04	3	2	3	2	3		–	–	2	2	1	3	3
CO 05	3	3	3	3	3		–	1	3	2	2	3	3
CO 06	3	3	3	3	3	1		2	3	3	2	3	3
AVG	2.6	2.3	2.1	2.5	2.6	1		1.5	2.3	1.8	1.5	2.8	2.3

SYLLABUS

List of Experiments

1. Develop requirements specification for a given problem (The requirements specification Should include both functional and non-functional requirements. For a set of about 20 sample problems, see the questions section of Chap 6 of Software Engineering book of Rajib Mall)

2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required)
3. Develop structured design for the DFD model developed
4. Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML, or Visual Paradigm etc. is required)
5. Develop Sequence Diagrams.
6. Develop Class diagrams.
7. Develop code for the developed class model using Java.
8. Use testing tool such as Junit.
9. Use a configuration management tool.
10. Use any one project management tool such as Microsoft Project or Gantt Project, etc.

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC36003	**Microprocessor and Microcontrollers.**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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

CO1	Explain the fundamental architecture, bus organization, and operations of the 8085 microprocessors.
CO2	Describe the architecture, memory organization, and interrupt system of the 8051 microcontrollers.
CO3	Develop and analyze assembly language programs for 8051 including serial communication, timers, and interrupts.
CO4	Interface various real-world devices such as LEDs, displays and motors with microcontrollers.
CO5	Demonstrate the working of advanced microcontrollers.
CO6	Apply microcontroller knowledge for solving real-world automation and embedded system problems.

COURSE EDUCATIONAL OBJECTIVES:

CEO1	Understand Architecture of Microprocessor and Microcontroller.
CEO2	Learn programming instructions and addressing modes.
CEO3	Develop application programs using assembly and C Languages.
CEO4	Design a hardware interfacing circuit comprising microcontrollers and supporting ICs to construct a useful real time application working as an electronic embedded system.

CO-PO MAPPING

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	2	-	-	-	-	-	1	2	1

CO 02	3	3	2	2	2	-	-	-	-	-	1	2	2
CO 03	3	2	2	1	2	-	-	-	1	1	1	2	2
CO 04	3	3	3	2	3	-	-	-	1	1	1	3	3
CO 05	3	3	3	2	3	1	-	-	2	2	1	3	3
CO 06	3	3	3	3	3	1	1	1	3	3	2	3	3
AVG	3.0	2.7	2.3	1.8	2.5	1.0	1.0	1.0	1.8	1.8	1.2	2.5	2.3

SYLLABUS

Unit 1 Fundamentals of Microprocessor (10 Hours)

Introduction to 8085 Microprocessor, Bus organization – Address Bus, Data Bus and Control Bus, Architecture of 8085 microprocessor and its functional operation, register organization of 8085, Signal Descriptions, Addressing modes, Instruction sets, Assembly language programming. stack and subroutine, Interrupts.

Unit 2 Advanced Microprocessor (9 Hours)

Introduction to 8086 microprocessor, 8086 architecture, Register Organization, Signal Descriptions, Memory Segmentation, Physical Memory Organization, Addressing Modes, Instruction Sets, Minimum and Maximum Mode Operation, Bus Cycle of minimum mode and maximum mode, Interrupts of 8086.

Unit 3 Introduction to 8051 Microcontroller (9 Hours)

Introduction to 8051 Microcontroller, features of 8051, Architecture, function of general purpose and special purpose registers, Pin configuration, I/O Port Structures, Memory organization – program and data memory, Interrupts and ISR.

Unit 4 8051 Assembly Language Programming (8 Hours)

Addressing Modes of 8051, Instruction sets; Data Transfer instructions, Arithmetic instructions, Logical instructions, Branching instructions, Bit manipulation instructions, Assembly language programming.

Unit 5 Real World Applications (9 Hours)

Programmable Peripheral Interface (8255), Programmable Interval Timer (8254), Programmable DMA Controller (8257), Interfacing of – switch , LED and array of LEDs, 7-Segment Display, Stepper Motor.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Book:

1. Microprocessor Architecture: Programming and Applications with the 8085, Penram International Publishing by R. S. Gaonkar.
2. The 8051 microcontroller and Embedded systems, Muhammed Ali Mazidi & Janice Gill Mazidi, Pearson Education

Reference Book*:*

1. The 8051 Microcontrollers Architecture, Programming & Applications by Kenneth J. Ayala.

Subject Code	Name of the Subject	L	T	P	C	
BPECS7014	**Natural Language Processing**	**3**	**0**	**0**	**3**	
Course Educational Objectives						
CEO1	Teach students the leading trends and systems in natural language processing.					
CEO2	Make them understand the concepts of morphology, syntax, semantics and pragmatics of the language and that they are able to give the appropriate examples that will illustrate the above mentioned concepts.					
CEO3	Teach them to recognize the significance of pragmatics for natural language understanding**.**					
CEO4	Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.					
Course Outcomes: : ***Upon successful completion of this course, students should be able to:***						
CO1	Understand approaches to syntax and semantics in NLP.					
CO2	Understand approaches to discourse, generation, dialogue and summarization within NLP.					
CO3	Understand current methods for statistical approaches to machine translation.					
CO4	Understand machine learning techniques used in NLP, including the probabilistic context-free grammars and unsupervised methods, as applied within NLP.					
CO 5	Apply various NLP techniques and algorithms for tasks such as information extraction, semantic search, and text summarization, including both extractive and abstractive methods, to process and analyze natural language data effectively.					
CO 6	Develop and implement advanced NLP applications, such as chatbots and machine translation systems, by leveraging natural language understanding (NLU) and natural language generation (NLG) techniques, and evaluate their performance based on real-world use cases.					
CO-PO & PSO Mapping						

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	3	3	3	3	-	-	-	3	2	2	3	3
CO 02	3	3	3	3	3	-	-	-	3	2	2	3	3
CO 03	3	1	2	3	3	-	-	-	3	2	2	3	3
CO 04	3	3	3	3	3	-	-	-	3	2	2	3	3
CO 05	3	3										3	3
CO 06	3	3										3	3
AVG	3	2.6	2.7	3	3				3	2	2	3	3

SYLLABUS

UNIT:1 **(12 Hours)**

Introduction to Natural Language Processing, Steps – Morphology – Syntax –Semantics, Morphological Analysis (Morphological Parsing), Stemming – Lemmatization, Parts of Speech Tagging, Approaches on NLP Tasks (Rule-based, Statistical, Machine Learning),N-grams, Multiword Expressions, Collocations (Association Measures, Coefficients and Context Measures),Vector Representation of Words ,Language Modeling.

UNIT:2 **(12 Hours)**

Syntax Parsing, Dependency Parsing, Semantics, Semantic Parsing, Word Sense Disambiguation, Lexical Disambiguation, Structural Disambiguation, Word, Context and Sentence-level Semantics, Pronoun Resolution, Semantic Representation of text, Introduction to Semantic Relations.

UNIT:3 **(10 Hours)**

Semantic Relations, Semantic Role Labeling, Semantic Frames, Ontology and Semantics, Semantic Network and Knowledge Graph, Intent Detection and Classification, Paraphrase Extraction, Discourse, Coreference Resolution, Text Coherence, Discourse Structure, Coherence Discourse Planning

UNIT:4 **(12 Hours)**

Information Extraction and Its Approaches: Information Extraction and its approaches, Information Retrieval, Semantic Search.
Summarization: Summarization, Extractive vs. Abstractive Summarization, Information Fusion, Single and Multi-document Summarization, Question Answering.

UNIT:5

Introduction to Chatbot Applications: Introduction to Chatbot Applications, Retrieval-based vs. Conversation-based Chatbots, NLU (Natural Language Understanding) and NLG (Natural Language Generation).
Machine Translation: Machine Translation, Interlingua.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1) DanielJurafsky and Prentice HallJames HMartin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2018.

2) C.Manning and H.Schutze,"Foundations of Statistical Natural Language Processing",MIT Press. Cambridge,MA:, 1999.
3) JamesAllen,Bejamin/cummings,"NaturalLanguageUnderstanding",2nd edition,1995.

Reference Books:

1) *YoavGoldberg, Neural Network Methods for Natural Language Processing.*
2) *http://mccormickml.com/2106/04/19/word2vec-tutorial-the-skip-gram-model/*
3) *https://nlp.stanford.edu/pubs/glove.pdf*

Subject Code	Name of the Subject	L	T	P	C
23BCSPC36001	**Introduction to Internet of Things**	3	0	2	4

Course Educational Objectives

CEO1	The objective of this course is to enable students to design, implement, and manage IoT systems addressing real-world challenges across various application domains.

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

CO1	Explain IoT Fundamentals and domain applications.
CO2	Identify IoT hardware and communication modules.
CO3	Apply cloud, edge, and fog computing concepts for IoT data management.
CO4	Develop IoT applications using development tools.
CO5	Analyze IoT security and implement suitable solutions.
CO6	Design and implement IoT-based projects in various domains.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	1	–	–	–	–	–	–	–		
CO 02	2	1	2	–	2	–	–	–	–	–	–		
CO 03	2	2	3	–	1	–	–	–	–	–	–		
CO 04	1	2	3	–	3	–	–	–	2	2	–		
CO 05	2	3	2	–	2	1	–	1	–	–	–		
CO 06	2	2	3	3	3	–	1	1	2	2	2		
AVG	2	2	2.33	2	2.2	1	1	1	2	2	2		

SYLLABUS

UNIT:1 **(10Hours)**

Introduction to IoT: Overview of IoT, Characteristics, Building Blocks, Architecture of IoT, M2M and IoT Technology, Design aspects: Physical and Logical Design, IoT enabling Technologies, IoT Levels and Deployment Templates.

Domain-Specific IoTs: Home Automation, Cities, Environment, Agriculture.

UNIT:2 **(9 Hours)**

IoT Hardware: Sensors & Actuators, Microcontrollers & different IoT-Boards, and Communication Modules: Wi-Fi, Bluetooth, LoRa module, and ZigBee module, I/O Interface.

IoT Software: IoT Software Development Tools, Git & Version Control, IDEs for IoT, Programming for Communication Protocols and API's.

UNIT:3 **(10 Hours)**

Cloud and Data Management and Analytics in IoT: Role of Cloud Computing in IoT, IoT cloud Platforms, Everything as a Service (XaaS), IoT Edge and Fog Computing, IoT Data management techniques, IoT Data Analytics, Data acquisition and integration, Data Cleaning & Pre-processing, Unstructured data storage on cloud/local server.

UNIT:4 **(8 Hours)**

IoT Application Development: Development Life cycle, Framework for IoT applications, Implementation of Device integration.

Security aspects in IoT: Introduction to IoT Security, IoT security challenges, Threats, Authentication & Authorization, Security Solutions and Mechanisms.

UNIT:5 **(9 Hours)**

IoT case studies and mini project: Home Automation, Industrial automation, Transportation, Agriculture, Healthcare, Environment, Smart Cities, Energy and Grids, Retail and Logistics, Education.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. VijayMadisetti, Arshdeep Bahga," Internet of ThingsA 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. Sitanshu Kar, K. Siva Krishna, Ranjit Patnaik "Internet of Things", Leilalni Katie Publication and Press, 2025, ISBN: 978-93-6348-031-5.
6. AdrianMcEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN:978-1-118-43062-0.
7. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN:0989973700
8. Adrian McEwen, "Designing the Internet of Things", Wiley.
9. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill.
10. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media.

e-Books/Web Content:

1. Designing for the Internet of Things, O'Reilly, February 2015.
2. Getting Started with the Internet of Things, O'Reilly 4th edition, October, 2015.
3. MOOC Courses: Spoken Tutorial / Swayam : Introduction to Internet of Things By Prof. Sudip Misra, IIT Kharagpur

Subject Code	Name of the Subject	L	T	P	C
23BHSHS36001	**Optimization Engineering**	**2**	**0**	**0**	**2**
Pre -Requisite: Basics of Mathematics, matrix, partial differential equation addition of linear equations					

Course Educational Objectives	
CEO1	To introduce the students how to use variables for formulating complex mathematical models in management science, industrial engineering and transportation science
CEO2	To provide students with opportunity using various software package for solving liner programming and integer programming models
CEO3	To introduce the students to use of basic methodology for solution of linear programs and integer programs
CEO4	To introduce the students to advance methods for large scale transportation and assignment problems

SYLLABUS

UNIT:1 [12 Hours]

Introduction Historical overview of operations research, fundamentals of OR Modeling Approach.

Linear Programming: Basic assumptions, formulation, graphical method, simplex method, Big-M method, two phase method, duality theory, Dual simplex.

UNIT:2 [10 Hours]

Sensitivity analysis: Change in objective function coefficient, Change in RHS, Deletion of variable

Integer programming: Special features, branch-and-bound technique

Dynamic Programming: Principle of optimality, recursive relations, solution of LPP

UNIT:3 [10 Hours]

Transportation Problems: Methods for obtaining basic feasible solutions (NWCR, LCM & VAM), Methods for obtaining optimum solution (Stepping stone & Modi method) Specific features of transportation problem.

Assignment Problem: Hungarian method for solving assignment problems. Maximization in Assignment problem, Unbalanced assignment problem.

UNIT:4 [8 Hours]

Queueing: Basic elements of queuing model, role of Poison & exponential distribution, single server model.

Game theory: Maxi-min and Mini-max principle, mixed strategy, dominance theory

UNIT:5 [14 Hours]

Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method.

Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method

Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***	
CO1	Formulate and solve linear programming problems using appropriate techniques.
CO2	Conduct and interpret post-optimal analysis of linear programming problems
CO3	Explain the concept of optimum allocation for transportation & assignment problems
CO4	Apply dynamic programming principle to Linear programming problems.

CO5	Develop mathematical skills to analyze and solve integer programming problem Queueing and Game theory.
CO6	Communicate ideas, explain procedures and interpret solution for Non-linear programming problems

Teaching Methods: Chalk& Board/PPT

REFERENCE BOOKS:

1. Taha H.A., Operations Research 9th Edition, Prentice Hall of India, New Delhi, 2010Book
2. Kanti Swarup., Man Mohan., and Gupta, P.K., Introduction to Operations Research 7th Edition, Sultan Chand & Sons, New Delhi, 2005
3. P.K.Gupta, D.S.Hira, "Operations Research", S.Chand and Company Ltd
4. Hillier, F.S., and Lieberman G.J., Introduction to Operations Research, 7thEdition, TMH, 2009.
5. Kalyanmoy Deb, "Optimization for Engineering Design", PHI Learning Pvt Ltd

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	3		2									
CO 02	2	3		1									
CO 03	3	3		1									
CO 04	2	3		1									
CO 05	2	2		1									
CO 06	2	3		1									
AVG	2.33	2.83		1.17									

Subject Code	Name of the Laboratory	L	T	P	C
23BCSPC36101	**Internet of Things Lab**	0	0	2	1

Course Educational Objectives

CEO1	The objective of this course is to provide practical exposure to IoT system development using Arduino and Raspberry Pi, focusing on sensor interfacing, data acquisition, and communication through standard IoT protocols for real-world applications.

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

CO1	Configure hardware platforms and their development environments to build foundational IoT setups.
CO2	Interface standard input/output component to implement logic-based hardware controls.
CO3	Integrate various physical and environmental to acquire real-time data.
CO4	Develop embedded programs to process sensor data and display it on LCD module.
CO5	Implement basic communication using Bluetooth and MQTT protocols.
CO6	Build simple IoT-based applications for real-time monitoring.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	1	-	-	3	-	-	-	1	-	-	2	1

CO 02	3	2	2	-	2	-	-	-	2	-	-	2	1
CO 03	3	2	2	1	2	1	1	-	2	-	-	3	2
CO 04	2	2	2	-	2	-	-	-	2	-	-	2	2
CO 05	2	2	3	2	3	-	-	-	2	1	-	3	3
CO 06	2	3	3	2	3	2	1	-	2	1	1	3	3
AVG	2.5	2	2.4	1.7	2.5	1.5	1	-	1.8	1	1	2.5	2

List of Experiments

Experiment-01: Familiarization with Arduino Uno and Raspberry Pi and perform the necessary Software Installation.

Experiment-02: To interface an LED/Buzzer with Arduino and develop a program to blink the LED such that it remains ON for 1 second after every 2 seconds.

Experiment-03: To interface a DHT11 temperature and humidity sensor with Arduino and write a program to read and display temperature and humidity values.

Experiment-04: To interface an ultrasonic sensor with Arduino and write a program to display the distance of an object.

Experiment-05: To interface five LEDs with Arduino and write a program to glow the LEDs sequentially in different patterns like Left to Right, Right to Left, Middle to Right, and Middle to Left.

Experiment-06: Interfacing a seven-segment display with Arduino and implementing a program to display digits (0–9).

Experiment-07: To interface a 16×2 LCD with Arduino and develop a program to display the student's name and roll number on the LCD.

Experiment-08: To interface a 16×2 LCD with Arduino and write a program to display temperature and humidity values on the LCD.

Experiment-09: To interface a 16×2 LCD with Arduino and develop a program to measure and display the distance of an object on the LCD.

Experiment-10: To interface various gas sensors with Arduino and develop a program to detect and monitor environmental gases such as smoke, methane, and carbon dioxide.

Experiment-11: Interfacing Bluetooth with Arduino/Raspberry Pi and implementing data transmission of sensor readings to a smartphone.

Experiment-12: Implementing MQTT subscription on Arduino/Raspberry Pi to receive and display temperature data from a broker.

23BCSPC36002 -- Introduction to Machine Learning

COMPUTER SCIENCE AND ENGINEERING

Course Objectives (COBJ)

1. To provide strong mathematical foundations for machine learning.
2. To develop ability to formulate learning problems mathematically.
3. To emphasize numerical optimization techniques in ML.
4. To design, analyze, and evaluate predictive models.

To introduce advanced learning methods and model tuning strategies.

Course Outcomes (CO)

CO	Description
CO1	Explain machine learning paradigms and mathematically formulate learning problems.
CO2	Apply feature selection methods to improve model performance.
CO3	Build and evaluate regression models using numerical optimization.
CO4	Design classification models and analyze their performance.
CO5	Apply unsupervised and ensemble learning methods and optimize models.
CO6	Analyze, compare, and optimize machine learning models using appropriate evaluation metrics, hyperparameter tuning, and cross-validation techniques for real-world applications.

CO–PO Mapping Matrix

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	1	-	-	3	-	-	-	1	-	-	2	1
CO 02	3	2	2	-	2	-	-	-	2	-	-	2	1
CO 03	3	2	2	1	2	1	1	-	2	-	-	3	2
CO 04	2	2	2	-	2	-	-	-	2	-	-	2	2
CO 05	2	2	3	2	3	-	-	-	2	1	-	3	3
CO 06	2	3	3	2	3	2	1	-	2	1	1	3	3
AVG	2.5	2	2.4	1.7	2.5	1.5	1	-	1.8	1	1	2.5	2

Unit I :Machine Learning Paradigms and Optimization using Gradient Descent (10 hours)

Definition and scope of Machine Learning, Evolution of ML, Difference between AI, ML, and Deep Learning, Applications of ML, Supervised Learning, Unsupervised Learning, Semi-Supervised Learning, Reinforcement Learning, Self-Supervised Learning, Comparative analysis of learning paradigms, Learning

problem formulation, Training set, validation set, and test set, Hypothesis space and hypothesis representation, Target function and learned function, Loss / Cost functions, Mean Squared Error, Mean Absolute Error, Log Loss, Empirical Risk Minimization (ERM), Structural Risk Minimization (conceptual), Optimization problems in ML, Convex sets and convex functions, Convex vs Non-Convex optimization, Local and global minima, Gradient and Hessian (conceptual),Convergence behavior of learning algorithms

Unit II: Regression Models and Optimization (12 Hours)

Simple Linear Regression(Regression model formulation, Assumptions of linear regression, Least Squares Method, Cost function derivation, Optimization Techniques(Gradient Descent algorithm, Learning rate and convergence, Batch and Stochastic Gradient Descent), Advanced Regression Models(Multiple Linear Regression, Multivariate regression equation, Polynomial Regression, Bias-variance tradeoff), Regularization Techniques(Overfitting and underfitting, Ridge Regression (L2), Lasso Regression (L1), Elastic Net), Model Evaluation(Mean Squared Error (MSE), Root Mean Squared Error (RMSE), R^2 and Adjusted R^2).

Unit-III: Introduction to Feature Selection (10 Hours)

Definition of features and feature space, Curse of dimensionality, Importance of feature selection, Benefits (Improved accuracy, Reduced overfitting, Reduced computation), Filter-Based Feature Selection(Univariate feature selection, Feature relevance and redundancy, Feature ranking and thresholding), Statistical Feature Selection Techniques(Chi-Square Test, ANOVA F-Test, Mutual Information, Correlation Coefficients(Pearson correlation, Spearman rank correlation)

Unit IV: Supervised Learning – Classification Models (12 Hours)

Logistic Regression(Logistic function and sigmoid, Cost function and optimization, Decision boundary, Multiclass classification (conceptual)), Instance-Based Learning(k-Nearest Neighbors (KNN), Distance measures: Euclidean, Manhattan, Choice of K and performance impact), Probabilistic Learning(Bayes theorem, Naïve Bayes Classifier, Gaussian Naïve Bayes, Assumptions and limitations**), Margin-Based** Learning(Support Vector Machines (SVM), Maximum margin principle, Hard margin vs soft margin, Kernel functions(Linear, Polynomial, Radial Basis Function), Classification Model Evaluation(Confusion Matrix, Accuracy, Precision, Recall, F1-Score, ROC and AUC)

Unit V: Unsupervised Learning, Ensemble Methods & Optimization (10 Hours)

Clustering Techniques(Introduction to clustering, K-Means clustering algorithm, Initialisation and convergence, Hierarchical clustering (Agglomerative)), Dimensionality Reduction(Curse of dimensionality, Principal Component Analysis (PCA), Covariance matrix, Eigenvalues and eigenvectors, Explained variance), Ensemble Learning(Ensemble concept, Bagging, Boosting, Random Forest, Advantages of ensemble methods), Model Optimization & Tuning(Bias-variance tradeoff revisited, Hyperparameter tuning, Grid search and random search, Cross-validation, Model selection strategies)

Text Books / Reference Books:

1. M. Mohri, A. Rostamizadeh, and A. Talwalkar, Foundations of Machine Learning, 2nd ed. MIT Press, 2018.

2. E. Alpaydin, Introduction to Machine Learning, 4th ed. MIT Press, 2020.

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
THEORY									
1	PC	23BCSPC47001	Computer Graphics	3	0	0	3	40	60
2	PC	23BCSPC47002	Compiler Design	3	0	0	3	40	60
3	PE	23BCSPE47011	Professional Elective-V (From Bucket)	3	0	0	3	40	60
4	HS	23BHSHS47001	Entrepreneurship Development	3	0	0	3	40	60
5	OE	23BCSOE47011	Open Elective-III (From Bucket)	3	0	0	3	40	60
			TOTAL	15	0	0	15	200	300
PRACTICAL/SESSIONAL									
5	PC	23BCSPC47101	Advanced Programming Laboratory	0	0	2	1	70	30
5	PST	23BCSPW47101	Major Project Work-I	0	0	6	3	50	50
6	PST	23BCSPW47102	Summer Industry Internship-III	0	0	0	1	0	50
			TOTAL	0	0	8	5	120	80
			TOTAL	**15**	**0**	**8**	**20**	**320**	**380**

BUCKETS FOR PROFESSIONAL ELECTIVES

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

BUCKETS FOR OPEN ELECTIVES

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

Subject Code	Subject Code	L	T	P	C	
23BCSPC47001	**Computer Graphics**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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.

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

CO1	To ***explain*** the structure of modern computer graphics systems and ***implement*** its primitives
CO2	To ***design, develop*** and ***model*** key algorithms for modeling and .
CO3	Apply Graphics in greater depth to more complex courses like Image Processing, Virtual, Augmented Reality, etc
CO4	To ***visualize*** surface detection and Virtual reality for a better visual effect.
CO5	Desing Illumination models and implement them.
CO6	Implement Animations in real time applications

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	2	-	-	1	-	-	-	-	-	-	1	-
CO 02	3	2	2	1	2	-	-	-	-	-	-	2	1
CO 03	2	2	2	-	1	-	-	-	-	-	-	1	2
CO 04	2	3	1	-	1	-	-	-	-	-	-	2	1
CO 05	2	2	1	-	2	-	-	-	-	-	-	2	-
CO 06	2	1	2	-	2	-	-	-	-	-	-	2	-
AVG	2.17	2	1.33	0.17	1.5	0	0	0	0	0	0	1.67	0.67

SYLLABUS

UNIT:1 **(10 Hours)**

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.

UNIT:2 **(12 Hours)**

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.

UNIT:3 **(10 Hours)**

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.

UNIT:4 **(12 Hours)**

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.

UNIT-5 **(10 Hours)**

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

Text Books:

1.Computer Graphics with Virtual Reality System, Rajesh K.Maurya, WileyDreamtech.
2.Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education

Reference Book:

1. *Computer Graphics Principle and Practice , J.D. Foley, A.Dam, S.K. Feiner, Addison, Wesley*
2. *Procedural Elements of Computer Graphics- David Rogers (TMH)*
3. *Computer Graphics: Algorithms and Implementations – D.P Mukherjee &Debasish Jana (PHI)*
4. *Introduction to Computer Graphics & Multimedia – AnirbanMukhopadhyay*

Subject Code	Name of the Subject	L	T	P	C	
23BCSPC47002	**Compiler Design**	**3**	**0**	**0**	**3**	

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

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	2	-	-	1	-	-	-	-	-	-	1	-
CO 02	3	3	2	1	2	-	-	-	-	-	-	2	1
CO 03	3	2	3	1	2	-	-	-	-	-	-	2	1
CO 04	2	2	2	1	1	-	-	-	-	-	-	2	1
CO 05	3	2	2	-	3	-	-	-	-	-	-	2	-
CO 06	2	2	2	-	2	-	-	-	-	-	-	2	-
AVG	2.5	2.17	1.83	0.5	1.83	0	0	0	0	0	0	1.83	0.5

SYLLABUS

UNIT:1 **(12 Hours)**

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.

UNIT:2 **(12 Hours)**

Syntax Analysis: 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

UNIT:3 **(10 Hours)**

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 **(10 Hours)**

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. Galles, Pearson Education.* 2. *Compiler Design in C, Allen I. Holub, PHI*

Subject Code	Subject Code	L	T	P	C	
23BCSPE47011	**Cryptography and Network Security**	**3**	**0**	**0**	**3**	

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	Apply security principles and best practices in developing Java-based web and enterprise applications.
CO6	Deploy and maintain Java applications using modern tools, frameworks, and server environments.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	2	-	-	1	-	-	-	-	-	-	1	-
CO 02	3	3	2	1	2	-	-	-	-	-	-	2	1
CO 03	3	2	3	1	2	-	-	-	-	-	-	2	1
CO 04	2	2	2	1	1	-	-	-	-	-	-	2	1
CO 05	3	2	2	-	3	-	-	-	-	-	-	2	-
CO 06	2	2	2	-	2	-	-	-	-	-	-	2	-

AVG	2.5	2.17	1.83	0.5	1.83	0	0	0	0	0	0	1.83	0.5

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 Mukhopadhya*

Subject Code	Name of the Subject	L	T	P	C	
23BCSOE47011	**Data Analytics**	**3**	**0**	**0**	**3**	

Course Educational Objectives

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.

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

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	Apply advanced analytics techniques such as NLP, time series, and anomaly detection to solve real-world problems
CO6	Evaluate and validate data analytics models using statistical tests, cross-validation, and performance metrics.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	2	1	2	-	-	-	-	-	-	2	1
CO 02	2	3	2	1	2	-	-	-	1	1	-	2	1
CO 03	2	2	1	-	1	-	-	-	-	1	-	1	-
CO 04	3	2	2	1	3	-	-	-	1	1	-	2	1
CO 05	2	2	2	-	3	-	-	-	1	1	-	2	-
CO 06	2	2	2	1	2	-	-	-	1	1	1	2	-
AVG	2.33	2.17	1.83	0.67	2.17	0	0	0	0.67	0.83	0.17	1.83	0.5

SYLLABUS

UNIT:1 **(10 Hours)**

Predictive Analytics: 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.

UNIT:2 **(10 Hours)**

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).

UNIT:3 **(10 Hours)**

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis.

Inferential Statistics and Prescriptive analytics 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.

UNIT:4 **(10 Hours)**

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. *2. G.James,D.Witten,T.Hastie,R.Tibshirani-An introduction to statistical learning with applications in R,Springer,2013.*
3. *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	**Name of the Subject**	**L**	**T**	**P**	**C**	
	Data Analysis Using Open-Source	**3**	**0**	**0**	**3**	

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

CO1	Acquire the knowledge on data analysis in R
CO2	Acquire the ability to find meaning pattern using R & Acquire the ability to find graphically interpret data in R
CO3	Apply the knowledge for implementing analytical algorithms
CO4	Handle large scale analytics projects from various domains & develop intelligent decision support systems
CO5	Analyze and evaluate statistical models, clustering techniques, and dimensionality reduction methods using R for data-driven decision making.
CO6	Design and implement end-to-end data analysis solutions using open-source tools and R programming for real-world applications.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2

CO 01	3				3							2	
CO 02	3	3			3				1	1		3	2
CO 03	3	3	2	3	3				1	1		3	3
CO 04	3	3	3	3	3				2	2	1	3	3
CO 05	3	3	3	3	3				2	2	2	3	3
CO 06	3	3	3	3	3	1		1	2	3	2	3	3
AVG	3	3	1.83	2.7	3	1	0	1	1.6	1.8	1.6	2.83	2.7

SYLLABUS

UNIT: 1(10 Hours)

Data in data analytics, NOIR classification, Introduction to R, Data types, Control structures, Control structures - Using the console, Objects in R - Numbers, Attributes, Vectors - create vectors, Using [] brackets, Vectorized operations, Matrix -building a matrix, Naming dimensions, Colnames and Rownames, Matrix operations, Visualizing with Matplot(),Data frame, List, Functions, Indexing data, Reading data, Writing data.

UNIT: 2 (12 Hours)

Simple Linear Regression, Estimating the coefficients, Accessing the accuracy of the coefficient Estimates, Assessing the Accuracy of the Model, Libraries for Simple Linear Regression in R, Programming in simple linear regression in R, Multiple Linear Regression - Estimating the Regression Coefficients, Multiple Linear regression, Extensions of the Linear Model, Potential Problems, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbors, Qualitative Predictors, Extensions of the Linear Model, Interaction Terms in R, Non-linear Transformations of the Predictors in R, Qualitative Predictors in R, Writing Functions for linear regression in R.

UNIT: 3 (10 Hours)

An overview of classification, Logistic Regression - The Logistic Model, Estimating the regression coefficients, Making Predictions, Multiple Logistic Regression, Logistic Regression for >2 Response Classes, Linear Discriminant Analysis - Using Bayes' Theorem for Classification, Linear Discriminant Analysis for p = 1, Linear Discriminant Analysis for p>1, Quadratic Discriminant Analysis, Logistic Regression, LDA, QDA, and KNN in R – T, Example using Stock Market Data, Logistic Regression in R, Linear Discriminant Analysis in R, Quadratic Discriminant Analysis in R, K-Nearest Neighbors in R, An Application to Caravan Insurance Data in R.

UNIT:4 (12 Hours)

Cross Validation The Validation Set Approach, Leave-One-Out Cross-Validation, k-Fold Cross-Validation, Bias-Variance Trade-off for k-fold cross validation, The Validation Set Approach in R, Leave-one-out cross validation in R, k-Fold Cross-Validation in R, The Boot Strap in R, Linear Model Selection and Regularization-subset selection, Stepwise Selection Choosing the Optimal Model, Shrinkage Methods Ridge Regression, Principal Components Analysis - What Are Principal Components? More on PCA, Principal Components Analysis in R

Clustering methods- K-Means Clustering, Hierarchal Clustering, K-Means Clustering in R, Hierarchical Clustering in R.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Dawn Griffiths, David Griffiths," Head First: Android Development", OReilly2015,ISBN:9781449362188.

2. Greg Milette, Adam Stroud, "PROFESSIONAL Android™ Sensor Programming", John Wiley and Sons, Inc2012,ISBN/978111265055,9781280678943,9781112274.

Reference Books:

1. *PaulDeital, Harvey Deital, Alexander Wald, "Android6forProgrammers,AppDrivenapproach", 2015, Prentice Hall ,ISBN:9780134289366.*

Subject Code	Name of the Subject	L	T	P	C	
	Data Analytics Tool Laboratory	0	0	2	1	

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

CO1	Understand the importance of data visualization for business intelligence and decision making.
CO2	Know approaches to understand visual perception
CO3	Learn about categories of visualization and application areas
CO4	Familiarize with the data visualization tools
CO5	Gain knowledge of effective data visuals to solve workplace problems
CO6	Develop and implement data visualization solutions using R and Tableau to analyze datasets and effectively communicate insights.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2		2	2					1		3	2
CO 02	2	3		2	2					1		3	2
CO 03	2	3	1	2	2					1		3	2
CO 04	2	2	2	2	3					1		3	3
CO 05	2	3	2	3	3				1	2		3	3
CO 06	3	3	3	3	3				2	2		3	3
AVG	2.3	2.6	2	2.2	2.5				1.5	1.1		3	2.5

SYLLABUS

List of Experiments

1. Introduction to R Language.
2. Variables and basic data types in R.
3. Operators, Conditional Statements in R.
4. Functions in R Language with examples.
5. Data structures in R.
6. Introduction to Tableau and Installation.
7. Connecting to Data and preparing data for visualization in Tableau.
8. Data Aggregation and Statistical functions in Tableau.
9. Data Visualizations in Tableau.
10. Basic Dashboards in Tableau.

Subject Code	Subject	L	T	P	C	
23BHSHS47001	**Entrepreneurship**	3	0	0	3	

Course Educational Objectives

CEO1	Explore the entrepreneurial mindset and culture that has been developing in
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

Course Outcomes

CO1	Understand the concepts of entrepreneurship and skills required to be an
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
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

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	1	2	-	-	1	-	-	1	1	2	-	-	-
CO 02	2	2	1	1	2	-	-	-	1	2	1	1	-
CO 03	2	1	-	1	1	-	-	-	1	1	1	-	-
CO 04	1	2	-	-	1	-	-	-	1	1	-	1	-
CO 05	2	2	1	-	2	-	-	-	2	2	1	-	1
CO 06	2	2	2	-	1	-	-	1	2	2	1	-	2
AVG	1.67	1.83	0.67	0.5	1.33	0	0	0.33	1.33	1.67	0.67	0.5	0.5

SYLLABUS

Unit – I **[10Hrs]**

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.

Unit - II **[10Hrs]**

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.

Unit – III **[10 Hrs]**

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

Subject Code	Subject	L	T	P	C	
23BCSPC47101	**Advanced Programming Lab (Cloud Computing & DevOps)**	**3**	**0**	**0**	**3**	

Course Educational Objectives

CEO1	To provide hands-on exposure to cloud platforms and DevOps practices
CEO2	To develop skills in automation, CI/CD, and containerization
CEO3	To enable deployment and monitoring of scalable applications
CEO4	To bridge industry practices with programming skills

Course Outcomes

CO1	Understand cloud computing models and services
CO2	Configure and manage cloud infrastructure
CO3	Apply version control and collaboration tools
CO4	Implement containerization using Docker
CO5	Develop CI/CD pipelines using DevOps tools
CO6	Deploy, monitor, and scale applications in cloud environments

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	-	-	2	-	-	-	-	-	-	2	1
CO 02	3	3	2	2	3	-	-	-	-	-	-	3	2
CO 03	2	3	2	-	3	-	-	-	2	2	-	3	2
CO 04	3	3	3	2	3	-	-	-	2	-	-	3	3
CO 05	3	3	3	3	3	-	-	-	3	2	2	3	3
CO 06	3	3	3	3	3	2	-	-	3	2	2	3	3
AVG	2.83	2.83	2.17	1.67	2.83	0.33	0	0	1.67	1	1	2.83	2.33

SYLLABUS

Module 1: Cloud Computing

Study of cloud models (IaaS, PaaS, SaaS)
Create and configure Virtual Machines in cloud
Storage services (Object & Block storage)
Deploy a web application on cloud

Module 2: Version Control

Installation and configuration of Git
Repository creation, commit, push, pull
Branching and merging

Module 3: Containerization

Installation of Docker Create Docker images and containers Dockerfile and Docker Compose
Module 4: CI/CD Setup Jenkins Build and automate CI/CD pipelines Integrate Git with Jenkins
Module 5: Orchestration & Monitoring Introduction to Kubernetes Deploy applications using Kubernetes Monitoring using tools like Prometheus/Grafana
Text Books 1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood – *Cloud Computing: Concepts, Technology & Architecture* Comprehensive coverage of cloud fundamentals, architecture, and services Widely recommended for academic courses Covers containerization, orchestration, and DevOps practices in cloud 2. Gene Kim, Jez Humble, Patrick Debois, John Willis – *The DevOps Handbook* Practical guide to CI/CD, automation, and DevOps culture
Reference Books 1. Gene Kim, Kevin Behr, George Spafford – *The Phoenix Project* Real-world DevOps concepts explained through case study (story-based learning) 2. Nicole Forsgren, Jez Humble, Gene Kim – *Accelerate: The Science of Lean Software and DevOps* Research-based insights on high-performing DevOps teams

Subject Code	**Name of the Subject**	**L**	**T**	**P**	**C**	
C408	**Software Project Management**	**3**	**0**	**0**		

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

CO1	Explain the fundamental concepts, principles, and life cycle of software project management.
CO2	Apply software project planning, estimation, scheduling, and resource allocation techniques.
CO3	Analyze software project risks, quality assurance processes, and software metrics for effective project management.
CO4	Evaluate software configuration management, project monitoring, and maintenance strategies for software development projects.
CO5	Develop software project plans using project management tools while managing project teams, communication, and stakeholder expectations.
CO6	Design and manage software projects by integrating planning, risk management, quality assurance, and project control techniques.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2			2				1	2	2	2	2

CO 02	3	3	2	2	3				2	2	3	3	2
CO 03	3	3	3	3	2			1	2	2	3	3	3
CO 04	3	3	3	3	3	1		2	2	2	3	3	3
CO 05	3	3	3	3	3	1		2	3	3	3	3	3
CO 06	3	3	3	3	3	2		2	3	3	3	3	3
AVG	3	2.83	2.8	2.8	2.6	1.3		1.6	2.3	2.3	2.8	2.83	2.6

SYLLABUS

UNIT: 1(10 Hours)

Introduction to Software Project Management

Basic concepts: Introduction to software project management, Characteristics of software projects, Software project life cycle, Project management process, Project stakeholders, Project organization, Role of project manager, Software process models, Project initiation, Project feasibility study, Software project selection, Project scope management, Work Breakdown Structure (WBS), Software project planning fundamentals.

UNIT: 2 (12 Hours)

Project Planning and Estimation

Basic concepts: Software size estimation, Function Point Analysis (FPA), Lines of Code (LOC), COCOMO and COCOMO II models, Software effort estimation, Cost estimation, Project scheduling techniques, Gantt Chart, PERT, CPM, Resource allocation, Staffing patterns, Team organization, Software project documentation.

UNIT: 3 (10 Hours)

Risk Management and Quality Assurance

Basic concepts: Software project risk management, Risk identification, Risk analysis, Risk mitigation and contingency planning, Software quality management, Software Quality Assurance (SQA), Software quality standards, Software metrics, Product metrics, Process metrics, Project metrics, Software reviews, Technical reviews, Audits, Software configuration management.

UNIT:4 (12 Hours)

Project Monitoring and Contemporary Practices

Basic concepts: Project monitoring and control, Earned Value Management (EVM), Project tracking, Change management, Software maintenance management, Project closure, Agile project management, Scrum framework, DevOps fundamentals, Project communication management, Team leadership, Stakeholder management, Software project management tools (Microsoft Project, Jira, Trello), Contemporary trends in software project management.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

- *Bob Hughes, Mike Cotterell, Rajib Mall,* ***Software Project Management****, 6th Edition, McGraw-Hill Education.*
- *Walker Royce,* ***Software Project Management: A Unified Framework****, Addison-Wesley.*
- *Pankaj Jalote,* ***Software Project Management in Practice****, Pearson Education.*

Reference Books:

1. *Roger S. Pressman and Bruce R. Maxim,* ***Software Engineering: A Practitioner's Approach****, McGraw-Hill.*
2. *Kathy Schwalbe,* ***Information Technology Project Management****, Cengage Learning.*
3. *Clifford F. Gray and Erik W. Larson,* ***Project Management: The Managerial Process****, McGraw-Hill.*

4. *Harold Kerzner,* ***Project Management: A Systems Approach to Planning, Scheduling, and Controlling****, Wiley.*

Subject Code	Name of the Subject	L	T	P	C	
	Mobile Computing	**3**	**0**	**0**		

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

CO1	Gain knowledge of GSM architecture.
CO2	To understand mobility management.
CO3	Understand working of wireless architectures and their applications.
CO4	Understand recent trends and emerging technologies.
CO5	Analyze various wireless communication technologies, mobile protocols, operating systems, and application development frameworks for mobile computing.
CO6	Develop and implement mobile computing applications by utilizing wireless communication technologies, mobile operating systems, and modern development tools.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	1	–	2	–	–	–	–	1	–	2	
CO 02	2	2	1	1	2	–	–	–		1	–	3	1
CO 03	2	3	2	2	3	–	–	–	1	2	1	3	2
CO 04	2	2	2	2	3		–	–	1	2	1	3	2
CO 05	3	3	3	3	3		–	–	2	2	2	3	3
CO 06	3	3	3	3	3	1		1	2	3	2	3	3
AVG	2.5	2.5	2	2.2	2.6	1		1	1.5	1.6	1.5	2.83	2.1

SYLLABUS

UNIT:1 (12 Hours)

Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signalling, Global System for Mobile Communication (GSM) and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; WLANs (Wireless LANs) IEEE 802.II standard, Mobile IP.

UNIT:2 (14 Hours)

Mobile Client: overview of Mobile handset, Mobile phones and their features, PDA, Design Constraints in applications for hand-held devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6Wireless Third Generation (3G) Mobile Services: Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000 Global Mobile Satellite Systems; case studies of the IRIDIUM, ICO and GLOBALSTAR systems

UNIT:3 **(10 Hours)**

Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Server-side programming in Java, Pervasive web application architecture.

Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux and Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT:4 **(12 Hours)**

Mobile Device Operating System, Commercial mobile operating systems, Software development kit, iOS, Android, Windows phones, M-Commerce, Mobile transaction system, related security issues, 4G technology, fundamental concepts of mobile cloud computing and different application instances.

Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless Local Loop (WLL):Introduction to WLL Architecture, wireless mark-up Languages (WML): HDML, WML, HTML, cHTML, XHTML, VoiceXML,Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, introduction to J2ME

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

1. P.K. Patra, S.K. Dash: Mobile Computing, Scitech Publications.

2. Rajkamal: Mobile Computing, Oxford University Press.

Reference Books:

1. *Ashok Talukder, Roopa Yavagal, Hasan Ahmed (2010), Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill,*

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
THEORY									
1	PE	23BCSPE48012	Professional Elective-VI (From Bucket)	3	0	0	3	40	60
2	OE	23BCSOE48011	Open Elective-IV (From Bucket)	3	0	0	3	40	60
3	OE	23BCSOE48013	Open Elective-V (From Bucket)	3	0	0	3	40	60
			TOTAL	9	0	0	9	120	180
PRACTICAL/SESSIONAL									
4	PST	23BCSPW48102	Technical Seminar	0	0	2	1	0	50
5	PST	23BCSPW48101	Major Project Work-II	0	0	6	3	50	50
			TOTAL	0	0	8	4	50	100
			TOTAL	**9**	**0**	**8**	**13**	170	280

BUCKETS FOR PROFESSIONAL ELECTIVES

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

BUCKETS FOR OPEN ELECTIVES

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

Subject Code	Subject	L	T	P	C
23BCSPE48012	E-Commerce & ERP	3	0	0	3

Course Educational Objectives

CEO1	To provide fundamental knowledge of Enterprise Resource Planning (ERP) concepts, architecture, and implementation life cycle.
CEO2	To enable students to understand ERP modules, tools, and enterprise integration used in modern organizations.
CEO3	To develop the ability to analyze E-Commerce business models, strategies, and digital enterprise transformation.
CEO4	To familiarize students with electronic payment systems, e-commerce software, and internet-based business operations.

Course Outcomes

CO1	Understand fundamental concepts and technologies related to ERP and Explain the different phases of the ERP implementation life cycle.
CO2	Examine the modules, benefits and various tools of ERP.
CO3	Analyze the impact of e-commerce on business model and strategies
CO4	Assess the electronic payment systems and software.
CO5	Analyze security, legal, and ethical issues in E-Commerce systems and propose
CO6	Evaluate modern trends such as cloud ERP, M-commerce, and enterprise integration

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	2	-	1	2	-	-	-	-	-	-	2	-
CO 02	3	3	1	1	2	-	-	-	-	-	-	2	1
CO 03	2	3	2	1	2	1	-	-	1	-	-	2	1
CO 04	2	2	2	1	2	-	-	-	1	-	-	2	-
CO 05	2	2	2	2	2	1	1	1	1	1	-	2	-
CO 06	2	2	2	2	3	1	-	-	2	1	1	2	-
AVG	2.33	2.33	1.5	1.33	2.17	0.5	0.17	0.17	0.83	0.33	0.17	2	0.33

SYLLABUS

Unit – I **[12 Hrs]**

ERP and Related Technologies: Overview of enterprise, Related Technologies, Business intelligence, Business process reengineering, Data warehousing, Data mining, Online analytical processing, Product life cycle management, Supply chain management, Customer relationship management, Management information system, Decision support system, Executive information system.

ERP Implementation: Implementation Challenges, Strategies, Life Cycle, Pre-implementation Tasks, Requirements Definition, Methodologies, Package selection, Project Teams, Process Definitions, Vendors and Consultants, Data Migration, Project management, Post Implementation Activities.

Unit - II **[10 Hrs]**

ERP in Action and Business Modules: Operation and Maintenance, Performance, Maximizing the ERP System, benefits of ERP Business Modules: Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

Unit – III **[10 Hrs]**

Introduction to ERP tools: Marketplace, Dynamics, SAP AG, Oracle, PeopleSoft, JD Edwards.

ERP Case studies: E-Commerce to E-business, E-Business structural transformation, Flexible business design, Customer experience, Create the new techno enterprise, new generation ebusiness leaders, Memo to CEO, empower your customer, Integrate Sales and Service, Integrated enterprise applications.

Unit – IV **[10 Hrs]**

Introduction to E-Commerce: Business models, Revenue models and business processes, Opportunities and nature of ecommerce, Internet protocols, Internet and semantic web, Selling on the Web and Marketing on the Web, Business to Business Strategy from Electronic Data Interchange to E-Commerce**.**

E-Commerce Software and Payment Systems: Web hosting alternatives, Basic and advance functions of e-commerce software, Software for small, Mid-size and large businesses, Online payment basic, Payment cards, Electronic cash, Electronic wallets, Stored value cards, Internet technologies and banking.

UNIT-V

Advanced E-Commerce & ERP Integration: E-Commerce security issues: Encryption, Digital signatures, SSL, Secure payment systems ,Legal and ethical issues in E-Commerce ,Mobile Commerce (M-Commerce): Applications and advantages , Cloud-based ERP systems and SaaS models ,ERP and E-Commerce Integration: Concepts, benefits, challenges ,Emerging trends: AI in ERP, Blockchain in E-commerce, Big Data analytics

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

Text Book:

1. Alexis Leon, “Enterprise Resource Planning”, 2nd edition, Tata McGraw Hill.

2. Alexis Leon, “Enterprise Resource Planning – Diversified”, 2nd edition, TMH.

Reference Book:

1. Ravi Shankar & S. Jaiswal, “Enterprise Resource Planning”, Galgotia.

2. Schneider, “E-commerce”, 7th edition, Course Technology of Thomson Learning.

3. Ravi Kalakota,“Frontiers of e-commerce”, 1st edition, Pearson

Subject Code	Name of the Subject	L	T	P	C	
23BCSOE48011	**Real-Time Systems**	**3**	**0**	**0**	**3**	

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:***

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

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	3	-	-	-	-	-	-	-	-	-	-	-	-
CO 02	3	3	-	-	-	-	-	2	-	-	-	-	-
CO 03	3	-	-	-	-	-	-	-	-	-	-	-	-
CO 04	3	3	-	3	-	-	-	-	-	-	-	-	-
CO 05	1	2	-	-	-	-	-	-	-	-	-	-	-
CO 06	2	2	-	-	-	-	-	-	-	-	-	-	-
AVG	2.5	1.67	0	0.5	0	0	0	0.33	0	0	0	0	0

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

UNIT:3 **(12 Hours)**

Languages for Real-Time Applications:

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.

UNIT:4 **(10 Hours)**

Operating Systems:

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.

UNIT-5 **(10 Hours)**

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

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

- *Real-Time Computer Control, Stuart Bennet, 2nd Edn. Pearson Education. 2008.*

Reference Books:

1. "Real-Time Systems", C.M. Krishna, Kang G Shin, McGraw-Hill International Editions, 1997.
2 Real-Time Systems Design and Analysis, Phillip. A. Laplante, second edition, PHI, 2005.
3. Embedded Systems, Raj Kamal, Tata McGraw Hill, India, third edition, 2005.

Subject Code	Name of the Subject	L	T	P	C	
23BCSPE48012	**Malware Analysis**	**3**	**0**	**0**	**3**	

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:***

CO1	Gain knowledge about the different forms of malware.

CO2	Set up a safe virtual environment to analyze malware & navigate, comment, and modify disassembly
CO3	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.
CO4	Learn procedures for recognizing and analyzing Android malware threats quickly and effectively.
CO5	Implement Cross References using open sources
CO6	Learn Behavioral and Code Analysis

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 01	2	1	-	-	1	-	-	-	-	-	-	1	-
CO 02	3	2	1	1	2	-	-	-	-	-	-	2	1
CO 03	3	2	2	1	2	-	-	-	-	-	-	2	1
CO 04	2	2	1	-	1	-	-	-	-	-	-	1	1
CO 05	2	1	2	-	2	-	-	-	-	-	-	2	-
CO 06	2	2	2	-	2	-	-	-	-	-	-	2	-
AVG	2.33	1.67	1.33	0.33	1.67	0	0	0	0	0	0	1.67	0.5

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 Assembly.

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.