
GEETANJALI INSTITUTE OF TECHNICAL STUDIES
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING



CURRICULUM



Geetanjali Institute of Technical Studies
Department of Computer Science and Engineering

CSE Department

Vision

To nurture the students to become employable graduates who can provide solutions to the societal issues through ICT.

Mission

- To focus on practical approach towards learning and exposing the students on the latest ICT technologies.
- To foster logical thinking among the students to solve real-time problems using innovative approaches.
- To provide state-of-the-art resources that contributes to inculcate ethical and life-long learning environment.

B. Tech (CSE) - PROGRAMME OUTCOMES (POs)

A student will develop:

1. **ENGINEERING KNOWLEDGE:** An ability to apply knowledge of Mathematics, Science and Engineering Fundamentals in Computer Science & Engineering.
2. **PROBLEM ANALYSIS:** An ability to analyse and interpret data by designing and conducting experiments. Develop the knowledge of developing algorithms, designing, implementation and testing applications in computer related areas.
3. **DESIGN/ DEVELOPMENT OF SOLUTION:** An ability to Design a system Component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. **CONDUCTION OF INVESTIGATION OF COMPLEX PROBLEMS:** An ability to Identify, formulate and solve engineering problems.
5. **MODERN TOOL USAGE:** An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
6. **THE ENGINEERING AND SOCIETY:** Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
7. **ENVIRONMENT & SUSTAINABILITY:** Understand the impact of professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need of sustainable development.
8. **ETHICS:** An ability to understand the professional, social and ethical responsibility.
9. **INDIVIDUAL AND TEAM WORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **COMMUNICATION:** An ability to Communicate effectively in order to succeed in their profession such as, being able to write effective reports and design documentation, make effective presentations.

11. **PROJECT MANAGEMENT & FINANCE:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in team, to manage projects and in multidisciplinary environment.

12. **LIFE-LONG LEARNING:** Recognize the need and an ability to engage in life-long learning.

B. Tech (CSE) - Programme Educational Objectives (PEOs)

PEO1: To enable the students to think out-of-the-box solutions for addressing societal issues through ICT.

PEO2: To impart skills in students to analyse, design and implement Software/Hardware solutions to solve interdisciplinary and complex problems.

PEO3: To expose the students towards effective dissemination of research findings in order to become successful entrepreneurs or to pursue higher education.

B. Tech (CSE) - PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: Professional Skills: The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2: Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

SCHEME
I Semester: B. Tech
Common to all branches of UG Engineering & Technology

SN	Category	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	1FY2-01	Engineering Mathematics-I	3	1	-	30	70	100	4
2	BSC	1FY2-02/ 1FY2-03	Engineering Physics/ Engineering Chemistry	3	1	-	30	70	100	4
3	HSMC	1FY1-04/ 1FY1-05	Communication Skills/ Human Values	2	-	-	30	70	100	2
4	ESC	1FY3-06/ 1FY3-07	Programming for Problem Solving/ Basic Mechanical Engineering	2	-	-	30	70	100	2
5	ESC	1FY3-08/ 1FY3-09	Basic Electrical Engineering/ Basic Civil Engineering	2	-	-	30	70	100	2
6	BSC	1FY2-20/ 1FY2-21	Engineering Physics Lab/ Engineering Chemistry Lab	-	-	2	60	40	100	1
7	HSMC	1FY1-22/ 1FY1-23	Language Lab/ Human Values Activities and Sports	-	-	2	60	40	100	1
8	ESC	1FY3-24/ 1FY3-25	Computer Programming Lab/ Manufacturing Practices Workshop	-	-	3	60	40	100	1.5
9	ESC	1FY3-26/ 1FY3-27	Basic Electrical Engineering Lab/ Basic Civil Engineering Lab	-	-	2	60	40	100	1
10	ESC	1FY3-28/ 1FY3-29	Computer Aided Engineering Graphics/ Computer Aided Machine Drawing	-	-	3	60	40	100	1.5
11	SODE CA	1FY8-00							100	0.5
Total									20.5	

L = Lecture, **T** = Tutorial,
P = Practical, **IA**=Internal Assessment,
ETE=End Term Exam, **Cr**=Credits

II Semester: B. Tech
Common to all branches of UG Engineering & Technology

SN	Category	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	2FY2-01	Engineering Mathematics-II	3	1	-	30	70	100	4
2	BSC	2FY2-03/ 2FY2-02	Engineering Chemistry/ Engineering Physics	3	1	-	30	70	100	4
3	HSMC	2FY1-05/ 2FY1-04	Human Values/ Communication Skills	2	-	-	30	70	100	2
4	ESC	2FY3-07/ 2FY3-06	Basic Mechanical Engineering/ Programming for Problem Solving	2	-	-	30	70	100	2
5	ESC	2FY3-09/ 2FY3-08	Basic Civil Engineering/ Basic Electrical Engineering	2	-	-	30	70	100	2
6	BSC	2FY2-21/ 2FY2-20	Engineering Chemistry Lab/ Engineering Physics Lab	-	-	2	60	40	100	1
7	HSMC	2FY1-23/ 2FY1-22	Human Values Activities and Sports/ Language Lab	-	-	2	60	40	100	1
8	ESC	2FY3-25/ 2FY3-24	Manufacturing Practices Workshop/ Computer Programming Lab	-	-	3	60	40	100	1.5
9	ESC	2FY3-27/ 2FY3-26	Basic Civil Engineering Lab/ Basic Electrical Engineering Lab	-	-	2	60	40	100	1
10	ESC	2FY3-29/ 2FY3-28	Computer Aided Machine Drawing/ Computer Aided Engineering Graphics	-	-	3	60	40	100	1.5
11	SODECA	2FY8-00							100	0.5
Total									20.5	

L = Lecture, **T** = Tutorial,
P = Practical, **IA**=Internal Assessment,
ETE=End Term Exam, **Cr**=Credits

B.Tech : Computer Science & Engineering 2nd Year - III Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	BSC	3CS2-01	Advanced Engineering Mathematics	3	0	0	3	30	120	150	3
2	HSMC	3CS1-02/ 3CS1-03	Technical Communication/ Managerial Economics and Financial Accounting	2	0	0	2	20	80	100	2
3	ESC	3CS3-04	Digital Electronics	3	0	0	3	30	120	150	3
4	PCC	3CS4-05	Data Structures and Algorithms	3	0	0	3	30	120	150	3
5		3CS4-06	Object Oriented Programming	3	0	0	3	30	120	150	3
6		3CS4-07	Software Engineering	3	0	0	3	30	120	150	3
Sub Total				17	0	0		170	680	850	17
PRACTICAL & SESSIONAL											
7	PCC	3CS4-21	Data Structures and Algorithms Lab	0	0	3		45	30	75	1.5
8		3CS4-22	Object Oriented Programming Lab	0	0	3		45	30	75	1.5
9		3CS4-23	Software Engineering Lab	0	0	3		45	30	75	1.5
10		3CS4-24	Digital Electronics Lab	0	0	3		45	30	75	1.5
11	PSIT	3CS7-30	Industrial Training	0	0	1		0	0	50	1
12	SODECA	3CS8-00	Social Outreach, Discipline & Extra Curricular Activities							25	0.5
Sub- Total				0	0	13		180	120	375	7.5
TOTAL OF III SEMESTER				17	0	13		350	800	1225	24.5

L: Lecture, T: Tutorial, P: Practical, Cr: Credits

ETE: End Term Exam, IA: Internal Assessment

B.Tech : Computer Science & Engineering 2nd Year - IV Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	BSC	4CS2-01	Discrete Mathematics Structure	3	0	0	3	30	120	150	3
2	HSMC	4CS1-03/	Managerial Economics and Financial Accounting	2	0	0	2	20	80	100	2
		4CS1-02	/Technical Communication								
3	ESC	4CS3-04	Microprocessor & Interfaces	3	0	0	3	30	120	150	3
4	PCC	4CS4-05	Database Management System	3	0	0	3	30	120	150	3
5		4CS4-06	Theory of Computation	3	0	0	3	30	120	150	3
6		4CS4-07	Data Communication and Computer Networks	3	0	0	3	30	120	150	3
Sub Total				17	0	0		170	680	850	17
PRACTICAL & SESSIONAL											
7	PCC	4CS4-21	Microprocessor & Interfaces Lab	0	0	2		30	20	50	1
8		4CS4-22	Database Management System Lab	0	0	3		45	30	75	1.5
9		4CS4-23	Network Programming Lab	0	0	3		45	30	75	1.5
10		4CS4-24	Linux Shell Programming Lab	0	0	2		30	20	50	1
11		4CS4-25	Java Lab	0	0	2		30	20	50	1
12	SODE CA	4CS8-00	Social Outreach, Discipline & Extra Curricular Activities							25	0.5
Sub- Total				0	0	12		180	120	325	6.5
TOTAL OF IV SEMEESTER				17	0	12		350	800	1175	23.5

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

B.Tech: Computer Science & Engineering 3rd Year - V Semester

THEORY												
SN	Category	Course		Contact hrs/week			Marks				Cr	
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total		
1	ESC	5CS3-01	Information Theory & Coding	2	0	0	2	20	80	100	2	
2	PCC/ PEC	5CS4-02	Compiler Design	3	0	0	3	30	120	150	3	
3		5CS4-03	Operating System	3	0	0	3	30	120	150	3	
4		5CS4-04	Computer Graphics & Multimedia	3	0	0	3	30	120	150	3	
6		5CS4-05	Analysis of Algorithms	3	0	0	3	30	120	150	3	
7		Professional Elective 1: (any one)		2	0	0	2	20	80	100	2	
		5CS5-11	Wireless Communication									
		5CS5-12	Human-Computer Interaction									
		5CS5-13	Bioinformatics									
		Sub Total		16	0	0		160	640	800	16	
PRACTICAL & SESSIONAL												
8	PCC	5CS4-21	Computer Graphics & Multimedia Lab	0	0	2	2	30	20	50	1	
9		5CS4-22	Compiler Design Lab	0	0	2	2	30	20	50	1	
10		5CS4-23	Analysis of Algorithms Lab	0	0	2	2	30	20	50	1	
11		5CS4-24	Advance Java Lab	0	0	2	2	30	20	50	1	
12	PSIT	5CS7-30	Industrial Training	0	0	1		75	50	125	2.5	
13	SODE CA	5CS8-00	Social Outreach, Discipline & Extra Curricular Activities						25	25	0.5	
		Sub- Total		0	0	9		195	155	350	7	
		TOTAL OF V SEMESTER		16	0	9		355	795	1150	23	

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

B.Tech: Computer Science & Engineering 3rd Year - VI Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks			Cr	
		Code	Title	L	T	P	Exm Hrs	IA	ETE		Total
1	ESC	6CS3-01	Digital Image Processing	2	0	0	2	20	80	100	2
2	PCC/ PEC	6CS4-02	Machine Learning	3	0	0	3	30	120	150	3
3		6CS4-03	Information Security System	2	0	0	2	20	80	100	2
4		6CS4-04	Computer Architecture and Organization	3	0	0	3	30	120	150	3
5		6CS4-05	Artificial Intelligence	2	0	0	2	20	80	100	2
6		6CS4-06	Cloud Computing	3	0	0	3	30	120	150	3
7		Professional Elective 1 (any one)		2	0	0	2	20	80	100	2
			6CS5-11	Distributed System							
		6CS5-12	Software Defined Network								
		6CS5-13	Ecommerce and ERP								
		Sub-Total		17	0	0		170	680	850	17
PRACTICAL & SESSIONAL											
8	PCC	6CS4-21	Digital Image Processing Lab	0	0	3	2	45	30	75	1.5
9		6CS4-22	Machine Learning Lab	0	0	3	2	45	30	75	1.5
10		6CS4-23	Python Lab	0	0	3	2	45	30	75	1.5
11		6CS4-24	Mobile Application Development Lab	0	0	3	2	45	30	75	1.5
12	SODE CA	6CS8-00	Social Outreach, Discipline & Extra Curricular Activities						25	25	0.5
		Sub- Total		0	0	12		180	145	325	6.5
		TOTAL OF VI SEMESTER		17	0	12		350	825	1175	23.5

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

B.Tech: Computer Science & Engineering 4th Year - VII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	7CS4-01	Internet of Things	3	0	0	3	30	120	150	3
2	OE		Open Elective - I	3	0	0	3	30	120	150	3
		Sub Total		6	0	0	6	60	240	300	6
PRACTICAL & SESSIONAL											
3	PCC	7CS4-21	Internet of Things Lab	0	0	4	2	60	40	100	2
4	PCC	7CS4-22	Cyber Security Lab	0	0	4	2	60	40	100	2
6	PSIT	7CS7-30	Industrial Training	1	0	0				125	2.5
7	PSIT	7CS7-40	Seminar	2	0	0				100	2
8	SODE CA	7CS8-00	Social Outreach, Discipline &Extra Curricular Activities							25	0.5
		Sub- Total		0	0	10	4	120	80	450	9
		TOTAL OF VII SEMESTER		6	0	10	10	180	320	750	15

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

B.Tech: Computer Science & Engineering 4th Year - VIII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC/PEC	8CS4-01	Big Data Analytics	3	0	0	3	30	120	150	3
2	OE		Open Elective - II	3	0	0	3	30	120	150	3
Sub Total				6	0	0	6	60	240	300	6
PRACTICAL & SESSIONAL											
3	PCC	8CS4-21	Big Data Analytics Lab	0	0	2	2	30	20	50	1
4	PCC	8CS4-22	Software Testing and Validation Lab	0	0	2	2	30	20	50	1
5	PSIT	8CS7-0	Project	3	0	0				450	7
6	SODE CA	8CS8-00	Social Outreach, Discipline & Extra Curricular Activities							25	0.5
Sub- Total				0	0	4	4	120	80	475	9.5
TOTAL OF VIII SEMESTER				6	0	4	10	180	320	775	15.5

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

List of Open Electives for Computer Science & Engineering

Subject Code	Title	Subject Code	Title
Open Elective - I		Open Elective - II	
7AG6-60.1	Human Engineering and Safety	8AG6-60.1	Energy Management
7AG6-60.2	Environmental Engineering and Disaster Management	8AG6-60.2	Waste and By-product Utilization
7AN6-60.1	Aircraft Avionic System	8AN6-60.1	Finite Element Methods
7AN6-60.2	Non-Destructive Testing	8AN6-60.2	Factor of Human Interactions
7CH6-60.1	Optimization Techniques	8CH6-60.1	Refinery Engineering Design
7CH6-60.2	Sustainable Engineering	8CH6-60.2	Fertilizer Technology
7CR6-60.1	Introduction to Ceramic Science & Technology	8CR6-60.1	Electrical and Electronic Ceramics
7CR6-60.2	Plant, Equipment and Furnace Design	8CR6-60.2	Biomaterials
7CE6-60.1	Environmental Impact Analysis	8CE6-60.1	Composite Materials
7CE6-60.2	Disaster Management	8CE6-60.2	Fire and Safety Engineering
7EE6-60.1	Electrical Machines and Drives	8EE6-60.1	Energy Audit and Demand side Management
7EE6-60.2	Power Generation Sources.	8EE6-60.2	Soft Computing
7EC6-60.1	Principle of Electronic communication	8EC6-60.1	Industrial and Biomedical applications of RF Energy
7EC6-60.2	Micro and Smart System Technology	8EC6-60.2	Robotics and control
7ME6-60.1	Finite Element Analysis	8ME6-60.1	Operations Research
7ME6-60.2	Quality Management	8ME6-60.2	Simulation Modeling and Analysis
7MI6-60.1	Rock Engineering	8MI6-60.1	Experimental Stress Analysis
7MI6-60.2	Mineral Processing	8MI6-60.2	Maintenance Management
7PE6-60.1	Pipeline Engineering	8PE6-60.1	Unconventional Hydrocarbon Resources
7PE6-60.2	Water Pollution control Engineering	8PE6-60.2	Energy Management & Policy
7TT6-60.1	Technical Textiles	8TT6-60.1	Material and Human Resource Management
7TT6-60.2	Garment Manufacturing Technology	8TT6-60.2	Disaster Management

SYLLABUS

1FY2-01: Engineering Mathematics-I

Credit: 4
3L+1T+0P

Max. Marks: 200 (IA:40, ETE:160)
End Term Exam: 3 Hou

SN	Course Code	Course Outcomes
1	CO11201.1	Learner will be skilled to estimate volume and surface area of the solid formed by revolution of different curves. Also workout definite integral through Beta and Gamma functions.
2	CO11201.2	Students will be familiar with the concept of sequence, monotonic sequence, Cauchy's sequence and infinite series. Also workout various method to test convergence and divergence of sequence and infinite series.
3	CO11201.3	Learner will be competent to express a function in term of a series of sine and cosine.
4	CO11201.4	Students will be able to estimate maxima and minima of multivariable functions using the concept of partial differentiation. Further workout limit, continuity and differentiability of two variable functions.
5	CO11201.5	Learner will be skilled in the technique to evaluate double and triple integration and able to apply the knowledge to determine area, volume, centre of mass and centre of gravity. Further workout vector differentiation and vector integration.

SN	CONTENTS	Hours
1	Calculus: Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	8
2	Sequences and Series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.	6
3	Fourier Series: Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series, Parseval's theorem.	6
4	Multivariable Calculus (Differentiation): Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	10
5	Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	10
TOTAL		40

Suggested Readings:

1. Thomas' Calculus, George B. Thomas, Jr., Maurice D. Weir, Joel R. Hass, Pearson Educations.
2. Calculus with Early Transcendental Functions, James Stewart, Cengage Learning Publication.
3. Engineering Mathematics, C.B. Gupta, S.R. Singh and Mukesh Kumar, McGraw Hill Education.
4. Engineering Mathematics, S. Pal and S.C. Bhunia, Oxford University Press.
5. Higher Engineering Mathematics, B.V. Ramana, McGraw Hill Education.
6. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley

Engineering Mathematics-II

Credit: 4
3L+1T+0P

Max. Marks: 200 (IA:40, ETE:160)
End Term Exam: 3 Hours

SN	Course Code	Course Outcomes
1	CO11201.1	Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Cayley Hamilton Theorem to find inverse of matrix which is very important in many engineering application.
2	CO11201.2	Students understand various methods to solve ordinary differential equation of first and Higher order. Which place important role in all branches of Engineering.
3	CO11201.3	Students understand various methods to solve ordinary differential equation of second order with variable coefficient which is useful for solving the practical problems which arise in the industry.
4	CO11201.4	To Understand the concept of PDE, including formation and solution of linear and non linear PDE. Further discussion about Lagrange's method, standard form and Charpit method to solve PDE.
5	CO11201.5	To understand the classification of second order PDE including the solution of one dimensional wave and Heat equation by method of separation of variables with boundary condition.

SN	CONTENTS	Hours
1	Matrices: Rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.	10
2	First order ordinary differential equations: Linear and Bernoulli's equations, Exact equations, Equations not of first degree: equations solvable for p , equations solvable for y , equations solvable for x and Clairaut's type.	6
3	Ordinary differential equations of higher orders: Linear Differential Equations of Higher order with constant coefficients, Simultaneous Linear Differential Equations, Second order linear differential equations with variable coefficients: Homogenous and Exact forms, one part of CF is known, Change of dependent and independent variables, method of variation of parameters, Cauchy- Euler equation; Power series solutions including Legendre differential equation and Bessel differential equations.	12
4	Partial Differential Equations – First order: Order and Degree, Formation; Linear Partial differential equations of First order, Lagrange's Form, Non Linear Partial Differential equations of first order, Charpit's method, Standard forms.	6
5	Partial Differential Equations– Higher order: Classification of Second order partial differential equations, Separation of variables method to simple problems in Cartesian coordinates including two dimensional Laplace, one dimensional Heat and one dimensional Wave equations.	6
TOTAL		40

Suggested Readings:

1. Advanced Engineering Mathematics, Peter O Neil, Cengage Learning Publication.
2. Advanced Engineering Mathematics, 4th Edition, Dennis G. Zill, Warren S. Wright, Jones & Bartlett

Publications.

3. Engineering Mathematics, S. Pal and S.C. Bhunia, Oxford University Press.
4. Engineering Mathematics, C.B. Gupta, S.R. Singh and Mukesh Kumar, McGrawHill Education.
5. Advanced Engineering Mathematics, Jain and Iyengar, Narosa Publications.
6. Higher Engineering Mathematics, B.V. Ramana, McGraw Hill Education.
7. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley.

1FY2-02/ 2FY2-02: Engineering Physics

Credit: 4
3L+1T+0P

Max. Marks: 200 (IA:40, ETE:160)
End Term Exam: 3 Hours

SN	Course Code	Course Outcomes
1	CO12201.1	Understand the concept of interference and diffraction to explain various wave optical phenomena
2	CO12201.2	To develop the concept of quantum mechanics and apply the knowledge to 1D and 3D potential box problem
3	CO12201.3	Understand the concept of coherence in source of light and basics of an optical fibre: working principle and construction, NA and acceptance angle of an Optical Fibre
4	CO12201.4	Understand the working of a LASER and basics of material science & characterization of materials
5	CO12201.5	Understanding Electromagnetism with the help of Maxwell's equation and formulate the electromagnetic energy transformation theorem.

SN	CONTENTS	Hours
1	Wave Optics: Newton's Rings, Michelson's Interferometer, Fraunhofer Diffraction from a Single Slit. Diffraction grating: Construction, theory and spectrum, Resolving power and Rayleigh criterion for limit of resolution, Resolving power of diffraction grating, X-Ray diffraction and Bragg's Law.	9
2	Quantum Mechanics: Introduction to quantum Mechanics, Wave-particle duality, Matter waves, Wave function and basic postulates, Time dependent and time independent Schrodinger's Wave Equation, Physical interpretation of wave function and its properties, Applications of the Schrodinger's Equation: Particle in one dimensional and three dimensional boxes.	6
3	Coherence and Optical Fibers: Spatial and temporal coherence: Coherence length; Coherence time and „Q“ factor for light, Visibility as a measure of Coherence and spectral purity, Optical fiber as optical wave guide, Numerical aperture; Maximum angle of acceptance and applications of optical fiber.	4
4	Laser: Einstein's Theory of laser action; Einstein's coefficients; Properties of Laser beam, Amplification of light by population inversion, Components of laser, Construction and working of He-Ne and semiconductor lasers, Applications of Lasers in Science, engineering and medicine.	6
5	Material Science & Semiconductor Physics: Bonding in solids: covalent and metallic bonding, Energy bands in solids: Classification of solids as Insulators, Semiconductors and Conductors, Intrinsic and extrinsic semiconductors, Fermi dirac distribution function and Fermi energy, Conductivity in semiconductors, Hall Effect: Theory, Hall Coefficient and applications.	7
6	Introduction to Electromagnetism: Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential, Bio-Savart law, Divergence and curl of static magnetic field, Faraday's law, Displacement current and magnetic field arising from time dependent electric field, Maxwell's equations, Flow of energy and Poynting vector.	8
TOTAL		40

Suggested Readings:

1. Engineering Physics: Malik and Singh (Tata McGraw Hill)
2. Engineering Physics: Naidu (Pearson)
3. Optics : Ajay Ghatak (Tata McGraw Hill)

4. Concept of Modern Physics: A. Baisier (Tata McGraw Hill)
5. Fundamental of Optics : Jetkins and White (Tata McGraw Hill)
6. Material Science: Smith (McGraw Hill)

1FY2-03/ 2FY2-03: Engineering Chemistry**Credit: 4
3L+1T+0P****Max. Marks: 200 (IA:40, ETE:160)****End Term Exam: 3 Hours**

SN	Course Code	Course Outcomes
1	CO11203.1	Differentiation between hard and soft water, solve the related numerical problems on water treatment; and its application in industries and daily life
2	CO11203.2	Comprehension of various types of fuel, instrumental techniques for analysis and solve the numerical problems related to it
3	CO11203.3	Identification of corrosion and application of its knowledge to protect the metal
4	CO11203.4	Developing basic knowledge of Inorganic Engineering materials viz. cement, glass, lubricants
5	CO11203.5	basic knowledge of organic reaction mechanism and introduction of drugs

SN	CONTENTS	Hours
1	Water: Common impurities, hardness, determination of hardness by complexometric (EDTA method), Degree of hardness, Units of hardness Municipal water supply: Requisite of drinking water, Purification of water; sedimentation, filtration, disinfection, breakpoint chlorination. Boiler troubles: Scale and Sludge formation, Internal treatment methods, Priming and Foaming, Boiler corrosion and Caustic embrittlement Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process. Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process.	10
2	Organic Fuels: Solid fuels: Coal, Classification of Coal, Proximate and Ultimate analyses of coal and its significance, Gross and Net Calorific value, Determination of Calorific value of coal by Bomb Calorimeter. Metallurgical coke, Carbonization processes; Otto-Hoffmann by-product oven method. Liquid fuels : Advantages of liquid fuels, Mining, Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number Gaseous fuels; Advantages, manufacturing, composition and Calorific value of coal gas and oil gas, Determination of calorific value of gaseous fuels by Junker's calorimeter, Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulong's formula, proximate analysis & ultimate and combustion of fuel.	10
3	Corrosion and its control: Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion. Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.	3
4	annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. Emulsification and steam emulsion number.	10
5	Organic reaction mechanism and introduction of drugs: Organic reaction mechanism: Substitution; SN1, SN2, Electrophilic aromatic substitution in benzene, free radical halogenations of alkanes, Elimination; elimination in alkyl halides, dehydration of alcohols, Addition: electrophilic and free radical addition in alkenes, nucleophilic addition in aldehyde and ketones, Rearrangement; Carbocation and free radical rearrangements Drugs : Introduction, Synthesis, properties and uses of Aspirin, Paracetamol	7
TOTAL		40

Suggested Readings:

1. Engineering Chemistry by Monica Jain and P C Jain, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
2. Engineering Chemistry Wiley, India.
3. The Chemistry and Technology of Coal, by J G Speigh, CRC Press.

4. The Chemistry and Technology of Petroleum, by J G Speigh, CRC Press.
5. Polymer Chemistry: An Introduction, Malcolm P. Stevens, Oxford University Press.
6. Lubricants and Lubrication, Theo Mang, Wilfried, Wiley-VCH.

1FY1-04/ 2FY1-04: Communication Skills

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Course Code	Course Outcomes
1	CO11104.1 & CO12104.1	Students will be able to understand and develop communication skills and techniques which will felicitate their ability to work collaboratively with others.
2	CO11104.2 & CO12104.2	Students will be able to use English grammar accurately that will increase their confidence in English writing and speaking.
3	CO11104.3& CO12104.3	Students will be able to invent, draft, organize, abstract, elaborate and synthesize their own and other's ideas in formatted way.
4	CO11104.4 & CO12104.4	Students will be able to understand literary devices after reading stories and also leran about parts of speech and vocabulary..
5	CO11104.5 & CO12104.5	Students will be able to understand literary devices and figure of speech after reading poems and also apprecaite art in all forms.

SN	CONTENTS	Hours
1	Communication: Meaning, Importance and Cycle of Communication. Media and Types of Communication. Verbal and Non-Verbal Communication. Barriers to communication. Formal and Informal Channels of Communication (Corporate Communication). Divisions of Human Communication and Methods to improve Interpersonal Communication. Qualities of good communication.	5
2	Grammar: Passive Voice. Reported Speech. Conditional Sentences. Modal Verbs. Linking Words (Conjunctions)	5
3	Composition: Job Application and Curriculum-Vitae Writing. Business Letter Writing. Paragraph Writing. Report Writing.	5
4	Short Stories: “Luncheon” by Somerset Maugham.“How Much Land Does a Man Need?” by Count Leo Tolstoy. “The Night Train at Deoli” by Ruskin Bond.	5
5	Poems: “No Men are Foreign” by James Kirkup. “If” by Rudyard Kipling. “Where the Mind is without Fear” by Rabindranath Tagore.	5
TOTAL		25

Suggested Readings:

1. Communication Skills, Pushplata & Sanjay Kumar, Oxford University Press, India.
2. The Written Word, Vandana Singh, Oxford University Press, India.
3. Current English Grammar and Usage with Composition, R. P. Sinha, Oxford University Press, India.
4. Rodriques M. V., ‘Effective Business Communication’, Concept Publishing Company, New Delhi, 1992 reprint (2000).
5. Bansal, R K and Harrison J B, ‘Spoken English’ Orient Longman, Hyderabad.
6. Binod Mishra & Sangeeta Sharma, ‘Communication Skills for Engineers and Scientists, PHI Learning Private Ltd, New Delhi, 2011.
7. Gartside L. ‘Modern Business Correspondence, Pitman Publishing, London.

1FY1-05/ 2FY1-05: Human Values

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Course Code	Course Outcomes
1	CO11105.1 & CO12105.1	Students will understand the importance of Happiness Through Identification Of Human Values and Skills.
2	CO11105.2 & CO12105.1	Students will understand the role of basic human aspirations in self and people around them.
3	CO11105.3 & CO12105.1	Students will understand about the harmony in family, in society and practically understand the importance of trust and respect as foundational value of relationship
4	CO11105.4 & CO12105.1	Students will understand the interconnectedness among the four orders of nature, recyclability, coexistence and harmony at all level of existence
5	CO11105.5 & CO12105.1	Students will understand to be prepared for humanistic education, professional competence with ethics and humanistic universal order.

S N	CONTENTS	Hour s
1	<p>Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</p> <p>Understanding the need, basic guidelines, Self Exploration - its content and process; „Natural Acceptance“ and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels</p>	5
2	<p>Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient „I“ and the material „Body“ Understanding the needs of Self („I“) and „Body“ - Sukh and Suvidha Understanding the Body as an instrument of „I“, Understanding the characteristics and activities of „I“ and harmony in „I“ Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.</p>	5
3	<p>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</p> <p>Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) , meaning of Vishwas; Difference between intention and competence, meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals , Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family.</p>	5
4	<p>Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</p> <p>Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all pervasive Space. Holistic perception of harmony at all levels of existence</p>	5

5	<p>Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, (b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: (a). At the level of individual: as socially and ecologically responsible engineers, technologists and managers. (b). At the level of society: as mutually enriching institutions and organization. Case studies related to values in professional life and individual life.</p>	5
TOTAL		25

Suggested Readings:

1. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009. ISBN: 978-9-350-62091-5
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
5. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
6. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
7. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
8. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
9. A N Tripathy, 2003, Human Values, New Age International Publishers.
10. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
11. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
12. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
13. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
14. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

1FY3-06/ 2FY3-06: Programming for Problem Solving

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Course Code	Course Outcomes
1	CO11306.1	To get the basic knowledge of computer & problem solving through algorithms & flowchart.
2	CO11306.2	To translate the algorithms to programs & execution (in C language).
3	CO11306.3	To implement conditional branching, iteration.
4	CO11306.4	To decompose a problem into functions and to develop modular reusable code.
5	CO11306.5	To use arrays, pointers and structures to develop algorithms and programs.

S N	CONTENTS	Hours
1	Fundamentals of Computer: Stored program architecture of computers, Storage device- Primary memory, and Secondary storage, Random, Direct, Sequential access methods, Concepts of High-level, Assembly and Low-level languages, Representing algorithms through flowchart and pseudo code.	8
2	Number system: Data representations, Concepts of radix and representation of numbers in radix r with special cases of r=2, 8, 10 and 16 with conversion from radix r1 to r2, r's and (r-1)'s complement, Binary addition, Binary subtraction, Representation of alphabets.	8
3	C Programming: Problem specification, flow chart, data types, assignment statements, input output statements, developing simple C programs, If statement, for loops, while loops, do-while loops, switch statement, break statement, continue statement, development of C programs using above statements, Arrays, functions, parameter passing, recursion, Programming in C using these statements, Structures, files, pointers and multi file handling.	12
TOTAL		28

Suggested Readings:

1. Fundamental of Computers By R. Thareja, Oxford University Press.
2. Programming in ANSI C by E Balagurusamy, Tata McGraw-Hill Education.
3. The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, PHI.
4. C:The Complete Reference by Herbert Schildt, McGraw-Hill Education.
5. Let us C by Yashavant P. Kanetkar, bpb publications
6. Programming in C by Thareja, Oxford University Press
7. Graphics Under C by Yashavant P. Kanetkar, bpb publications.

1FY3-07/ 2FY3-07: Basic Mechanical Engineering

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Course Code	Course Outcomes
1	CO11307.1 & CO12307.1	Students will be able to understand the introduction of mechanical engineering and develop knowledge about steam boilers, steam turbines and power plants.
2	CO11307.2 & CO12307.2	Students will be able to conclude basics of centrifugal, reciprocation pumps and Internal Combustion Engine. Students will be able to create knowledge of various types of refrigeration and air conditioning systems with their applications.
3	CO11307.3 & CO12307.3	Students will be able to analyze basics of different types power transmission systems such as belt, rope, gears and gear trains
4	CO11307.4 & CO12307.4	Students will be able to illustrate working of different manufacturing processes
5	CO11307.5 & CO12307.5	Students will be able to identify different engineering materials their, properties and various types of heat treatment processes

SN	CONTENTS
1	Fundamentals: Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.
2	Pumps and IC Engines: Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.
3	Refrigeration and Air Conditioning: Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.
4	Transmission of Power: Introduction and types of Belt and Rope Drives, Gears.
5	Primary Manufacturing Processes: Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.
6	Engineering Materials and Heat Treatment of Steel: Introduction to various engineering materials and their properties.

Suggested Readings:

1. G. Shanmugam and S Ravindran, Basic Mechanical Engineering, Mc Graw hill, fourth edition.
2. K Venu Gopal and Prabhu Raja V, Basic Mechanical Engineering, Anuradha agencies pub, Chennai.

1FY3-08/ 2FY3-08: Basic Electrical Engineering

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Course Code	Course Outcomes
1	CO12308.1	Ability to solve circuit using different kind of methods and theorems.
2	CO12308.2	Ability to know the behaviors of basic electrical elements like resistor, inductor and capacitor.
3	CO12308.3	Students will be able to know the behaviors of transformer.
4	CO12308.4	Students will be able to know the behaviors of AC and DC machines.
5	CO12308.5	Students can use electronics components in the circuit after understanding its properties. Ability to know the behavior of LT switchgear, earthing and electrical power measurement

S N	CONTENTS	Hours
1	DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Series-Parallel circuits, Node voltage method, Mesh current method, Superposition, Thevenin's, Norton's and Maximum power transfer theorems.	5
2	AC Circuits: Representation of sinusoidal waveforms, peak and r.m.s values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	4
3	Transformers: Ideal and practical transformer, EMF equation, equivalent circuit, losses in transformers, regulation and efficiency.	4
4	Electrical Machines: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor, single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators.	7
5	Power Converters: Semiconductor PN junction diode and transistor (BJT). Characteristics of SCR, power transistor and IGBT. Basic circuits of single phase rectifier with R load, Single phase Inverter, DC-DC converter.	4
6	Electrical Installations: Layout of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing. Power measurement, elementary calculations for energy consumption.	4
TOTAL		28

Suggested Readings:

1. Basic Electrical and Electronics Engineering by Sukhija and Nagsarkar, Oxford Publication
2. Basic Electrical & Electronics Engineering by Kothari, Nagrath, TMH
3. Basic Electrical & Electronics Engineering by V. Jagathesan, K. Vinod Kumar & R. Saravan Kumar, Wiley India.
4. Basic Electrical & Electronics Engineering by Prasad/Sivanagraju, Cengage learning Indian Edition
5. Basic Electrical and Electronics Engineering by Muthusubramaniam, TMH
6. Fundamentals of Electrical and Electronics Engineering by Ghosh, Smarajit, PHI India
7. Basic Electrical & Electronics Engineering by Ravish Singh, TMH
8. Electrical and Electronic Technology by Edward Hughes et al, Pearson Publication

1FY3-09/ 2FY3-09: Basic Civil Engineering

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Course Code	Course Outcomes
1	CO12309.1	Role of civil engineer and impact of infrastructure on society will be understood to student.
2	CO12309.2	Principles of surveying and leveling will be known to student.
3	CO12309.3	Student will be able to understand about foundation and parts of building
4	CO12309.4	Importance of traffic engineering will be known to students.
5	CO12309.5	Students will understand about problem related to environment.

S N	CONTENTS	Hours
1	Introduction to objective, scope and outcome the subject	1
2	Introduction: Scope and Specialization of Civil Engineering, Role of civil Engineer in Society, Impact of infrastructural development on economy of country.	2
3	Surveying: Object, Principles & Types of Surveying; Site Plans, Plans& Maps; Scales & Unit of different Measurements. Linear Measurements: Instruments used. Linear Measurement by Tape, Ranging out Survey Lines and overcoming Obstructions; Measurements on sloping ground; Tape corrections, conventional symbols. Angular Measurements: Instruments used; Introduction to Compass Surveying, Bearings and Longitude & Latitude of a Line, Introduction to total station. Levelling: Instrument used, Object of levelling, Methods of levelling in brief, Contour maps.	8
4	Buildings: Selection of site for Buildings, Layout of Building Plan, Types of buildings, Plinth area, carpet area, floor space index, Introduction to building byelaws, concept of sun light and ventilation. Components of Buildings & their functions, Basic concept of R.C.C., Introduction to types of foundation.	3
5	Transportation: Introduction to Transportation Engineering; Traffic and Road Safety: Types and Characteristics of Various Modes of Transportation; Various Road Traffic Signs, Causes of Accidents and Road Safety Measures.	2
6	Environmental Engineering: Environmental Pollution, Environmental Acts and Regulations, Functional Concepts of Ecology, Basics of Species, Biodiversity, Ecosystem, Hydrological Cycle; Chemical Cycles: Carbon, Nitrogen & Phosphorus; Energy Flow in Ecosystems. Water Pollution: Water Quality standards, Introduction to Treatment & Disposal of Waste Water. Reuse and Saving of Water, Rain Water Harvesting. Solid Waste Management: Classification of Solid Waste, Collection, Transportation and Disposal of Solid. Recycling of Solid Waste: Energy Recovery, Sanitary Land fill, On-Site Sanitation. Air & Noise Pollution: Primary and Secondary air pollutants, Harmful effects of Air Pollution, Control of Air Pollution. . Noise Pollution Harmful Effects of noise pollution, control of noise pollution, Global warming & Climate Change, Ozone depletion, Green House effect	4
TOTAL		28

Suggested Readings:

1. Palancharmy, Basic Civil Engineering, McGraw Hill publishers.
2. Sathesh Gopi, Basic Civil Engineering, Pearson Publishers.
3. Ketki Ranwala Dalal, Essentials of Civil Engineering, Charotar Publishing House.

1FY2-20/ 2FY2-20: Engineering Physics Lab

Credit: 1

Max. Marks: 50 (IA:30, ETE:20)

SN	Course Code	Course Outcomes
1	CO11220.1 & CO12220.1	Student will be able to measure the wavelength of light using Michelson's Interferometer, Newton's Ring and Diffraction Grating, dispersive power of a prism, numerical aperture of an optical fibre, coherence length as well as coherence time of a He-Ne LASER using Michelson's Interferometer and thereby learn the optical phenomena of classical and quantum wave optics.
2	CO11220.2 & CO12220.2	Student will be able to measure the bandgap of a semiconductor material and Hall coefficient of a semiconductor by measuring its Hall voltage and thereby learn the experimental technique to measure energy band gap and Hall coefficient of a semiconductor and learn to identify the type of semiconductor (p-type or n-type)
3	CO11220.3 & CO12220.3	Student will be able to measure the height of a distant object using Sextant and hence learn the use of a sextant to measure angle of inclination as well as learn the use of trigonometric ratios to find various distances.
4	CO11220.4 & CO12220.4	Student will be able to measure the time constant of a RC circuit, specific resistance of a wire by Carry Foster's bridge and hence learn the charging and discharging behavior of a capacitor.

1.	To determine the wave length of monochromatic light with the help of Michelson's interferometer.
2.	To determine the wave length of sodium light by Newton's Ring.
3.	To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
4.	Determination of band gap using a P-N junction diode.
5.	To determine the height of given object with the help of sextant.
6.	To determine the dispersive power of material of a prism with the help of spectrometer.
7.	To study the charge and discharge of a condenser and hence determine the same constant (both current and voltage graphs are to be plotted).
8.	To determine the coherence length and coherence time of laser using He – Ne laser.
9.	To measure the numerical aperture of an optical fibre.
10.	To study the Hall Effect and determine the Hall Voltage and Hall coefficients.

1FY2-21/ 2FY2-21: Engineering Chemistry Lab**Credit: 1****Max. Marks: 50 (IA:30, ETE:20)****0L+0T+2P**

S. No	Course Code	Course Outcomes
1.	CO11122.1 & CO12122.1	students will learn to pronounce and transcribe words after learning various phonetic symbols. They can also use these phonetics to improve their pronunciation.
2	CO11122.1 & CO12122.2	students will get a revised knowledge of synonyms , antonyms and word formation.
3	CO11122.1 & CO12122.3	students will be able to give seminar presentation on different topics and have a knowledge of group discussion.
1.	Determination the hardness of water by EDTA method	
2.	Determination of residual chlorine in water	
3.	Determination of dissolved oxygen in water	
4.	Determination of the strength of Ferrous Ammonium sulphate solution with the help of K ₂ Cr ₂ O ₇ solution by using diphenyl amine indicator	
5.	Determination of the strength of CuSO ₄ solution iodometrically by using hypo solution	
6.	Determination of the strength of NaOH and Na ₂ CO ₃ in a given alkali mixture	
7.	Proximate analysis of Coal	
8.	Determination of the flash & fire point and cloud & pour point of lubricating oil	
9.	Determination of the kinematic viscosity of lubricating oil by Redwood viscometer no. 1 at different temperature	
10.	Synthesis of Aspirin/ Paracetamol	

1FY2-22/ 2FY2-22: Language Lab**Credit:1** **Max. Marks: 50 (IA:30, ETE:20)****0L+0T+2P**

S. No	Course Code	Course Outcomes
1	CO11123 & CO12123.1	Students will understand the importance of happiness and prosperity through identification of human values and skills.
2	CO11123 & CO12123.2	Students will understand the role of basic human aspirations, about harmony in family, society and the importance of trust and respect.
3	CO11123 & CO12123.3	Students will understand about the interconnectedness among the four orders of nature, recyclability, coexistence, professional ethics and competence.

<ol style="list-style-type: none">1. Phonetic Symbols and Transcriptions.2. Extempore.3. Group Discussion.4. Dialogue Writing.5. Listening comprehension.

Suggested Readings:

1. Technical Communication: principles and Practice, Meenakshi Raman & Sangeeta Sharma, Oxford University Press, India.
2. Effective Technical Communication, Barun K. Mitra, Oxford University Press, India.
3. Binod Mishra & Sangeeta Sharma, 'Communication Skills for Engineers and Scientists, PHI Learning Private Ltd, New Delhi, 2011.
4. Communication Skills, Pushplata & Sanjay Kumar, Oxford University Press, India.
5. Bhattacharya, Indrajit, An Approach to Communication Skills, Dhanpat Rai & Co. (Pvt) Ltd., New Delhi.
6. Wright, Crissy, Handbook of Practical Communication Skills, Jaico Publishing House, Mumbai.
7. Gimson, A C, 'An Introduction to the Pronunciation of English', ELBS.

1FY1-23/ 2FY1-23: Human Values Activities and Sports

Credit: 1	Max. Marks: 50 (IA:30, ETE:20)
0L+0T+2P	
CO12105.1	Students will understand the importance of Happiness Through Identification Of Human Values and Skills.
CO12105.2	Students will understand the role of basic human aspirations in self and people around them.
CO11105.3	Students will understand about the harmony in family, in society and practically understand the importance of trust and respect as foundational value of relationship
CO11105.4	Students will understand the interconnectedness among the four orders of nature, recyclability, coexistence and harmony at all level of existence
CO11105.5	Students will understand to be prepared for humanistic education, professional competence with ethics and humanistic universal order.

PS 1:

Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them.

PS 2:

Now-a-days, there is a lot of talk about many techno-genic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion?

On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

PS 3:

1. Observe that each of us has the faculty of „Natural Acceptance“, based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our „Natural Acceptance“ and may a time it is also clouded by our strong per-conditioning and sensory attractions).

Explore the following:

- (i) What is „Naturally Acceptable“ to you in relationship the feeling of respect or disrespect for yourself and for others?
- (ii) What is „naturally Acceptable“ to you - to nurture or to exploit others? Is your living in accordance with your natural acceptance or different from it?

2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

PS 4:

1. a. Observe that any physical facility you use, follows the given sequence with time:
Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable
b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your important activities. Observe whether the activity is of „I“ or of Body or with the participation of both or with the participation of both „I“ and Body.
Observe the activities within „I“. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

PS 5:

1. Write a narration in the form of a story, poem, skit or essay to clarify a salient Human Value to the children.
2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.

PS 6:

List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature. Analyse and explain the aspect of mutual fulfillment of each unit with other orders.

PS 7:

Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basis of natural acceptance of human values? If so, how should one proceed in this direction from the present situation?

PS 8:

1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order.
2. Propose a broad outline for humanistic Constitution at the level of Nation.

Project:

3. **Every student required to take-up a social project e.g. educating children in needy/weaker section; services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college.**

Sports:

- a) Planning in Sports,
- b) Sports & Nutrition
- c) Yoga and Life style
- d) Measures Physical Education & Sports for CWSN (Children with Special needs - Divyang)
- e) Children & Sports
- f) Women & Sports
- g) Test & Measurement in Sports
- h) Physiology & Sports
- i) Sports Medicine
- j) Kinesiology, Biomechanics & Sports
- k) Psychology & Sports
- l) Training in Sports

1FY3-24/ 2FY3-24: Computer Programming Lab

Credit: 1.5

Max. Marks: 75 (IA:45, ETE:30)

0L+0T+3P

SN	Course Code	Course Outcomes
1	CO11324.1 & CO12324.1	To Design, implement, test and debug programs in C
2	CO11324.2 & CO12324.2	To implement and learn conditional statements.
3	CO11324.3 & CO12324.3	To implement the different types of array and its applications.
4	CO11324.4 & CO12324.4	To imply practical applications of structure and union.
5	CO11324.5 & CO12324.5	To implement the concept of File Handling.

1. To learn about the C Library, Preprocessor directive, Input-output statement.
2. Programs to learn data type, variables, If-else statement
3. Programs to understand nested if-else statement and switch statement
4. Programs to learn iterative statements like while and do-while loops
5. Programs to understand for loops for iterative statements
6. Programs to learn about array and string operations
7. Programs to understand sorting and searching using array
8. Programs to learn functions and recursive functions
9. Programs to understand Structure and Union operation
10. Programs to learn Pointer operations
11. Programs to understand File handling operations
12. Programs to input data through Command line argument

1FY3-25/ 2FY3-25: Manufacturing Practices Workshop

Credit: 1.5	Max. Marks: 75 (IA:45, ETE:30)	
0L+0T+3P		
SN	Course Code	Course Outcomes
1	CO11325.1 & CO12325.1	Student will be able to understand the basic tools and operations of carpentry shop with preparation of a simple joint
2	CO11325.2 & CO12325.2	Student will be able to understand the basics of foundry shop with preparation of sand mould and casting of simple pattern
3	CO11325.3 & CO12325.3	Students will be able to describe the basic tools used in welding shop with preparation of lap and butt joint
4	CO11325.4 & CO12325.4	Students will be able to learn about various parts and operations on Lathe machine with preparation of job
5	CO11325.5 & CO12325.5	Students will be able to understand the various tools and operations of fitting shop with preparation of job
<p>Carpentry Shop</p> <ol style="list-style-type: none"> 1. T – Lap joint 2. Bridle joint <p>Foundry Shop</p> <ol style="list-style-type: none"> 3. Mould of any pattern 4. Casting of any simple pattern <p>Welding Shop</p> <ol style="list-style-type: none"> 5. Lap joint by gas welding 6. Butt joint by arc welding 7. Lap joint by arc welding 8. Demonstration of brazing, soldering & gas cutting <p>Machine Shop Practice</p> <ol style="list-style-type: none"> 9. Job on lathe with one step turning and chamfering operations <p>Fitting and Sheet Metal Shop</p> <ol style="list-style-type: none"> 10. Finishing of two sides of a square piece by filing 11. Making mechanical joint and soldering of joint on sheet metal 12. To cut a square notch using hacksaw and to drill a hole and tapping 		

1FY3-26/ 2FY3-26: Basic Electrical Engineering Lab

Credit: 1			Max. Marks: 50 (IA:30, ETE:20)
0L+0T+2P			
SN	Course Code	Course Outcomes	
1	CO12326.1	Students can identify basic electrical component and able to test and measure electrical quantities using digital and analog meters.	
2	CO12326.2	Students get basic information about transformer.	
3	CO12326.3	Student will be able to understand about star Delta connection of 3 phase transformer.	
4	CO12326.4	Students get complete information about AC & DC machine by cut out section.	
5	CO12326.5	Students get knowledge of design of different converters and LT switch gears	
<ol style="list-style-type: none"> 1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors. 2. Transformers: Observation of the no-load current waveform on an oscilloscope. Loading of a transformer: measurement of primary and secondary voltages and currents, and power. 3. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).Phase-shifts between the primary and secondary side. 4. Demonstration of cut-out sections of machines: dc machine (commutator- brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine. 5. Torque Speed Characteristic of separately excited dc motor. 6. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear. 			

1FY3-27/ 2FY3-27: Basic Civil Engineering Lab**Credit: 1****Max. Marks: 50 (IA:30, ETE:20)****0L+0T+2P**

SN	Course Code	Course Outcomes
1	CO11327 & CO12327.1	To understand the linear measurement with the help of tape and chain include ranging and laying offset method.
2	CO11327 & CO12327.2	Measurement of bearing of line with help of compass.
3	CO11327 & CO12327.3	To be aware of the of levelling instruments during making of longitudinal and cross section of road and also able to take the measurements using the Total Station.
4	CO11327 & CO12327.4	Determine various water and waste water quality parameter like pH, hardness, and turbidity and solids.
5	CO11327 & CO12327.5	Describe the various water supplies and sanitary fitting.

1. Linear Measurement by Tape:
 - a) Ranging and Fixing of Survey Station along straight line and across obstacles.
 - b) Laying perpendicular offset along the survey line
2. Compass Survey: Measurement of bearing of lines using Surveyor's and Prismatic compass
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
 - a) To determine the reduced levels in closed circuit.
 - b) To carry out profile levelling and plot longitudinal and cross sections for road by Height of Instrument and Rise & Fall Method.
4. To study and take measurements using various electronic surveying instruments like EDM, Total Station etc.
5. To determine pH, hardness and turbidity of the given sample of water.
6. To study various water supply Fittings.
7. To determine the pH and total solids of the given sample of sewage.
8. To study various Sanitary Fittings.

1FY3-28/ 2FY3-28: Computer Aided Engineering Graphics

Credit: 1.5	Max. Marks: 75 (IA:45, ETE:30)	
0L+0T+3P		
SN	Course Code	Course Outcomes
1	CO11328 & CO12328.1	Use the drawing instruments effectively and able to dimension the given figure.
2	CO11328 & CO12328.2	Understand the systematic approach for projection of points & lines.
3	CO11328 & CO12328.3	Able to draw the basic views related to projection of lines & planes.
4	CO11328 & CO12328.4	Understand the theory of section of solid & projection of Section of solid including cylinders , cones, prism.
5	CO11328 & CO12328.5	Understand the fundamentals of computer graphics.

Introduction: Principles of drawing, lines, type of lines, usage of Drawing instruments, lettering, Conic sections including parabola, hyperbola, Rectangular Hyperbola (General method only); Scales-Plain, Diagonal and Vernier Scales.

Projections of Point & Lines: Position of Point, Notation System, Systematic Approach for projections of points, front view & Top view of point, Position of straight lines, line parallel to Both the RPs, Line perpendicular to either of the RPs, Line inclined to one RP and parallel to the other, Line inclined to Both the RPs, Traces of a line (One drawing sheet, one assignment in sketch book).

Projection of Planes: Positions of planes, Terms used in projections of planes, plane parallel to RP, plane inclined to one RP and perpendicular to the other RP, plane perpendicular to Both the RPs, plane Inclined to Both the RPs, True shape of the plane, Distance of a point from plane, Angle between two planes.

Projections of Regular Solids: frustum and truncated solids, those inclined to both the Planes-Auxiliary Views.

Section of Solids: Theory of sectioning, section of prisms and cubes, section of pyramids and Tetrahedron section of Cylinders, section of cones, section of spheres (One drawing sheet, one assignment in sketch book)

Overview of Computer Graphics : Covering theory of CAD software [such as: The menu System, Toolbars (standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of lines, Planes, Simple and compound Solids.

Suggested Readings:

1. Engineering Drawing Geometrical Drawing P.S.Gill , S.K.Katara & Sons
2. Engineering Drawing,Dhanarajay A Jolhe ,Tata McGraw Hill.
3. Engineering Drawing, Basant Agarwal & CM Agarwal ,Tata McGraw Hill
4. Engineering Drawing, N.D.Bhatt, Charotar Publishing House Pvt. Ltd.
5. Engineering Drawing with an introduction to AutoCAD, Dhananjay A Jolhe
6. Engineering Drawing with AutoCAD, B.V.R. Gupta and M. Rajaroy
7. AutoCAD 2017 for Engineers & Designers (Basic and Intermediate), Sham Tickoo,

1FY3-29/ 2FY3-29: Computer Aided Machine Drawing

Credit: 1.5	Max. Marks: 75 (IA:45, ETE:30)	
0L+0T+3 P		
SN	Course Code	Course Outcomes
1	CO11329 & CO12329.1	Use the drawing instruments effectively and able to dimension the given figure.
2	CO11329 & CO12329.2	Understand the systematic approach for projection of points & lines.
3	CO11329 & CO12329.3	Able to draw the basic views related to projection of lines & planes.
4	CO11329 & CO12329.4	Understand the theory of section of solid & projection of Section of solid including cylinders , cones, prism.
5	CO11329 & CO12329.5	Understand the fundamentals of computer graphics.

Introduction: Principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, rules of dimensioning.

Conversion of pictorial views into orthographic views: (1 drawing sheet) Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing view problems covering Principles of Orthographic Projections.

Sectional views of mechanical components: (1 drawing sheet) Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web rib, shaft, pipes, different types of holes, conventions of section lines for different metals and materials.

Fasteners and other mechanical components: (Free hand sketch) Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints. Riveted joints, rivets and riveting, type of rivets, types of riveted joints etc. Bearing: Ball, roller, needle, foot step bearing. Coupling: Protected type, flange, and pin type flexible coupling. Other components: Welded joints, belts and pulleys, pipes and pipe joints, valves etc.

Overview of Computer Graphics: (2 drawing sheets) Covering theory of CAD software such as: The menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (Where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of Lines, Planes, Simple and compound Solids.

II Year Curriculum

III SEMESTER

SUBJECT: 3CS2-01: ADVANCED ENGINEERING MATHEMATICS

CO23201.1	To learn the concepts and principles of Random variable and Probability distribution
CO23201.2	Students are able to apply different probability distribution to identify and solve real life problem.
CO23201.3	To learn the formulation of different mathematical problems into optimization Problems and application in Engineering field.
CO23201.4	Apply the principles of optimization using differential calculus
CO23201.5	Student able to formulate real life problem into linear programming problem , transportation and assignment problem. Get the best solution which helps them in many areas.

Credit-3

Max. Marks : 150 (IA:30,ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Random Variables: Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution. Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.	7
2	Binomial distribution , Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution. Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.	5
3	Historical development , Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	Classical Optimization using Differential Calculus: Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions	6
5	Linear Programming: Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
TOTAL		40

Suggested Readings:

1. Elementary Number Theory with applications: Thomas Koshy, 2nd Ed., Elsevier.
2. Operation Research By Kanti Swaroop, P. K. Gupta & Manmohan, Sultan chand & sons
3. Integral Transform By Dr. R.K. Gupta, A.R. Vashishtha, Krishna Prakashan Mandir Meerut
4. Calculus of Finite Differences & Numerical Analysis By Dr. Gupta & Malik Krishna Prakashan Mandir Meerut

SUBJECT: 4CS1-03: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

CO23103.1	Understand the Economic Concepts and Conventions and will Realize the Need for managerial concepts.
CO23103.2	Understand the practical application of demand and supply.
CO23103.3	Will be able to analyze the how to increase demand of different companies
CO23103.4	Students will be able to Identify economic problems in competitive market.
CO23103.5	Students will be able to understand the concept of financial accounting

Credit-2
2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)
End Term Exam: 2 Hours

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic economic concepts- Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	Demand and Supply analysis- Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	Production and Cost analysis- Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	Financial statement analysis- Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds- flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
TOTAL		26

Suggested Readings:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

SUBJECT: 3CS3-04: DIGITAL ELECTRONICS

CO23304.1	Develop the understanding of number system and its application in digital electronics.
CO23304.2	Development and analysis of K-map to solve the Boolean function to the simplest form for the implementation of compact digital circuits.
CO23304.3	Acquire knowledge about various logic gates and logic families and analyze basic circuits of these families.
CO23304.4	Develop ability to identify, analyze and design combinational circuits like half adder full adder, MUX, DEMUX encoder, decoder.
CO23304.5	Develop ability to design various synchronous and asynchronous sequential circuits like registers FLIP FLOP, and counters.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Fundamental concepts: Number systems and codes, Basic logic Gates and Boolean algebra: Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra.	8
2	Minimization Techniques and Logic Gates: Principle of Duality - Boolean expression -Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine - McCluskey method of minimization.	8
3	Digital Logic Gate Characteristics: TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS& CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET.	8
4	Combinational Circuits: Combinational logic circuit design, adder, subtractor, BCD adder encoder, decoder, BCD to 7-segment decoder, multiplexer demultiplexer.	8
5	Sequential Circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave Characteristic table and equation, counters and their design, Synchronous counters – Synchronous Up/Down counters – Programmable counters – State table and state transition diagram ,sequential circuits design methodology. Registers –shift registers.	8
TOTAL		40

Suggested Readings:

1. Digital integrated electronics, By Herbert Taub, Donald L. Schilling, TMH
2. Digital Logic and Computer Design By M. Morris Mano, Pearson
3. Modern Digital Electronics By R.P. Jain, TMH
4. Fundamentals of Digital circuits By A. Anand kumar, PHI
5. Digital circuit design By S. Salivahanan, Sarivazhagan, Vikas publications

SUBJECT: 3CS4-05: DATA STRUCTURES AND ALGORITHMS

CO23405.1	To impart the basic concepts of data structures and algorithms.
CO23405.2	To understand concepts about searching and sorting techniques.
CO23405.3	To Understand basic concepts about stacks, queues, lists, trees and graphs.
CO23405.4	To understanding about writing algorithms and step by step approach in solving, problems with the help of fundamental data structures.
CO23405.5	To impart the basic concepts of data structures and algorithms.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Stacks: Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.	8
2	Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues-Round Robin Algorithm. Circular Queues, DeQueue Priority Queues. Linked Lists:Introduction, single linked list, representation of a linked list in memory, Different Operations on a Single linked list, Reversing a single linked list, Advantages and disadvantages of single linked list, circular linked list, double linked list and Header linked list.	10
3	Searching Techniques: Sequential and binary search.Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort and counting sorting algorithms.	7
4	Trees: Definition of tree, Properties of tree, Binary Tree, Representation of Binary trees using arrays and linked lists, Operations on a Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B-tree , B+ tree, AVL tree, Threaded binary tree.	7
5	Graphs: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree(Prims &Kruskal), Dijkstra's shortest path algorithms.Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.	8
TOTAL		40

Suggested Readings:

1. An introduction to data structures with applications By Jean-Paul Tremblay, P. G. Sorenson, TMH
2. Data Structures in C/C++, Horowitz, Sawhney, Galgotia
3. Data Structures in C/C++, Tanenbaum, Pearson
4. Data Structures in C++, Weiss, Parson

SUBJECT : 3CS4-06: OBJECT ORIENTED PROGRAMMING

CO23406.1	To understand the different programming paradigm
CO23406.2	To know the principles of OOPs.
CO23406.3	Understand and apply the principles of inheritance
CO23406.4	Understand the principles of polymorphism
CO23406.5	Finally the objective of this course is to develop programming skills of undergraduate students to solve basic real world problems using objective oriented programming techniques.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Introduction to different programming paradigm, characteristics of OOP, Class, Object, data member, member function, structures in C++, different access specifiers, defining member function inside and outside class, array of objects.	8
2	Concept of reference, dynamic memory allocation using new and delete operators, inline functions, function overloading, function with default arguments, constructors and destructors, friend function and classes, using this pointer.	8
3	Inheritance, types of inheritance, multiple inheritance, virtual base class, function overriding, abstract class and pure virtual function	9
4	Constant data member and member function, static data member and member function, polymorphism, operator overloading, dynamic binding and virtual function	9
5	Exception handling, Template, Stream class, File handling.	6
TOTAL		40

Suggested Readings:

1. How to Program C++, Dietel, Pearson
2. Mastering C++ By K.R.Venugopal, TMH
3. Object Oriented Programming in C++ By Robert Lafore, Pearson
4. Object Oriented Design & Modelling, Rambaugh, Pearson

3CS4-07: SOFTWARE ENGINEERING

CO23407.1	Student will be understand fundamental concepts in software engineering, SDLC, software requirements specification, formal requirements specification and verification
CO23407.2	Student will learn about Software Project Management and Cost estimation.
CO23407.3	Student will understand basic of requirement analysis and Structured analysis.
CO23407.4	Student will learn fundamental software design and Effective modular design.
CO23407.5	Student will know about object-oriented analysis and basic UML.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)

End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Introduction, software life-cycle models, software requirements specification, formal requirements specification, verification and validation.	8
2	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.	8
3	Requirement Analysis: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling	8
4	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.	8
5	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts, Class and object relationships, object modularization, Introduction to Unified Modeling Language	8
TOTAL		40

Suggested Readings:

1. How to Program C++, Dietel, Pearson
2. Mastering C++ By K.R.Venugopal, TMH
3. Object Oriented Programming in C++ By Robert Lafore, Pearson
4. Object Oriented Design & Modelling, Rumbaugh, Pearson

SUBJECT: 3CS4-21: Data Structures and Algorithms Lab

CO23421.1	To implement concepts of linear data structures like Stack and Queue.
CO23421.2:	To implement various Sorting and Searching Techniques.
CO23421.3:	To learn programming solve problems using both arrays and pointers
CO23421.4	To implement concepts of non-linear data structures
CO23421.5	To implement concept of linked list.

Credit-1.5
0L+0T+3P**Max. Marks :75 (IA:45,ETE:30)**

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays up to 4-dimensions.	CO23421.3
2	Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.	CO23421.1
3	Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials	CO23421.3
4	Represent a sparse matrix using array. Implement addition and transposition operations using the representation.	CO23421.3
5	Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.	CO23421.5
6	Repeat exercises 2, 3 & 4 with linked structure.	CO23421.5
7	Implementation of binary tree with operations like addition, deletion, traversal.	CO23421.4
8.	Depth first and breadth first traversal of graphs represented using adjacency matrix and list.	CO23421.4
9.	Implementation of binary search in arrays and on linked Binary Search Tree.	CO23421.4
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.	CO23421.2

SUBJECT: 3CS4-22 : Object Oriented Programming Lab

CO23422.1	The students will learn the different programming paradigm.
CO23422.2	The students will understand the principles of OOP.
CO23422.3	The students will be able to understand and apply the principles of inheritance & polymorphism.
CO23422.4	The students will be able to understand the concept of virtual functions and templates.
CO23422.5	The students will learn various streams and they will be able to develop programming skills to solve basic real world problems using object oriented programming techniques.

Credit-1.5
0L+0T+3P**Max. Marks :75 (IA:45,ETE:30)**

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Understand the basics of C++ library, variables, data input-output.	CO23422.1, CO23422.2
2	C++ program using with the concept of structures.	CO23422.1, CO23422.2
3	Implement class and object concepts and function overloading.	CO23422.1, CO23422.2, CO23422.4
4	Write programs to understand dynamic memory allocation and array of objects.	CO23422.1, CO23422.2
5	Program to understand different types of constructors and destructor.	CO23422.2
6	Implement friend function to access private data of a class and usage of this pointer.	CO23422.1, CO23422.2
7	Write programs to understand the usage of constant data member and member function, static data member and member function in a class.	CO23422.4
8	Implement different types of inheritance, function overriding and virtual function.	CO23422.3, CO23422.4
9	Implement Operator overloading concepts.	CO23422.4
10	Write programs to understand function template and class template.	CO23422.5
11	Write programs to understand exception handling techniques.	CO23422.5
12	Write programs to understand file handling techniques.	CO23422.5

SUBJECT: 3CS4-23: Software Engineering Lab

CO1	The students will learn the different programming paradigm.
CO2	The students will understand the principles of OOP.
CO3	The students will be able to understand and apply the principles of inheritance & polymorphism.
CO4	The students will be able to understand the concept of virtual functions and templates.
CO5	The students will learn various streams and they will be able to develop programming skills to solve basic real world problems using object oriented programming techniques.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using Java and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.	CO1
2	Develop Software Requirements Specification (SRS) for a given problem in IEEE template.	CO1, CO2
3	Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project.	CO2,CO3
4	Develop structured design for the DFD model developed.	CO2,CO3
5	Developed all Structure UML diagram of the given project.	CO4
6	Develop Behavior UML diagram of the given project.	CO4
7	Manage file, using ProjectLibre project management software tool.	CO1,CO5

SUBJECT: 3CS4-24: Digital Electronics Lab

CO1	Develop and realize various logic gate. Also design those gate with help of other logic gates.
CO2	Realize circuits for various Boolean expressions. Also develop and simplify various sop and pos equations.
CO3	Realize circuits like circuit of adder and subtractor. Also realize different combinational circuit in the system.
CO4	Using clock signal develop various flip flops and circuits to understand concept of flip flop and counters.
CO5	Develop circuits like counters and registers for different type of input and output using clock.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gates with 2, 3, & 4 inputs).	CO1
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates.	CO1
3	To realize an SOP and POS expression	CO2
4	To realize Half adder/ Subtractor & Full Adder/ Subtractor using NAND & NOR gates and to verify their truth tables.	CO3
5	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor & basic Full Adder/ Subtractor.	CO3
6	To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct an 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.	CO3
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven-segment display.	CO3
8.	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.	CO4
9.	Construct a divide by 2,4 & 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.	CO5
10	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer. Note: As far as possible, the experiments shall be performed on bread board. However, experiment Nos. 1-4 are to be performed on bread board only.	CO5

IV SEMESTER

SUBJECT: 4CS2-01: DISCRETE MATHEMATICS STRUCTURE

CO24201.1	Fundamental concepts of mathematics sets, functions, relations.
CO24201.2	Write an argument using logical notation and determine if the argument is or is not valid.
CO24201.3	Demonstrate the ability to find permutation, combination & lattice.
CO24201.4	Fundamental concepts of groups & rings
CO24201.5	Demonstrate different traversal methods for trees and graphs.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Set Theory: Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem. Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction. Composition of Functions. The Pigeonhole and Generalized Pigeonhole Principles.	7
3	Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.	8
4	Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.	8

5	Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.	8
6	Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	8
Total		40

Suggested Readings:

1. Discrete Mathematics with Applications, Koshy, ELSEVIER
2. Discrete Mathematical Structures By Lipschutz & Lipson, TMH
3. Discrete Mathematical Structures, Kolman et.al, Pearson

SUBJECT: 4CS1-02: TECHNICAL COMMUNICATION

CO24102.1	Understand the meaning and importance of technical communication and different technical styles
CO24102.2	practice the unique qualities of professional rhetoric and writing style, such as sentence conciseness, clarity, accuracy, honesty, avoiding wordiness or ambiguity, using direct order organization, readability, coherence and transitional devices
CO24102.3	recognize, explain, and use the formal elements of specific genres of organizational communication: white papers, memorandums, web pages, wikis, blogs, business letters, and promotional documents.
CO24102.4	recognize, explain, and use the formal elements of specific genres of organizational communication: white papers, recommendation and analytical reports, proposals
CO24102.1	Understand the meaning and importance of technical communication and different technical styles

Credit-2
2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)
End Term Exam: 2 Hours

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Technical Communication- Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	Comprehension of Technical Materials/Texts and Information Design & development- Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	Technical Writing, Grammar and Editing- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	Advanced Technical Writing- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
TOTAL		26

Suggested Readings:

1. Effective business communication by Asha Kaul
2. Technical writing by Tata McGraw Hill

SUBJECT: 4CS3-04: MICROPROCESSOR & INTERFACES

CO24304.1	Understand the 8085 microprocessor's architecture, pin description and its functionality in depth. Student will get an idea about microprocessor based system by designing logical circuitry in order to interface processor with memory and I/O devices.
CO24304.2	Students will learn instructions of 8085 microprocessor, their classification and different programming techniques. Student will be able to identify the addressing modes and length in bytes of instructions.
CO24304.3	Students will learn additional 16 bit instructions and arithmetic operations. Student will be able to design, write, and analyze assembly language programs of 8085 microprocessor. Student will be able to learn about various interrupts available in 8085 microprocessor. Interrupt structure, interrupt vector table and interrupt service routines etc. as well as how serial communication takes place.
CO24304.4	Interfacing of different programmable peripherals (8255, 8254, and 8279 etc) with Microprocessor.
CO24304.5	To introduce serial and parallel bus standards.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses; concept of static and dynamic RAM, type of ROM, memory map.	7
3	Software architecture registers and signals, Classification of instruction, Instruction set, addressing modes, Assembly Language Programming and Debugging, Programming Technique, instruction Format and timing.	8
4	Advance Assembly Language Programming, Counter and time delay; types of Interrupt and their uses, RST instructions and their uses, 8259 programmable interrupt controller; Macros, subroutine; Stack-implementation and uses with examples; Memory interfacing.	8
5	8085 Microprocessor interfacing:, 8255 Programmable Peripheral Interface, 8254 programmable interval timer, interfacing of Input/output device, 8279 Key board/Display interface.	8
6	Microprocessor Application: Interfacing scanned multiplexed display and liquid crystal display, Interfacing and Matrix Keyboard, MPU Design; USART 8251, RS232C and RS422A, Parallel interface-Centronics and IEEE 488.	8
Total		40

Suggested Readings:

1. Microprocessor architecture, programming, and applications with the 8085 By Ramesh S. Gaonkar
2. Introduction to Microprocessor By Aditya P. Mathur, TMH

3. Microprocessor & Interfacing By Douglas V. Hall, TMH

SUBJECT: 4CS4-05: DATABASE MANAGEMENT SYSTEM

CO24405.1	Students will be able to learn the basic concepts and appreciate the applications of database systems.
CO24405.2	Students will be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
CO24405.3	Students will be able to understand the relational database theory, be able to write relational algebra expressions for queries and normalization approach.
CO24405.4	Students will be familiar with basic database transaction processing and transaction states.
CO24405.5	Students will be familiar with the basic issues of database failure, recovery and concurrency control.

Credit-3

Max. Marks : 150 (IA:30,ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to database systems: Overview and History of DBMS. File System v/s DBMS. Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Structure of a DBMS. Entity Relationship model: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.	7
3	Relationship Algebra and Calculus: Relationship Algebra Selection and Projection, Set Operations, Renaming, Joins, Division, Relation Calculus, Expressive Power of Algebra and Calculus. SQL queries programming and Triggers: The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	8
4	Schema refinement and Normal forms: Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.	8
5	Transaction Processing: Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.	8

6	Concurrency Control: Implementation of Concurrency: Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, Database Failure and Recovery: Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	8
Total		40

Suggested Readings:

1. H.f. Korth and Silberschatz: Database Systems Concepts, McGraw Hill
2. Almasri and S.B. Navathe: Fundamentals of Database Systems,
3. C.J. Date: Data Base Design, Addison Wesley
4. Hansen and Hansen : DBM and Design, PHI

SUBJECT: 4CS4-06: THEORY OF COMPUTATION

CO24406.1	Students will be able to analyze and design finite automata and apply formal mathematical methods to prove properties of languages; grammars also analyze and design regular expression
CO24406.2	Students will be able to develop the ability to apply the ideas about context free grammars, Derivation and ambiguity. They will also be able to solve Greibach and Chomsky Normal form related problems including membership problems.
CO24406.3	Student will understand the concept of PDA and able to analyze and design push down automata.
CO24406.4	Students will be able to construct Turing machine for different problems and argue formally about correctness on different restricted machine models of computation. They can distinguish different computing languages and classify their respective types
CO24406.5	Students will be able to understand the key notions, such as computability, decidability, and complexity through problem solving.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and non- deterministic finite automation, Equivalence of DFA and N DFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	7
3	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	8
4	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.	8
5	Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.	8
6	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
Total		40

Suggested Readings:

1. Aho, Hopcroft and Ullman, Introduction to Automata Theory, Formal Languages and Computation, Narosa

2. Cohen, Introduction to Computer Theory, Addison Wesley.
3. Papadimitriou, Introduction to Theory of Computing, Prentice Hall.

SUBJECT: 4CS4-07: DATA COMMUNICATION AND COMPUTER NETWORKS

CO24407.1	Students will be able to visualize the different aspects of networks, topologies, protocols and network design models and understand various physical layer functionalities.
CO24407.2	Students will be able to examine various Data Link layer design issues and Data Link protocols and understand data link layer functionalities i.e error detection and correction methods.
CO24407.3	Students will be able to understand various network layer functionalities i.e routing and IP addressing and internetworking.
CO24407.4	Students will be able to examine the important aspects, functions, services and protocols of transport layer.
CO24407.5	Students will be able to understand application layer services, protocols and network security.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System	7
3	Data Link Layer: Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	9
4	Network Layer: Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking	8
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm	8
6	Application Layer: WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	7
Total		40

Suggested Readings:

1. Tanenbaum; Computer Network, 4th Ed., Pearson.
2. Kurose; Computer Networking, 3rd Ed., Pearson.
3. Peterson, Davie; Computer Networks, 4rd Ed., ELSEVIER

SUBJECT: 4CS4-21: Microprocessor & Interfaces Lab

CO1	Student will be able to understand microprocessor based system.
CO2	Student will be able to understand computer organization and advanced systems.
CO3	Student will be able to analyze, specify, design, write and test assembly language programs of 8085 microprocessor.
CO4	Student will be able to learn different programming techniques such as looping, counting and indexing by some complex programs of 8085 microprocessor.
CO5	Student will be able to interface external programmable devices with 8085 trainer kit.

Credit-1
0L+0T+2P**Max. Marks :50 (IA:30,ETE:20)**

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Add the contents of memory locations XX00 &XX01 & place the result in memory location XX02.	CO1
2	Add the 16 bit numbers stored in memory location & store the result in another memory location.	CO2
3	Transfer a block of data from memory location XX00 to another memory location XX00 in forward & reverse order.	CO3
4	Write a program to swap two blocks of data stored in memory.	CO3
5	Write a program to find the square of a number.	CO4
6	Write a main program and a conversion subroutine to convert Binary to its equivalent BCD.	CO4
7	Write a program to find largest & smallest number from a given array.	CO4
8.	Write a program to Sort an array in ascending & descending order.	CO4
9.	Write a program to multiply two 8 bit numbers whose result is 16 bit.	CO4
10.	Write a program of division of two 8 bit numbers.	CO4
11.	Generate square wave from SOD pin of 8085 & observe on CRO.	CO5
12.	Write a program to perform traffic light control operation.	CO5
13.	Write a program to control the speed of a motor.	CO5

SUBJECT: 4CS4-22: DATABASE MANAGEMENT SYSTEM LAB

CO1	Students will be able to understand, appreciate and effectively explain the underlying concepts of database technologies
CO2	Students will be able to populate and query a database using SQL DML/DDDL commands.
CO3	Students will be able to declare and enforce integrity constraints on a database using a SQL query in RDBMS
CO4	Students will be able to demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.
CO5	Students will be able to do Programming PL/SQL including stored procedures, stored functions, cursors, package.
CO6	Students will be able to analyze an information storage problem and derive an information model expressed in the form.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Design a Database and create required tables. For e.g. Bank, College Database.	CO1, CO2
2	Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.	CO3
3	Write a SQL statement for implementing ALTER, UPDATE and DELETE.	CO1, CO2, CO3
4	Write the queries to implement the joins.	CO1, CO2, CO4
5	Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().	CO1
6	Write the query to implement the concept of Integrity constraints.	CO3
7	Write the query to create the views.	CO1, CO2, CO4
8	Perform the queries for triggers.	CO5
9	Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints	CO1, CO2, CO4, CO5, CO6
10	Write the query for creating the users and their role	CO5, CO6

SUBJECT: 4CS4-23: Network Programming Lab

CO1	Students will be able to understand Different Type of LAN& Network Equipments.
CO2	Students will be able to understand and verify standard Network topologies i.e. Star, Bus, Ring etc.
CO3	Students will be able to understand LAN installations and Configurations.
CO4	Students will be able to implement various types of error correcting techniques.
CO5	Students will be able to implement various types of framing methods.
CO6	Students will be able to understand and implement client-server communication and estimate the RTT from client to server using TCP.
CO7	Students will be able to implement client-server communication using UDP (Single client connections/multiple client's connections).
CO8	Students will be able to understand and implement client-server communication using TCP with multiplexed I/O operations.
CO9	Students will be able to implement Routing algorithm.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Study of Different Type of LAN& Network Equipments.	CO1
2	Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.	CO2
3	LAN installations and Configurations.	CO3
4	Write a program to implement various types of error correcting techniques..	CO4
5	Write a program to implement various types of framing methods.	CO5
6	Write two programs in C: hello_client and hello_server a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection b. The client connects to the server, sends the string "Hello, world!", then closes the connection.	CO6
7	Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.	CO6
8.	Repeat Exercises 6 & 7 for UDP.	CO7
9.	Repeat Exercise 7 with multiplexed I/O operations.	CO8
10	Simulate Bellman-Ford Routing algorithm in NS2.	CO9

SUBJECT: 4CS4-24: Linux Shell Programming Lab

CO1	Student will learn basic command, pipe command and Process Control Commands
CO2	Student will able to learn shell script based on control structure(If-Then etc.) and Looping
CO3	Student will get knowledge about case structure using break keyword.
CO4	Student will get basic knowledge of Function used.
CO5	Student will learn about to make shapes in linux .
CO6	To learn shell programming using Array.

**Max. Marks :50
(IA:30,ETE:20)**

1	Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.	CO₁, CO₃
2	Commands related to inode, I/O redirection and piping, process control commands, mails.	CO₁
3	<p>Shell Programming: Shell script based on control structure- If-then-fi, if-thenelse- if, nested if-else, to find:</p> <p>3.1 Greatest among three numbers.</p> <p>3.2 To find a year is leap year or not.</p> <p>3.3 To input angles of a triangle and find out whether it is valid triangle or not.</p> <p>3.4 To check whether a character is alphabet, digit or special character.</p> <p>3.5 To calculate profit or loss.</p>	CO₂
4	<p>Shell Programming - Looping- while, until, for loops</p> <p>4.1 Write a shell script to print all even and odd number from 1 to 10.</p> <p>4.2 Write a shell script to print table of a given number</p> <p>4.3 Write a shell script to calculate factorial of a given number.</p> <p>4.4 Write a shell script to print sum of all even numbers from 1 to 10.</p> <p>4.5 Write a shell script to print sum of digit of any number.</p>	CO₂
5	<p>Shell Programming - case structure, use of break</p> <p>5.1 Write a shell script to make a basic calculator which performs addition, subtraction, Multiplication, division</p> <p>5.2 Write a shell script to print days of a week.</p>	CO₃, CO₄

	5.3 Write a shell script to print starting 4 months having 31 days.	
6	Shell Programming – Functions 6.1 Write a shell script to find a number is Armstrong or not. 6.2 Write a shell script to find a number is palindrome or not. 6.3 Write a shell script to print Fibonacci series. 6.4 Write a shell script to find prime number. 6.5 Write a shell script to convert binary to decimal and decimal to binary	CO₂, CO₄
7	Write a shell script to print different shapes- Diamond, triangle, square, rectangle, hollow square etc.	CO₅, CO₁
8	Shell Programming – Arrays 8.1 Write a C program to read and print elements of array. 8.2 Write a C program to find sum of all array elements. 8.3 Write a C program to find reverse of an array. 8.4 Write a C program to search an element in an array. 8.5 Write a C program to sort array elements in ascending or descending order.	CO₆

SUBJECT: 4CS4-25: Java Lab

CO1	To Understand basics and OOPS concept of Java programming.
CO2	To create Java programs using inheritance and polymorphism.
CO3	Demonstrate the concepts of Interface, package and Strings
CO4	Able to apply the concept of exception handling.
CO5	To Implement multithreading in JAVA.
CO6	Develop applications using Console I/O and File I/O, GUI applications

Credit-1
0L+0T+2P

Max. Marks :50 (IA:30,ETE:20)

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Develop an in depth understanding of programming in Java: data types, variables, operators, operator precedence, Decision and control statements, arrays, switch statement, Iteration Statements.	CO1
2	Write Object Oriented programs in Java: Objects, Classes constructors, returning and passing objects as parameter, Inheritance, Access Control, Using super, final with inheritance Overloading and overriding methods,	CO2
3	Develop understanding to developing packages & Interfaces in Java: Package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.	CO3
4	Develop understanding to developing Strings and exception handling: String constructors, special string operations. Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally.	CO4
5	Develop applications involving concurrency: Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, and Synchronization.	CO5
6	Develop applications involving file handling: I/O streams, File I/O.	CO6
7	Programs to demonstrate basic concepts e.g. operators, classes, constructors, control & iteration statements, recursion etc. such as complex arithmetic, matrix arithmetic, tower of Hanoi problem etc.	CO2
8.	Development of programs/projects to demonstrate concepts like inheritance, exception handling, packages, interfaces etc. such as application for electricity department, library management.	CO2, CO3,CO6
9.	Development of a project to demonstrate various file handling concepts.	CO6
10	Develop applications involving Applet: Applet Fundamentals, using paint method and drawing polygons.	CO6

III Year Curriculum

V SEMESTER

SUBJECT: 5CS3-01: INFORMATION THEORY & CODING

CO35301.1	Students will get the concepts of entropy & Source coding.
CO35301.2	Students will learn the various source coding schemes for data compaction.
CO35301.3	Students will get the concepts of linear block code and various operations on it.
CO35301.4	Students will be able to know cyclic code and its various concepts.
CO35301.5	Students will be able to know convolutional code and its various concepts.

Credit-2

Max. Marks : 100 (IA:20,ETE:80)

2L+0T+0P

End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to information theory: Uncertainty, Information and Entropy, Information measures for continuous random variables, source coding theorem. Discrete Memory less channels, Mutual information, Conditional entropy.	05
3	Source coding schemes for data compaction: Prefix code, Huffman code, Shanon-Fane code &Hempel-Ziv coding channel capacity. Channel coding theorem. Shannon limit.	05
4	Linear Block Code: Introduction to error connecting codes, coding & decoding of linear block code, minimum distance consideration, conversion of non-systematic form of matrices into systematic form.	05
5	Cyclic Code: Code Algebra, Basic properties of Galois fields (GF) polynomial operations over Galois fields, generating cyclic code by generating polynomial, parity check polynomial. Encoder & decoder for cyclic codes.	06
6	Convolutional Code: Convolutional encoders of different rates. Code Tree, Trllis and state diagram. Maximum likelihood decoding of convolutional code: The viterbi Algorithm fee distance of a convolutional code.	06
	Total	28

Suggested Readings:

1. Digital Communication, Simon Haykin, Wiley.
2. Information Theory and Coding, K.S. Shivaprakasha Murlidhar Kulkarni

SUBJECT: 5CS4-02: COMPILER DESIGN

CO35402.1	Students will be able to learn major concepts in areas of language translation and compiler design.
CO35402.2	Students will be able to ability to identify, formulate, and solve computer engineering problems with proper systematic & semantic approach.
CO35402.3	Students will be able to Develop possible program constructs for further code generation with Type checking.
CO35402.4	Students will be able to learn various concepts of symbol tables, Run time environments, memory management strategy.
CO35402.5	Students will get the concepts of Intermediate code generation, Code optimization and Code generations.

Credit-2
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction: Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.	06
3	Review of CFG Ambiguity of grammars: Introduction to parsing. Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.	10
4	Syntax directed definitions; Construction of syntax trees, S- Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.	10
5	Storage organization; Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.	08

6	Definition of basic block control flow graphs; DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	07
	Total	42

Suggested Readings:

1. Aho, Ullman and Sethi: Compilers, Addison Wesley.
2. Holub, Compiler Design in C, PHI.

SUBJECT: 5CS4-03: OPERATING SYSTEM

CO35403.1	Students will be able to understand operating system and process concept.
CO35403.2	Students will be able to analyze Scheduling algorithms and formulate solutions for critical section problem
CO35403.3	Students will be able to describe deadlock, Methods for handling deadlocks and memory management strategies
CO35403.4	Students will be able to gain the knowledge of virtual memory
CO35403.5	Students will be able to understand various file and disk management strategies.

Credit-2
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction and History of Operating systems: Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	Memory management: contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	Deadlock: Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms Device management: devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	File management: file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	UNIX and Linux operating systems as case studies; Time OS and case studies of Mobile OS	08
	Total	40

Suggested Readings

1. A. Silberschatz and Peter B Galvin: Operating System Principals, Wiley India Pvt. Ltd.
2. Achyut S Godbole: Operating Systems, Tata McGraw Hill
3. Tanenbaum: Modern Operating System, Prentice Hall.
4. DM Dhamdhare: Operating Systems – A Concepts Based Approach, Tata McGraw Hill
5. Charles Crowley: Operating System A Design – Oriented Approach, Tata McGraw Hill.

SUBJECT: 5CS4-04: COMPUTER GRAPHICS & MULTIMEDIA

CO35404.1	Students will be able understand the basics of computer graphics, different graphics systems, application of computer graphics and rasterisation of line, circle and ellipse.
CO35404.2	Students will be able to applygeometric transformations on graphics objects, their application in composite form, different color filling algorithm and clipping algorithm.
CO35404.3	Students will be able toexplore visible surface detection techniques& curves.
CO35404.4	Students will be able to render projected objects to naturalize the scene in 2D view and use of illumination models for this& color models.
CO35404.5	Students will be able to explore multimedia components and animation techniques.

Credit-2

Max. Marks : 150 (IA:30,ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	06
3	Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).	07
4	Two Dimensional Graphics: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	08
5	Three Dimensional Graphics: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.	08
6	Illumination and Colour Models: Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.	06
7	Animations &Realism: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification – morphing – tweening. ComputerGraphics Realism: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.	06
	Total	42

Suggested Readings:

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: Computer Graphics- Principles and Practice, Pearson
2. Hearn and Baker: Computer Graphics, PHI
3. Multimedia Systems Design, Prabhat Andleigh and Thakkar, PHI.

SUBJECT: 5CS4-05: ANALYSIS OF ALGORITHMS

CO35405.1	Students will be able to understand various asymptotic notations, its properties and use in measuring algorithm behavior, learn about various sorting, greedy and divide and conquer approach.
CO35405.2	Students will be able to apply various algorithms for different computing problems using dynamic programming and branch and bound techniques.
CO35405.3	Students will be able to design and evaluate algorithms using various algorithm design techniques for pattern matching algorithms.
CO35405.4	Students will be able to analyze randomized algorithms, Recite algorithms that employ randomization.
CO35405.5	Relate the concepts of NP Completeness for analyze and solving the complexity of real life problems.

Credit-2
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Background: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. Divide And Conquer Method: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	Greedy Method: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. Dynamic Programming: Matrix Chain Multiplication. Longest CommonSubsequence and 0/1 Knapsack Problem.	10
4	Branch And Bound: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	Assignment Problems: Formulation of Assignment and Quadratic Assignment Problem. Randomized Algorithms- Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	Problem Classes Np, Np-Hard And Np-Complete: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

Suggested Readings:

1. Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India.
2. Horowitz and Sahani: Fundamental of Computer algorithms.
3. Aho A.V , J.D Ulman: Design and analysis of Algorithms, Addison Wesley

SUBJECT: 5CS5-12: HUMAN COMPUTER INTERACTION

CO355.1	Students will be able understand the foundation of human computer interaction, and also able identify User Interface (UI) design principles and techniques. And students will be able understand the importance's of different types of Model based design and evaluate design.
CO355.2	Students will be able to explore Standard guidelines of human computer interaction likewise Shneiderman's eight, golden rules, Norman's seven principles, Cognitive walkthrough.
CO355.3	Students will be able to explore the empirical research methods to understand the experiment design and data analysis with explanation of one-way ANOVA.
CO355.4	Students will be able to understand task modelling and analysis using HTA, CTT, design using FSM and others
CO355.5	Students will be able to understand the basic of CA and Object-Oriented Modelling of User Interface Design.

Credit-2

2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)

End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Historical evolution of the field, Interactive system design, Concept of usability -definition and elaboration, HCI and software Engineering, GUI design and Aesthetics, Prototyping techniques.	02
2	Model-based Design and evaluation: Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and Hick-Hyman's law, Model-based design case studies,	03
3	Guidelines in HCI: Shneiderman's eight, golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use Heuristic evaluation, Contextual inquiry, Cognitive walkthrough	05
4	Empirical research methods in HCI: Introduction (motivation, issues, research question formulation techniques), Experiment design and data analysis (with explanation of one-way ANOVA)	06
5	Task modelling and analysis: Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT),Introduction to formalism in dialog design, design using FSM (finite state machines) State charts and (classical) Petri Nets in dialog design	06
6	Introduction to CA, CA types, relevance of CA in IS design Model Human Processor (MHP), OOP- Introduction OOM- Object Oriented Modeling of User Interface Design	05
	Total	28

Suggested Readings:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction, 3rdEdition, Pearson Education, 2004.
2. Wilbert O. Galitz, —The Essential Guide to User Interface Design, Wiley publication.
3. Alan Cooper, Robert Reimann, David Cronin, —About Face3: Essentials of Interaction design,Wiley publication.

SUBJECT: 5CS4-21: COMPUTER GRAPHICS & MULTIMEDIA LAB

CO1	Students will be able to understand and explain the mathematical and practical principles of Computer Graphics eg: To draw basic objects like lines, Circles and Ellipse
CO2	Students will be able to apply concept of geometric, mathematical and algorithmic concepts necessary for programming computer graphics
CO3	Students will be able to apply the comprehension of windows, clipping and view-ports object representation in relation to images displayed on screen.
CO4	Students will be able to use matrix algebra in computer graphics and implement fundamental algorithms and transformations involved in viewing models.

Credit-1
0L+0T+2P

Max. Marks :50 (IA:30,ETE:20)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1.	Study and Understanding of basic graphics function.	CO1
2.	Write a program to implement line, circle and ellipse attributes.	CO1, CO2
3.	Write program to draw any figure using circle and lines	CO2
4.	Write a program to draw a hut following figure using circle and line and rectangle.	CO2
5.	Write a program to plot a point (pixel) on the screen.	CO2
6.	Write a program to draw straight line using direct method.	CO2, CO3
7.	Write a program to draw straight line using simple DDA method.	CO3
8.	Write a program to draw straight line using incremental DDA algorithm.	CO3
9.	Write a program to draw straight line using Bresenham's line drawing algorithm.	CO3
10.	Write a program to draw straight line using midpoint line drawing algorithm.	CO3
11.	Write a program to draw a circle using midpoint circle drawing algorithm.	CO4
12.	Write a program to draw an ellipse using midpoint ellipse drawing algorithm.	CO4

SUBJECT: 5CS4-22: COMPILER DESIGN LAB

CO1	Apply different compiler writing tools to implement the different Phases of compiler.
CO2	Develop an Understanding of Scanning by using concept Parse tree and syntax tree, Top down parsing, Bottom up parsing.
CO3	To introduce different translation languages and to understand the importance of code optimization.
CO4	Develop an Understanding of Allocation data structure, heaps.
CO5	Develop an Understanding about Language processor development tools: LEX and YACC

Credit-1
0L+0T+2P

Max. Marks :50 (IA:30,ETE:20)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	To identify whether given string is keyword or not.	CO1
2	Count total no. of keywords in a file. [Taking file from user]	CO2
3	Count total no of operators in a file. [Taking file from user]	CO3
4	Count total occurrence of each character in a given file. [Taking file from user]	CO2
5	Write a C program to insert, delete and display the entries in Symbol Table.	CO4
6	Write a LEX program to identify following: a) Valid mobile number b) Valid url c) Valid identifier d) Valid date (dd/mm/yyyy)	CO5
7.	Write a lex program to count blank spaces, words, lines in a given file.	CO3
8.	Write a lex program to count the no. of vowels and consonants in a C file.	CO4
9.	Write a YACC program to recognize strings aaab, abbb using $a^n b^n$, where $b \geq 0$.	CO5
10	Write a YACC program to evaluate an arithmetic expression involving operators +, -, * and /.	CO5
11	Write a C program to find first of any grammar.	CO2

SUBJECT: 5CS4-23: Analysis of Algorithms Lab

CO1	Students will be able to design and implement programs using Divide and Conquer like Quick Sort, Merge Sort etc.
CO2	Students will be able to solve various problems related to Dynamic Programming Techniques like Knapsack Problem etc.
CO3	Students will be able to analyze problems using Greedy Approach like Minimum Cost Spanning Tree, Shortest Path Algorithms etc.
CO4	Students will be able to analyze problem using Backtracking Techniques like Queens Problem etc.
CO5	Students will be able to design and implement various Graph Algorithms.

Credit-1
0L+0T+2P

Max. Marks :50 (IA:30,ETE:20)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.	CO1
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.	CO1
3	Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.	CO5
4	Implement 0/1 Knapsack problem using Dynamic Programming.	CO2
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.	CO3, CO5
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm...	CO3, CO5
7	a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method	CO5
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm	CO3, CO5
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.	CO2, CO5
10	Implement N Queen's problem using Backtracking.	CO4

SUBJECT: 5CS4-22: ADVANCE JAVA LAB

CO1	Students will be able to understand and explain the fundamentals of java programming and also recognize programming concepts of swing and applets in java.
CO2	Students will be able to apply concept of object-oriented programming in advance Java.
CO3	Students will be able to understand GUI programming and database connectivity in java and also make a project in advance java.
CO4	Students will be able to create Website development according to user requirements with J2EE and JSP servlets.

Credit-1
0L+0T+2P

Max. Marks :50 (IA:30,ETE:20)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1.	Write a program to Create thread by extending a thread class in java.	CO1
2.	Write a program to implement multithreading using runnable interface.	CO1, CO2
3.	Write a program to design a registration form using java swing.	CO2
4.	Write a program to implement event handling using swing to make a mini calculator using java swing.	CO2
5.	Write a program to design a servlet that takes all the input from webpage and display the same through servlet.	CO2
6.	Write a program to design a servlet that add two numbers received from the web pages and display the same.	CO2, CO3
7.	Write a program to design a JSP page for currency converter.	CO3,CO4
8.	Design a JSP page to calculate the area of a circle, square and rectangle.	CO3,CO4
9.	A Mini Project on note pad.	CO1, CO2, CO3, CO4

VI SEMESTER

SUBJECT: 6CS3-01: Digital Image Processing

CO36301.1	Students will be able to understand the fundamental steps involve in image processing, how image is acquired using different sensors and different color model used to represent image.
CO36301.2	Students will be able to apply different types of transform function on image for sharpening and smoothing in spatial as well as in frequency domain.
CO36301.3	Students will be able to analyze different types of noise occurs in image during transmission and able to restore the image using inverse and homomorphism algorithm.
CO36301.4	Students will be able to develop knowledge about different compression standards of image and how compression is achieved using various coding.
CO36301.5	Students will be able to differentiate between line point and edge detection, how edges and boundaries are linked and segment the image during detection process.

Credit-2

2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)

End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to Image Processing: Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.	06
4	Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	Image Segmentation & Representation: Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	Total	28

Suggested Readings:

1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, addison Wesley 1992. Boyle and Thomas: Computer Vision - A First Gurse 2nd Edition, ISBN 0-632-028-67X, Blackwell Science 1995.
2. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.
3. Pakhera Malay K: Digital Image Processing and Pattern Recogination, PHI.

SUBJECT: 6CS4-02:Machine Learning

CO36402.1	Student able to understanding Supervised learning Through Decision Tree, KNN, SVM etc
CO36402.2	Student can knowledge about Unsupervised Learning Algorithm such as Clustering, Association rule mining, Gaussian Mixture Model.
CO36402.3	Student would be understand Feature Extraction and Feature Selection.
CO36402.4	Student get basic knowledge of Semi-Supervised Learning and Reinforcement Learning.
CO36402.5	Student can be learn about basic of Recommended System.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Supervised learning algorithm: Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm	09
3	Unsupervised learning algorithm: Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	08
4	Introduction to Statistical Learning Theory, Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	08
5	Semi supervised learning, Reinforcement learning: Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State- Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	08
6	Recommended system, Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.	08
	Total	42

Suggested Readings:

1. Machine learning – S Dutt, S Chandramouli, A K Das
2. Machine Learning A Guide to Current Research Editors: **Mitchell**, Tom M., **Carbonell**, Jaime G., **Michalski**, Ryszard S.

SUBJECT: 6CS4-03: Information Security System

CO36403.1	Develop a basic understanding of cryptography, how it has evolved and some key encryption techniques used today, Develop an understanding of security policies.
CO36403.2	To master and implement different encryption algorithms
CO36403.3	To master fundamentals of secret and public cryptography
CO36403.4	Students will be able to understand message authentication protocols and hash functions.
CO36403.5	To master protocols for security services

Credit-2
2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)
End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to security attacks: services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	06
3	Modern block ciphers: Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	06
4	Public Key Cryptosystems with Applications: Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	06
5	Cryptographic Hash Functions, their applications: Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	05
6	Key management and distribution: symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH.	04
	Total	28

Suggested Readings:

1. “ Distributed and Cloud Computing “ By Kai Hawang , Geoffrey C.Fox, Jack J. Dongarra
Pub: Elsevier
2. Cloud Computing ,Principal and Paradigms, Edited By Rajkumar Buyya, Jemes Broberg, A. Goscinski, Pub.- Wiley
3. Kumar Saurabh, “Cloud Computing” , Wiley Pub

SUBJECT: 6CS4-04: COMPUTER ARCHITECTURE AND ORGANIZATION

CO36404.1	Students will be able to understand basic structure of computer.
CO36404.2	Students will be able to understand control unit operations, will able to conceptualize instruction level parallelism.
CO36404.3	Students will be able to perform computer arithmetic operations.
CO36404.4	Students will be able to design memory organization that uses banks for different word size operations, understand the concept of cache mapping techniques.
CO36404.5	Students will be able to understand the concept of I/O organization.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Computer Data Representation: Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. Basic Computer Organization and Design Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	Programming The Basic Computer: Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	7
4	Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC) Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	8
5	Computer Arithmetic: Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit. Input-Output Organization, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU IOP Communication, Serial communication.	8

6	Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	Total	42

Suggested Readings:

1. Computer Organization and Architecture - William Stallings (Pearson Education Asia)
2. Computer Organization and Architecture -John P. Hayes (McGraw -Hill)
3. Computer Organization -V. Carl. Hamacher (McGraw-Hill)

SUBJECT: 6CS4-05: Artificial Intelligence

CO36405.1	Student able to understanding production system, searching algorithms, control strategies.
CO36405.2	Student can know about knowledge representing, propositional and predicate logic and solve fact using resolution using refutation and learn of Montonic and non monotonic concepts.
CO36405.3	Student can create semantic net, frames and conceptual dependency and learn basic fuzzy logic.
CO36405.4	Student can analyze game playing applying minmax procedure, alpha-beta pruning on problems and basic about NL
CO36405.5	Learn about learning concepts, neural network, and architecture of expert system.

Credit-2
2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)
End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to AI and Intelligent agent: Different Approach of AI, Problem Solving : Solving Problems by Searching, Uninformed search, BFS, DFS, Iterative deepening, Bi directional search, Hill climbing, Informed search techniques: heuristic, Greedy search, A* search, AO* search, constraint satisfaction problems.	03
3	Game Playing: Minimax, alpha-beta pruning, jug problem, chess problem, tiles problem	06
4	Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.	06
5	Learning: Overview of different forms of learning, Supervised base learning: Learning Decision Trees, SVM, Unsupervised based learning, Market Basket Analysis, Neural Networks.	07
6	Introduction to Natural Language Processing: Different issue involved in NLP, Expert System, Robotics.	05
	Total	28

Suggested Readings:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

SUBJECT: 6CS4-06: Cloud Computing

CO36406.1	Students will be able to understand the fundamentals of cloud computing along with cloud computing design and challenges.
CO36406.2	Students will be able to use relevant software tools used in cloud computing. Student will also differentiate between Parallel and Distributed Paradigms.
CO36406.3	Students will be able to gain the knowledge about virtualization and its needs in cloud computing. Students will be able to use the tools available for virtualization.
CO36406.4	Students will be able to understand the security issues and recovery methods associated with cloud computing
CO36406.5	Students will be able to write case studies on the tools available for industrial purpose to deploy clouds. Students will also develop understanding about cloud computing application areas.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction: Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things	06
3	Cloud Computing Architecture: Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.	10
4	Virtualization Technology: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre.	10

5	Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	08
6	Cloud Platforms in Industry: Amazon web services , Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	07
	Total	42

Suggested Readings:

1. “ Distributed and Cloud Computing “ By Kai Hawang , Geoffrey C.Fox, Jack J. Dongarra
Pub: Elsevier
2. Cloud Computing ,Principal and Paradigms, Edited By Rajkumar Buyya, Jemes Broberg, A. Goscinski, Pub.- Wiley
3. Kumar Saurabh, “Cloud Computing” , Wiley Pub

SUBJECT: 6CS5-11: DISTRIBUTED SYSTEM

CO36511.1	Students will be able to develop and apply knowledge of distributed system fundamentals, algorithms such as logical clock synchronization and distributed system architecture.
CO36511.2	Students will be able to gain knowledge about message communication, remote procedure call and remote method invocation (RPC and RMI).
CO36511.3	Students will be able to analyze load sharing and balancing algorithms and also describe Distributed file system characteristics.
CO36511.4	Students will be able to develop knowledge about distributed systems using various techniques for tolerating partial failures and deadlocks.
CO36511.5	Students will be able to explain failure recovery model in distributed system, also summarizes replicated data management.

Credit-2
2L+0T+0P

Max. Marks : 100 (IA:20,ETE:80)
End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Distributed Systems: Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.	06
3	Concurrent Processes and Programming: Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included).Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies	05
4	Distributed Process Scheduling: A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems	06

5	Distributed Shared Memory: Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	06
6	Distributed Agreement: Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	05
	Total	28

Suggested Readings:

1. Distributed operating systems and algorithm analysis by Randy Chow and T. Johnson, Pearson
2. Operating Systems A concept based approach by DM Dhamdhere, TMH
3. Distributed Systems- concepts and Design, Coulouris G., Dollimore J, and Kindberg T., Pearson

SUBJECT: 6CS4-21: DIGITAL IMAGE PROCESSING LAB

CO1	This Lab helps the student to understand the Fundamentals of Digital image and its processing.
CO2	Perform the image enhancement technique for the improvement of pictorial information for human perception i.e. enhancing the quality of the image so that the image will have a better look.
CO3	Apply the concepts of image segmentation and compression using which a graduate will be able to remove the redundancy pixels and transmit the image using less bandwidth.
CO4	Describe object detection and recognition technique learning which a graduate will be able to understand the fundamentals of digital image processing with particular emphasis on problems in biomedical research and clinical medicine.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.	CO1, CO2
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform	CO2
3	Linear filtering using convolution. Highly selective filters.	CO2
4	Ideal filters in the frequency domain. Non Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.	CO3, CO4
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.	CO4

SUBJECT: 6CS4-22: MACHINE LEARNING LAB

CO1	Understand the implementation procedures for the machine learning algorithms.
CO2	Design Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.	CO1, CO2
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	CO1, CO2
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	CO1,CO2,CO3
4	Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets	CO3,CO4
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	CO1,CO2,CO3
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set	CO2,CO4
7	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.	CO2,CO4
8.	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.	CO2, CO3
9.	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem	CO2,CO3
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	CO4

SUBJECT: 6CS4-23: PYTHON LAB

CO1	Understand and develop Computational Thinking concepts.
CO2	Express a problem-solving strategy to breakdown a complex problem into a series of simpler tasks.
CO3	Describe python programs that appropriately utilize built-in functions and control flow statements
CO4	Use functions for structuring Python programs.
CO5	Represent compound data using Python lists, tuples, dictionaries

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)
End Term Exam: 2 Hours

Sr. No.	Experiment Name	CO/PO Mapping
1.	Write a program to demonstrate basic data type in python.	CO1
2.	2 Write a program to compute distance between two points taking input from the user	CO2
3.	Write a program add.py that takes 2 numbers as command line arguments and prints its sum.	CO3
4.	3 Write a Program for checking whether the given number is an even number or not.	CO4
5.	Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10 4	CO5
6.	Write a Program to demonstrate list and tuple in python.	CO1
7.	Write a program using for loop that loops over a sequence.	CO2
8.	Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.	CO3
9.	Find the sum of all the primes below two million.	CO4
10.	By considering the terms in the Fibonacci sequence whose values do not exceed four million. WAP to find the sum of the even-valued terms.	CO5
11.	Write a program to count the numbers of characters in the string and store them in a dictionary data structure	CO1
12.	Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure	CO2
13.	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?	CO3
14.	Write a program to print each line of a file in reverse order.	CO4
15.	Write a program to compute the number of characters, words and lines in a file.	CO5
16.	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on.	CO1

17.	Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.	CO2
18.	Write a program to implement Merge sort.	CO3
19.	Write a program to implement Selection sort, Insertion sort.	CO4

SUBJECT: 6CS4-24: MOBILE APPLICATION DEVELOPMENT LAB

CO1	The students will learn to introduce Android platform and its architecture.
CO2	The students will learn activity creation and Android UI designing.
CO3	The students will be familiarized with Intent, Broadcast receivers and Internet services.
CO4	The students will be able to work with SQLite Database and content providers.
CO5	The students will be able to integrate multimedia, camera and Location based services in Android Application.
CO6	The students will learn to explore Mobile security issues.

Credit-1.5
0L+0T+3P

Max. Marks :75 (IA:45,ETE:30)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	To study Android Studio and android studio installation. Create "Hello World" application.	CO1, CO2
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).	CO2, CO3
3	Design simple GUI application with activity and intents e.g. calculator.	CO2, CO3
4	Develop an application that makes use of RSS Feed.	CO3
5	Write an application that draws basic graphical primitives on the screen.	CO2, CO3, CO5
6	Create an android app for database creation using SQLite Database.	CO4
7	Develop a native application that uses GPS location information.	CO5
8.	Implement an application that writes data to the SD card.	CO4, CO5
9.	Design a gaming application.	CO5
10	Create an application to handle images and videos according to size.	CO5

IV Year Curriculum

VII SEMESTER

SUBJECT: 7CS4-01: INTERNET OF THINGS

CO47401.1	Understand the definition and significance of the Internet of Thing and explore the relationship between IoT, cloud computing, and big data.
CO47401.2	Understand the different types of sensors and different types of Arduino and Raspberry Pi board
CO47401.3	Students will be able to understand architecture and reference model of IoT and different challenges in IoT
CO47401.4	Students will be able to understand machine to machine communication and comparison b/w SDN and NFV
CO47401.5	Design IoT applications in different domain and be able to analyze their performance

Credit-3

Max. Marks : 150 (IA:30,ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to IoT: Definition and characteristics of IoT, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs, IOT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.	08
3	IoT Hardware and Software: Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIoTOS, Contiki OS, Tiny OS.	07
4	Architecture and Reference Model: Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, Other challenges.	08
5	IOT and M2M: M2M, Difference and similarities between IOT and M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT.	08
6	Case study of IoT Applications: Domain specific IOTs- Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyles.	08
	Total	40

Suggested Readings:

1. Rajkamal, "Internet of Things", Tata McGraw Hill publication
2. Vijay Madiseti and Arshdeep Bahga, "Internet of things(A-Hand-on-Approach)" Universal Press

SUBJECT: 7ME6-60.2: QUALITY MANAGEMENT

CO47660.1	To understand the concept of Quality.
CO47660.2	To understand distinguish and use the several techniques and quality management tools.
CO47660.3	To understand the Implication of Quality on Business
CO47660.4	To Implement Quality Implementation Programs
CO47660.5	To have exposure to challenges in Quality Improvement Programs

Credit-3

Max. Marks : 150 (IA:30,ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Quality Management: Quality – Concept, Different Definitions and Dimensions, Inspection, Quality Control, Quality Assurance and Quality Management, Quality as Wining Strategy, Views of different Quality Gurus, Quality Cost.	6
3	Process Quality Improvement: Introduction to process quality, Graphical and statistical techniques for process Quality Improvement, Graphical tools for data representation, 7QC tools, Sampling, sampling distribution, and hypothesis Testing, Regression, control charts, process capability analysis, Measurement system analysis, Analysis of Variance(ANOVA), Design and analysis of experiment (DOE), Acceptance sampling pan, TQM	9
4	Leadership, Lean and JIT Q Quality Philosophy, Benchmarking, Process failure mode and effect analysis (PFMEA), Service Quality, Six sigma for process Improvement, ISO 9001, ISO 14000 and QS 9000, Quality audit, Quality Circles.	9
5	Product Quality Improvement: Quality Function Deployment, Robust Design and Taguchi Method	8
6	Design Failure: Mode and Effect Analysis, Product Reliability Analysis, Six sigma in product development	7
	Total	40

Suggested Readings:

1. Total Quality Management By Dale H. Besterfield, C B Michna, Mary Besterfield-sacre (Author) ,G H Besterfield, H Urdhwareshe, R Urdhwareshe.

SUBJECT: 7CS4-21: INTERNET OF THINGS LAB

CO1	Understand the definition and significance of the programming language which used for Internet of Thing CO2: Understand and explore the different platform/software/hardware used for IOT CO3: Apply the knowledge of Basic IOT techniques and protocols to develop innovative applications with number of sensors and components.
CO2	Understand the definition and significance of the programming language which used for Internet of Thing CO2: Understand and explore the different platform/software/hardware used for IOT CO3: Apply the knowledge of Basic IOT techniques and protocols to develop innovative applications with number of sensors and components.
CO3	Understand the definition and significance of the programming language which used for Internet of Thing CO2: Understand and explore the different platform/software/hardware used for IOT CO3: Apply the knowledge of Basic IOT techniques and protocols to develop innovative applications with number of sensors and components.

Credit-2
0L+0T+4P

Max. Marks :100(IA:60,ETE:40)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Study and Understand Python with the help of program • Write a Program for arithmetic operation in Python. • Write a Program for looping statement in Python.	CO1
2	Run some programs on IOT simulator - Cupcarbon like: • Read Hello message • Read two numbers and print their sum, difference, product and division	CO1,CO2
3	Study and Install IDE of Arduino and different types of Arduino and • Write program using Arduino IDE for Blink LED • Get input from two switches and switch on corresponding LEDs	CO2
4	Write Program for RGB LED using Arduino	CO2
5	Study the Temperature sensor and Write Program foe monitor temperature using Arduino.	CO3
6	Demonstrate and program for PIR Motion Sensor (Digital Input).	CO3

SUBJECT: 7CS4-22: Cyber Security Lab

CO1	CO1: Students will be able to solve and relate mathematic concepts behind the cryptographic algorithms.
CO2	CO2: Students will be able to explain basic operations of cryptographic algorithms.
CO3	CO3: Students will be able to describe various private and public key security algorithms used for network security along with its encryption and decryption.
CO4	CO4: Students will be able to evaluate various scenarios and apply the required type of algorithm for ensuring security.
CO5	CO5: Students will be able analyse protocols for various security objectives with cryptographic tools.

Credit-2
0L+0T+4P

Max. Marks :100(IA:60,ETE:40)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Implement the following Substitution & Transposition Techniques concepts: a) Caesar Cipher b) Rail fence row & Column Transformation	CO2
2	Implement the Diffie-Hellman Key Exchange mechanism Consider the end user as one of the parties (Alice) and the other party (bob).	CO3
3	Implement the following Attack: Brute Force Attack	CO1
4	Installation of Wire shark, tcpdump, etc and observe data transferred in client server communication using UDP/TCP and identify the UDP/TCP datagram.	CO2
5	Installation of rootkits and study about the variety of options.	CO5
6	Perform an Experiment to Sniff Traffic using ARP Poisoning.	CO4
7.	Demonstrate intrusion detection system using any tool (snort or any other s/w).	CO5
8.	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures.	CO4

VIII SEMESTER

SUBJECT: 8CS4-01: Big Data Analytics

CO48401.1	Students will be able understand the key issues in big data management and its associated applications for business decisions and strategy understand the problem solving and critical thinking skills in fundamental enabling techniques like Hadoop.
CO48401.2	Students will be able to explore the Writing MapReduce Programs with the help of MapReduce Framework and Basic programs of Hadoop MapReduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner, Partitioner.
CO48401.3	Students will be able to explore the Hadoop I/O, Writable Classes and Implementing a Custom Writable.
CO48401.4	Students will be able to understand the Pig Hadoop Programming and Scripts.
CO48401.5	Students will be able to understand Applying Structure to Hadoop Data with Hive

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to Big Data: Big data features and challenges, Problems with Traditional Large-Scale System , Sources of Big Data, 3 V's of Big Data, Types of Data. Working with Big Data: Google File System. Hadoop Distributed File System (HDFS) - Building blocks of Hadoop (Namenode. Data node. Secondary Namenode. Job Tracker. Task Tracker), Introducing and Configuring Hadoop cluster (Local. Pseudo-distributed mode, Fully Distributed mode). Configuring XML files.	10
3	Writing MapReduce Programs: A Weather Dataset. Understanding Hadoop API for MapReduce Framework (Old and New). Basic programs of Hadoop MapReduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner, Partitioner.	08
4	Hadoop I/O: The Writable Interface. Writable Comparable and comparators. Writable Classes: Writable wrappers for Java primitives. Text. Bytes Writable. Null Writable, Object Writable and Generic Writable. Writable collections. Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.	08
5	Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow. Working through the ABCs of Pig Latin. Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.	07

6	Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive. Examining the Hive Clients. Working with Hive Data Types. Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.	06
	Total	40

Suggested Readings:

1. CreAnand Rajaraman and Jeff Ullman —Mining of Massive Datasets, Cambridge University Press
2. Alex Holmes —Hadoop in Practice, Manning Press, Dreamtech Press.
3. Bill Franks , —Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics, Wiley
4. Chuck Lam, —Hadoop in Action, Dreamtech Press

SUBJECT: 8TT6-60.1: MATERIAL AND HUMAN RESOURCE MANAGEMENT

CO48660.1	To understand the basic knowledge of Capital structure in Human resource management.
CO48660.2	To understand the Various classification, requirement and factors of Working capital.
CO48660.3	To analysis the job and scientific recruitment and selection process for the higher productivity for personal management and HRD.
CO48660.4	To analyze the different material management process in human resource.
CO48660.5	To integrate the knowledge of various Techniques of Inventory Control.

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Capital Structure: Meaning: Essentials of an ideal/optimum Capital Structure, Difference between capital, Capitalisation and Capital Structure.	7
3	Management of Working Capital: Definition; Nature Classification of Working Capital – (i) Permanent working Capital and (ii) Variable Working Capital; Factors affecting requirement of working capital.	8
4	Personal Management and HRD. Job Analysis: Meaning and Importance; Processes of Job Analysis. Job Description and Job Specification.	8
5	Materials Management: Definition and Objectives: Inventory Management.	8
6	Inventory Control: Techniques of Inventory control- ROL, FOR Value Analysis, ABC Analysis, VED Analysis; Factors affecting Inventory Control, Ordering Costs, Carrying	8
	Total	40

Suggested Readings:

1. Human Resource Management The Open University of Hong Kong
2. Material Management J.R. Tony Arnold, Stephen N. Chapman, Lloyd M. Clive Pearson Publication
3. Material Management Dr. Dilfraz Singh Excel Books Private Limited.

SUBJECT: 8CS4-21: Big Data Analytics Lab

CO1	Students will be able understand the key issues in big data management and its associated applications for business decisions and strategy understand the problem solving and critical thinking skills in fundamental enabling techniques like Hadoop
CO2	Students will be able to explore the Writing MapReduce Programs with the help of MapReduce Framework and Basic programs of Hadoop MapReduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner, Partitioner
CO3	Students will be able to understand the Pig Hadoop Programming and Scripts.
CO4	Students will be able to understand Applying Structure to Hadoop Data with Hive

Credit-2
0L+0T+2P

Max. Marks :50(IA:30,ETE:20)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1.	Implement the following Data structures in Java <ul style="list-style-type: none"> • i) Linked Lists ii) Stacks iii) Queues iv) Set v) Map 	CO1
2.	Perform setting up and Installing Hadoop in its three operating modes: <ul style="list-style-type: none"> • Standalone, Pseudo distributed, Fully distributed. 	CO1
3.	Implement the following file management tasks in Hadoop: <ul style="list-style-type: none"> • Adding files and directories • Retrieving files • Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities 	CO1
4.	Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.	CO2
5.	Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.	CO2
6.	Implement Matrix Multiplication with Hadoop Map Reduce	CO2
7.	Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.	CO3
8.	Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.	CO4

SUBJECT: 8CS4-22: Software Testing and Validation Lab

CO1	The students will learn the different programming paradigms about Jabuti.
CO2	The students will understand the principles and aspects of JABUTI.
CO3	The students will be able to understand and apply the principles of jabuti and Selenium.
CO4	The students will be able to understand the concept of core functionality about the selenium and installation aspects as well.
CO5	The students will learn various streams and they will be able to develop programming skills to solve basic real world problems using Selenium techniques.

Credit-2
0L+0T+2P

Max. Marks :50(IA:30,ETE:20)
End Term Exam: 2 Hours

S.NO.	NAME OF EXPERIMENT	CO Mapped
1	Write a program that calculates the area and perimeter of the circle. And find the Coverage & Test Cases of that program using JaButi Tool., ROI and time during the execution of the program.	CO1,CO2
2	Write a program which read the first name and last name from console and matching with expected result by using JaBuTi.	CO1,CO2
3	Write a program that takes three double numbers from the java console representing , respectively, the three coefficients a,b, and c of a quadratic equation.	CO3
4	Write a program that reads commercial website URL from a url from file .you should expect that the URL starts with www and ends with .com. retrieve the name of the site and output it. For instance, if the user inputs www.yahoo.com, you should output yahoo. After that find the test cases and coverage using JaButi.	CO3
5	Write a program that reads two words representing passwords from the java console and outputs the number of character in the smaller of the two. For example, if the words are open and sesame, then the output should be 4, the length of the shorter word, open. And test this program using JaButi	CO3
6	Calculate the mutation score of programs given in 1(a) to 1 (f) using jumble Tool	CO3
7	Calculate the coverage analysis of programs given in 1 (a) To 1 (f) using EclEmma Free open source Tool	CO3
8	Using Selenium IDE, Write at test suite containing minimum 4 test cases.	CO4
9	Conduct attest suite for any two websites.	CO4
10	Install Selenium server and demonstrate it using a script in Java/PHP	CO4,CO5
11	Write and test a program to login a specific web page using selenium.	CO4,CO5
12	Write and test a program to update 10 student records into table into Excel file.	CO5