R.M.D. ENGINEERING COLLEGE

(An Autonomous Institution)

REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM

B.Tech. INFORMATION TECHNOLOGY

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics and Information Technology for the applications relevant to various streams of Engineering and Technology.

2. To enrich graduates with the core competencies necessary for applying knowledge of computers and telecommunications equipment to store, retrieve, transmit, manipulate and analyze data in the context of business enterprise.

3. To enable graduates to think logically, pursue lifelong learning and will have the capacity to understand technical issues related to computing systems and to design optimal solutions.

4. To enable graduates to develop hardware and software systems by understanding the importance of social, business and environmental needs in the human context.

5. To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills to solve real world problems and meet the diversified needs of industry, academia and research.

PROGRAM OUTCOMES (POs)

ENGINEERING GRADUATES WILL BE ABLE TO:

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OBJECTIVES (PSOs)

After the successful completion of the program, the graduates will be able to:

1. To create, select, and apply appropriate techniques, resources, modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
2. To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications.
3. Identify and utilize the strengths of current technologies in the hardware/support and mobile technology domains in implementing IT enabled services for societal needs.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	2										2
PEO2	3	3	1	1								2
PEO3			3			1						3
PEO4			3		1	2	3	1				
PEO5				3				1	1	2	2	1

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OBJECTIVES (PSOs)	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PSO1	3	2			3				2	2		3
PSO2	3	3	3	3	3	3	3	3	3	3	3	3
PSO3				3			3	3			3	2

Contribution 1: Reasonable 2:Significant 3:Strong

R.M.D. ENGINEERING COLLEGE
(An Autonomous Institutions)

B.TECH INFORMATION TECHNOLOGY
REGULATIONS – 2022
CHOICE BASED CREDIT SYSTEM

I - VIII SEMESTERS CURRICULUM

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES WITH LABORATORY COMPONENT								
1.	22MA101	Matrices and Calculus	BSC	5	3	0	2	4
2.	22CH101	Engineering Chemistry	BSC	5	3	0	2	4
3.	22CS101	Problem Solving using C++	ESC	5	3	0	2	4
4.	22CS102	Software Development Practices	ESC	5	3	0	2	4
5.	22EC101	Digital Principles and System Design	ESC	5	3	0	2	4
LABORATORY COURSES WITH THEORY COMPONENT								
6.	22GE111	Computer Aided Engineering Graphics	ESC	3	1	0	2	2
LABORATORY COURSES								
7.	22GE112	Product Development Lab - I	EEC	2	0	0	2	1
MANDATORY COURSE								
8.	22MC101	Induction Program (Non-Credit Course)	MC	3 Weeks	-	-	-	-
			TOTAL	**30**	**16**	**0**	**14**	**23**

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORYCOURSES								
1.	22GE102	Heritage of Tamils	HSMC	1	1	0	0	1
THEORY COURSES WITH LABORATORY COMPONENTS								
2.	22MA201	Transforms and Numerical Methods	BSC	5	3	0	2	4
3.	22CS201	Data Structures	ESC	5	3	0	2	4
4.	22PH201	Physics for Computer Science and Information Technology	BSC	5	3	0	2	4
5.	22HS101	Professional Communication	HSMC	4	2	0	2	3
6.	22CS202	Java Programming	ESC	5	3	0	2	4
7.	22IT201	Database Management Systems	PCC	5	3	0	2	4
LABORATORY COURSES								
8.	22GE211	Product Development Lab – II	EEC	2	0	0	2	1
MANDATORY COURSE								
9.	22MC102	Environmental Sciences and Sustainability (Non Credit)	MC	2	2	0	0	0
AUDIT COURSE								
10.	22AC201	Yoga for Stress Management (Non Credit)	AC	1	1	0	0	0
			TOTAL	**35**	**21**	**0**	**14**	**25**

SEMESTER III

Sl. No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	22GE301	Universal Human Values II: Understanding Harmony	HSMC	4	2	2	0	3
2.	22GE201	Tamils and Technology	HSMC	1	1	0	0	1
3.	22MA301	Discrete Mathematics	BSC	4	3	1	0	4
4.	22IT301	Design Thinking	ESC	4	3	1	0	4
THEORY COURSES WITH LABORATORY COMPONENT								
5.	22CS301	Advanced Java Programming	PCC	5	3	0	2	4
6.	22CS303	Design and Analysis of Algorithms	PCC	4	2	0	2	3
7.	22CS304	Operating Systems	PCC	4	2	0	2	3
LABORATORY COURSES								
7.	22GE311	Product Development Lab - III	EEC	2	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES								
9.	22CS311	Aptitude and Coding Skills I	EEC	2	0	0	2	1
10	22IT311	Internship/Seminar	EEC	2	0	0	2	1
AUDIT COURSE								
11.		Value Education (Non Credit)	AC	1	1	0	0	0
			TOTAL	**33**	**17**	**4**	**12**	**25**

B.M.D ENGINEERING COLLEGE

SEMESTER IV

Sl. No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES WITH LABORATORY COMPONENT								
1.	22MA401	Probability and Statistics	BSC	5	3	0	2	4
2.	22IT401	Artificial Intelligence and Machine Learning	PCC	5	3	0	2	4
3.	22IT402	Computer Architecture and Microprocessors	PCC	5	3	0	2	4
4.	22IT403	Web Development Frameworks	PCC	5	3	0	2	4
5.	22IT404	Application System Design with UML	PCC	5	3	0	2	4
6.		Professional Elective I	PEC	4	2	0	2	3
LABORATORY COURSES								
7.	22GE411	Product Development Lab - IV	EEC	2	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES								
8.	22CS411	Aptitude and Coding Skills - II	EEC	2	0	0	2	1
AUDIT COURSE								
9.		Yoga/Personality (Non Credit)	AC	1	1	0	0	0
			TOTAL	**34**	**18**	**0**	**16**	**25**

SEMESTER V

Sl. No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES WITH LABORATORY COMPONENT								
1.	22IT501	Data Communications and Computer Networks	PCC	5	3	0	2	4
2.	22IT502	Data Analytics	PCC	5	3	0	2	4
3.	22IT503	Cloud Computing	PCC	5	3	0	2	4
4.		Professional Elective II	PEC	4	2	0	2	3
5.		Professional Elective III	PEC	4	2	0	2	3
6.		Open Elective I	OEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7.	22CS511	Advanced Aptitude and Coding Skills - I	EEC	2	0	0	2	1
8.	22IT511	Internship/Seminar	EEC	2	0	0	2	1
MANDATORY COURSE								
9.		Indian Constitution (Non Credit)	MC	1	1	0	0	0
TOTAL				**32**	**16**	**0**	**16**	**23**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORYCOURSES WITH LABORATORY COMPONENT								
1.	22IT601	Mobile Architecture and Development	PCC	5	3	0	2	4
2.		Embedded Systems and Internet of Things	PCC	5	3	0	2	4
3.		Professional Elective IV	PEC	4	2	0	2	3
4.		Professional Elective V	PEC	4	2	0	2	3
5.		Open Elective II	OEC	4	2	0	2	3
6.		Open Elective III	OEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7.	22CS611	Advanced Aptitude and Coding Skills - II	EEC	2	0	0	2	1
			TOTAL	**28**	**14**	**0**	**14**	**21**

SEMESTER VII

SI. No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORYCOURSES								
1.		Professional Ethics	HSMC	2	2	0	0	2
THEORY COURSES WITH LABORATORY COMPONENTS								
2.	22IT701	Microservice Architecture	PCC	5	3	0	2	4
3.		Professional Elective VI	PEC	4	2	0	2	3
4.		Open Elective IV	OEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
5.	22IT711	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	6	0	0	6	3
MANDATORY COURSE								
6.		Essence of Indian Knowledge Tradition (Non Credit)	MC	1	1	0	0	0
			TOTAL	**22**	**10**	**0**	**12**	**15**

SEMESTER VIII

Sl. No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
LABORATORY COURSES								
1.	22IT811	ProjectWork	EEC	16	0	0	16	8
			TOTAL	**16**	**0**	**0**	**16**	**8**

TOTALNO.OFCREDITS:165

SUMMARY OF CREDIT DISTRIBUTION

S.NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	HSMC	-	4	4	-	-	-	2	-	10
2.	BSC	8	8	4	4	-	-	-	-	24
3.	ESC	14	8	4	-	-	-	-	-	26
4.	PCC	-	4	10	16	12	8	4	-	54
5.	PEC	-	-	-	3	6	6	3	-	18
6.	OEC	-	-	-	-	3	6	3	-	12
7.	EEC	1	1	3	2	2	1	3	8	21
	Total	**23**	**25**	**25**	**25**	**23**	**21**	**15**	**8**	**165**

HSMC - Humanities and Social Sciences including Management Course; BSC – Basic Science Course; ESC – Engineering Science Course; PCC – Professional Core Course; PEC – Professional Elective Course; EEC – Employability Enhancement Course; MC – Mandatory Course;, AC – Audit Course

PROFESSIONAL ELECTIVES & HONOURS DEGREE VERTICALS

Vertical I Data Science	Vertical II Cyber Security	Vertical III Full Stack Engineering	Vertical IV Media Processing	Vertical V Fintech and Web 3.0	Vertical VI Artificial Intelligence and Machine Learning	Vertical VII Quantum Computing
Data Science for Engineers	Cyber Security	Software Testing and Automation	Computer Graphics	Blockchain Technologies	Soft Computing	Linear Algebra
Image and Video Analytics	Modern Cryptography	Server-side Programming	Human Computer Interaction	Finance Engineering	Applied AI	Quantum Information Theory
Text and Speech Analysis	Database Security and Access Control	DevOps	Digital Marketing	Web 3.0 and Metaverse	Social Network Analysis	Quantum Statistical Data Analysis
Business Analytics	Ethical Hacking	Web Application Security	Digital Image Processing	Metamask: Crypto Wallet	Reinforcement Learning	Quantum Computing Architecture
Deep Learning and Neural Networks	Malware Analysis	Front End Engineering	Visual Effects	Introduction to Fintech	Knowledge Engineering	Quantum Computing Foundations
Recommender Systems	Secured Coding	Server-side Engineering	Augmented Reality/ Virtual Reality	Smart Contracts and Solidity	Deep Learning	Quantum Programming
Data Exploration and Visualization	Application Security	Scalable Messaging Infrastructure - Apache Kafka	Mobile VR and AI in Moduley	Blockchain Platforms and Usecases	Computer Vision	Quantum Cryptography
Cognitive Science and Analytics	Digital Forensics	Usability Design of Software Application	Game Development	Blockchain Security and Performance	Natural Language Processing	Machine Learning with Quantum Computing
Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*

MINOR DEGREE VERTICALS

Vertical I Data Science	Vertical II Cyber Security	Vertical III Full Stack Engineering	Vertical IV Media Processing	Vertical V Fintech and Web 3.0	Vertical VI Artificial Intelligence and Machine Learning	Vertical VII Quantum Computing	Vertical VIII Entrepreneurship and Innovation
Data Science for Engineers	Computer Networks	Web Technology - Foundation	Computer Graphics	Blockchain Technologies	Artificial Intelligence and Machine Learning	Linear Algebra	Foundations of Entrepreneurship
Business Analytics	Cyber Security	Front End Engineering	Human Computer Interaction	Finance Engineering	Applied AI	Quantum Computing Foundations	Team Building and Leadership Management for Business
Deep Learning and Neural Networks	Malware Analysis	Server-side Engineering	Digital Marketing	Introduction to Fintech	Knowledge Engineering	Quantum Computing Architecture	Creativity and Innovation in Entrepreneurship
Recommender Systems	Secured Coding	Usability Design of Software Application	Augmented Reality/ Virtual Reality	Smart Contracts and Solidity	Deep Learning	Quantum Programming	Principles of Marketing Management for Business
Data Exploration and Visualization	Application Security	DevOps	Mobile VR and AI in Moduley	Blockchain Platforms and Usecases	Computer Vision	Quantum Cryptography	Human Resource Management for Entrepreneurs
Cognitive Science and Analytics	Digital Forensics	Scalable Messaging Infrastructure - Apache Kafka	Game Development	Blockchain Security and Performance	Natural Language Processing	Machine Learning with Quantum Computing	Financing New Business Ventures
Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*	Capstone Design Project*

CURRICULUM OF B.TECH (HONOURS) IN INFORMATION TECHNOLOGY WITH SPECIALIZATION IN

Data Science| Cyber Security | Full Stack Engineering | Media Processing| Fintech and Web 3.0

VERTICAL I- DATA SCIENCE

Sl. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Data Science for Engineers	PEC	4	2	0	2	3
2.		Image and Video Analytics	PEC	4	2	0	2	3
3.		Text and Speech Analysis	PEC	4	2	0	2	3
4.		Business Analytics	PEC	4	2	0	2	3
5.		Deep Learning and Neural Networks	PEC	4	2	0	2	3
6.		Recommender Systems	PEC	4	2	0	2	3
7.		Data Exploration and Visualization	PEC	4	2	0	2	3
8.		Cognitive Science and Analytics	PEC	4	2	0	2	3
9.		Capstone Design Project*	PEC	12	0	0	12	6

VERTICAL II- CYBER SECURITY

Sl. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Cyber Security	PEC	4	2	0	2	3
2.		Modern Cryptography	PEC	4	2	0	2	3
3.		Malware Analysis	PEC	4	2	0	2	3
4.		Ethical Hacking	PEC	4	2	0	2	3
5.		Database Security and Access Control	PEC	4	2	0	2	3
6.		Secured Coding	PEC	4	2	0	2	3
7.		Application Security	PEC	4	2	0	2	3
8.		Digital Forensics	PEC	4	2	0	2	3
9.		Capstone Design Project*	PEC	12	0	0	12	6

VERTICAL III- FULL STACK ENGINEERING

Sl. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1		Software Testing and Automation	PEC	4	2	0	2	3
2		Server-side Programming	PEC	4	2	0	2	3
3		DevOps	PEC	4	2	0	2	3
4		Web Application Security	PEC	4	2	0	2	3
5		Usability Design of Software Application	PEC	4	2	0	2	3
6		Front End Engineering	PEC	4	2	0	2	3
7		Server-side Engineering	PEC	4	2	0	2	3
8		Scalable Messaging Infrastructure - Apache Kafka	PEC	4	2	0	2	3
9		Capstone Design Project*	PEC	12	0	0	12	6

VERTICAL IV- MEDIA PROCESSING

Sl. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1		Computer Graphics	PEC	4	2	0	2	3
2		Human Computer Interaction	PEC	4	2	0	2	3
3		Digital Marketing	PEC	4	2	0	2	3
4		Digital Image Processing	PEC	4	2	0	2	3
5		Visual Effects	PEC	4	2	0	2	3
6		Augmented Reality/ Virtual Reality	PEC	4	2	0	2	3
7		Mobile VR and AI in Moduley	PEC	4	2	0	2	3
8		Game Development	PEC	4	2	0	2	3
9		Capstone Design Project*	PEC	12	0	0	12	6

VERTICAL V- FINTECH AND WEB 3.0

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1		Blockchain Technologies	PEC	4	2	0	2	3
2		Finance Engineering	PEC	4	2	0	2	3
3		Introduction to Fintech	PEC	4	2	0	2	3
4		Metamask: Crypto Wallet	PEC	4	2	0	2	3
5		Web 3.0 and Metaverse	PEC	4	2	0	2	3
6		Smart Contracts and Solidity	PEC	4	2	0	2	3
7		Blockchain Platforms and Usecases	PEC	4	2	0	2	3
8		Blockchain Security and Performance	PEC	4	2	0	2	3
9		Capstone Design Project*	PEC	12	0	0	12	6

R2022 (2022-23)

MINOR DEGREE

OFFERED FROM OTHER DEPARTMENTS FOR

B.TECH. INFORMATION TECHNOLOGY STUDENTS

Sl. No.	Name of the Minor Degree	Offering Department
1.	IoT	ECE
2.	Robotic and Automation	ECE
3.	Intelligent Healthcare	AIML
4.	Digital Marketing	CSBS

SEMESTER –I

22MA101	MATRICES AND CALCULUS (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Explain the concepts of matrix algebra techniques needed for practicalapplications.
- Determine the curvature of the curves.
- Illustrate the simple applications of multivariable calculus and vector calculus.
- Elaborate the concept and application of multiple integrals.

UNIT I	MATRICES	15

Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

Theory: 9

Experiments using SCILAB:

1. Introduction to SCILAB through matrices and general syntax.
2. Finding the Eigen values and Eigenvectors.
3. Plotting the graph of a quadratic form.

Laboratory: 6

UNIT II	SINGLE VARIABLE CALCULUS	15

Curvature in Cartesian and Polar Co-ordinates – Centre and radius of curvature –Circle of curvature–Evolutes.

Theory: 9

Experiments using SCILAB:

1. Evaluating the radius of curvature.
2. Finding the coordinates of the center of curvature.
3. Tracing of Curves.

Laboratory: 6

UNIT III	MULTIVARIABLE CALCULUS	15

Partial derivatives (excluding Euler's theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables.

Theory: 9

Experiments using SCILAB:

1. Evaluating the maxima of functions of several variables.
2. Evaluating the minima of functions of several variables.

3. Evaluation of Jacobians.

Laboratory: 6

UNIT IV	MULTIPLE INTEGRALS	15

Double integrals – Change of order of integration – Area enclosed by plane curves –Triple integrals – Volume of solids.

Theory: 9

Experiments using SCILAB:

1. Evaluating area under a curve.
2. Evaluating area using double integral.
3. Evaluation of volume by integrals.

Laboratory: 6

UNIT V	VECTOR CALCULUS	15

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane and Gauss divergence theorem (Statement only) – Simple applications involving cubes and rectangular parallelopipeds.

Theory: 9

Experiments using SCILAB:

1. Evaluating gradient.
2. Evaluating directional derivative.
3. Evaluating divergent and curl.

Laboratory: 6

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:CO1:

Use the matrix algebra methods to diagonalize the matrix.
CO2: Determine the evolute of the curve.
CO3: Apply differential calculus ideas on the function of several variables.
CO4: Evaluate the area and volume by applying the concept of multiple integration.
CO5: Utilize the concept of vector calculus in evaluating integrals.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, TheNational Publication Company, Chennai, 2003.
2. Sivaramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.

3. H. K. Dass, and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. ChandPrivate Limited, 3rd Edition 2014.
4. B.V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill PublishingCompany, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, “Engineering Mathematics”, Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

LIST OF EQUIPMENTS:

1. SCILAB- Open source

22CH101	ENGINEERING CHEMISTRY (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To understand the water quality criteria and interpret its applications in water purification.
- To gain insights into the basic concepts of electrochemistry and implement its applications in chemical sensors.
- To acquire knowledge on the fundamental principle of energy storage devicesand relate it to electric vehicles.
- To identify the different types of smart materials and explore their applications in Engineering and Technology.
- To assimilate the preparation, properties and applications of nano materials invarious fields.

UNIT I	WATER TECHNOLOGY	15

Sources of water –Impurities - Drinking water quality parameters –Hardness and its types, problems - Municipal water treatment and disinfection (chlorination- break-point chlorination, UV, Ozonation). Boiler troubles- Scales and sludges, Boiler feed water: Requirements - Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning). External treatment –Ion exchange demineralization - Principle, process and fouling.

Desalination of brackish water: Reverse osmosis –principle-types of membranes, process and fouling.

(Theory-9)

Determination of total, temporary and permanent hardness of water by EDTA method.

Determination of chloride content of water sample by argentometric method.

Determination of alkalinity in water sample

(Laboratory-6)

UNIT II	ELECTROCHEMISTRY AND SENSORS	15

Introduction- Conductance- factors affecting conductance – Electrodes– origin of electrode potential – single electrode potential, standard electrode potential – measurement of single electrode potential –over voltage - reference electrodes

(standard hydrogen electrode, calomel electrode)-ion selective electrode- glass

electrode - Nernst equation (derivation),numerical problems, Electrochemical seriesand its applications.

Chemical sensors – Principle of chemical sensors – Breath analyzer– Gas sensors –CO2 sensors-Sensor for health care – Glucose sensor.

(Theory-9)

Determination of the amount of NaOH using a conductivity meter. Determination of the amount of acids in a mixture using a conductivity meter.Determination of the amount of given hydrochloric acid using a pH meter.

(Laboratory-6)

UNIT III	ENERGY STORAGEDEVICES AND ENERGYSOURCES	15

Batteries –Primary alkaline battery - Secondary battery - Pb-acid battery, Fuel cell - H2 – O2 fuel cell.

Batteries used in E- vehicle: Ni-metal hydride battery, Li-ion Battery, Li-air Battery Nuclear Energy – Nuclear fission, fusion, differences, characteristics – nuclear chain reactions – light water nuclear reactor – breeder reactor.

(Theory-9)

Determination of single electrode potential of the given electrode. Estimation of the iron content of the given solution using a potentiometer.

Determination of electrochemical cell potential (using different electrodes/ different concentrations of electrolytes)

(Laboratory-6)

UNIT IV	SMART MATERIALS FOR ENGINEERING APPLICATIONS	15

Polymers – Definition – Classification – smart polymeric materials - Preparation, properties and applications of Piezoelectric polymer - Polyvinylidene fluoride (PVDF), Electroactive polymer- Polyaniline (PANI) and Biodegradable polymer - Polylactic acid(PLA).

Polymer composites: Definition, Classification – FRP's – Kevlar.

Shape Memory Alloys: Introduction, Shape memory effect – Functional properties ofSMAs – Types of SMA - Nitinol (Ni-Ti) alloys - applications.

Chromogenic materials: Introduction – Types - applications.

(Theory-9)

Determination of the molecular weight of polymer using Ostwald viscometer.

Application of polymeric fibers in 3D printing.

(Laboratory-6)

UNIT V	NANO CHEMISTRY	15

Introduction – synthesis – top-down process (laser ablation, chemical vapor deposition), bottom-up process (precipitation, electrochemical deposition) – properties of nanomaterials – types – nanotubes -carbon nanotubes, applications of CNT - nanocomposites – General applications of nanomaterials in electronics, information

technology, medical and healthcare, energy, environmental remediation, constructionand transportation industries.

(Theory-9)

Determination of concentration of $BaSO_4$ nanoparticles by conductometric titrations.
Preparation of ZnO nanocrystal by precipitation method.

(Laboratory-6)

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Interpret the water quality parameters and explain the various water treatment methods.

CO2: Construct the electro chemical cells and sensors.

CO3: Compare different energy storage devices and predict their relevance in electricvehicles.

CO4: Classify different types of smart materials, their properties and applications in Engineering and Technology.

CO5: Integrate the concepts of nano chemistry and enumerate its applications in variousfields.

TEXT BOOKS:

1. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2022.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2012.

REFERENCES:

1. S.S. Daraand S.S. Umare, "A Textbook of Engineering Chemistry",12th Edition, S.Chand &Company, NewDelhi, 2013.
2. V.R. Gowarikar, Polymer Science, 2nd edition, New Age International Publishers, 2021.
3. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume - 1&Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.
4. Geoffrey A. Ozin, Andre C. Arsenault and Ludovico Cademartiri, "Nanochemistry: A Chemical Approach to Nanomaterials",2nd Edition, RSC publishers , 2015.
5. Prasanna Chandrasekhar, "Conducting polymers, fundamentals and applications–Including Carbon Nanotubes and Graphene", Second Edition, SpringerScience& Business Media, New York, 2019.
6. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", 6th edition, Pearson Education Pvt. Ltd., 2019.

LIST OF EQUIPMENTS:

1. Conductivity meter – 20 Nos.
2. pH meter - 19 Nos.
3. Potentiometer - 20 Nos.

22CS101	PROBLEM SOLVING USING C++ (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To learn problem solving and programming fundamentals.
- To gain knowledge on pointers and functions.
- To apply the principles of object orientated programming.
- To understand operator overloading, inheritance and polymorphism.
- To use the functionalities of I/O operations, files build C++ programs using exceptions.

UNIT I	PROBLEM SOLVING AND PROGRAMMING FUNDAMENTALS	15

Computational thinking for Problem solving – Algorithmic thinking for Problem solving - Building Blocks - Problem Solving and Decomposition - Dealing with Error – Evaluation. Overview of C – Data types – Identifiers – Variables – Storage Class Specifiers – Constants – Operators - Expressions – Statements – Arrays and Strings – Single-Dimensional – Two-Dimensional Arrays – Arrays of Strings – Multidimensional Arrays.

List of Exercise/Experiments:

1. Write C/C++ programs for the following:
    a. Find the sum of individual digits of a positive integer.
    b. Compute the GCD of two numbers.
    c. Find the roots of a number (Newton‘s method)
2. Write C/C++ programs using arrays:
    a. Find the maximum of an array of numbers.
    b. Remove duplicates from an array of numbers.
    c. Print the numbers in an array after removing even numbers.
3. Write C/C++ programs using strings:
    a. Checking for palindrome.
    b. Count the occurrences of each character in a given word.

UNIT II	POINTERS AND FUNCTIONS	15

Pointers -Variables – Operators – Expressions – Pointers and Arrays – Functions - Scope Rules – Function Arguments – return Statement – Recursion – Structures – Unions – Enumerations.

List of Exercise/Experiments:

1. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members:
    EID, Ename, Designation, DOB, DOJ, Basic pay
    Note that DOB and DOJ should be implemented using structure within structure.
2. Compute internal marks of students for five different subjects using structures and functions.

UNIT III	CLASSES AND OBJECTS	15

Concepts of Object-Oriented Programming – Benefits of OOP – Simple C++ program - Classes and Objects - Member functions - Nesting of member functions - Private

member functions - Memory Allocation for Objects - Static Data Members - Static Member functions - Array of Objects - Objects as function arguments - Returning objects
- friend functions – Const Member functions - Constructors – Destructors.

List of Exercise/Experiments:

1. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
2. Program to illustrate default constructor, parameterized constructor and copy constructors.

UNIT IV	OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM	15

Operator Overloading - Overloading Using Friend functions – Inheritance – Types of inheritance – Virtual Base Class - Abstract Class – Constructors in Derived Classes - member class: nesting of classes.
Pointer to objects – this pointer- Pointer to derived Class - Virtual functions – Pure Virtual Functions – Polymorphism.

List of Exercise/Experiments:

1. Write a Program to Demonstrate the i) Operator Overloading. ii) FunctionOverloading.
2. Write a Program to Demonstrate Friend Function and Friend Class.
3. Program to demonstrate inline functions.
4. Program for Overriding of member functions.
5. Write C++ programs that illustrate how the following forms of inheritance are supported:
   a) Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance.

UNIT V	I/O, FILES AND EXCEPTIONS	15

C++ Streams – Unformatted I/O - Formatted Console I/O – Opening and Closing File – File modes - File pointers and their manipulations – Templates – Class Templates – Function Templates - Exception handling.

List of Exercise/Experiments:

1. Program to demonstrate pure virtual function implementation.
2. Count the number of account holders whose balance is less than the minimumbalance using sequential access file.
3. Write a Program to Demonstrate the Catching of all Exceptions.
4. Mini project.

TOTAL: 45+30 = 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:CO1:

Solve problems using basic constructs in C.

CO2: Implement C programs using pointers and functions.

CO3: Apply object-oriented concepts and solve real world problems.

CO4: Develop C++ programs using operator overloading and polymorphism.

CO5: Implement C++ programs using Files and exceptions.

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference C++", 4th edition, MH, 2015. (Unit 1 &2)
2. E Balagurusamy, "Object Oriented Programming with C++", 4th Edition, TataMcGraw-Hill Education, 2008. (Unit 3, 4 & 5)

REFERENCES:

1. Karl Beecher, "Computational Thinking: A beginner's guide to problem-solving and programming", BCS Learning & Development Ltd, 2017. (Unit 1)
2. Nell Dale, Chip Weems, "Programming and Problem Solving with C++", 5thEdition, Jones and Barklett Publishers, 2010.
3. John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.
4. Yashavant P. Kanetkar, "Let us C++", BPB Publications, 2020
5. ISRD Group, "Introduction to Object-oriented Programming and C++", TataMcGraw-Hill Publishing Company Ltd., 2007.
6. D. S. Malik, "C++ Programming: From Problem Analysis to Program Design",Third Edition, Thomson Course Technology, 2007.
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01297200240671948837_shared/overview

LIST OF EQUIPMENTS:

1. Standalone desktops with C/C++ compiler (or) Server with C/C++ compiler.

22CS102	SOFTWARE DEVELOPMENT PRACTICES (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To discuss the essence of agile development methods.
- To set up and create a GitHub repository.
- To create interactive websites using HTML
- To design interactive websites using CSS.
- To develop dynamic web page using Java script.

UNIT I	AGILE SOFTWARE DEVELOPMENT AND Git and GitHub	15

Software Engineering Practices – Waterfall Model - Agility – Agile Process – Extreme Programming - Agile Process Models – Adaptive Software Development – Scrum – Dynamic Systems Development Method – Crystal – Feature Driven Development – Lean Software Development – Agile Modeling – Agile Unified Process – Tool set for Agile Process.

- Introduction to Git –Setting up a Git Repository - Recording Changes to the Repository- Viewing the Commit History - Undoing Things - Working with Remotes -Tagging - Git Aliases - Git Branching - Branches in a Nutshell - Basic Branching and Merging - Branch Management - Branching Workflows - Remote Branches - Rebasing.

Introduction to GitHub – Set up and Configuration - Contribution to Projects, Maintaining a Project – Scripting GitHub.

List of Exercise/Experiments:

1. Form a Team, Decide on a project:
    a) Create a repository in GitHub for the team.
    b) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updating.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.
2. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull requestand peer reviews.
3. Form a Team, Decide on a project:
    c) Create a repository in GitHub for the team.
    d) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updation.
        - Once pull request is reviewed and merged, the master or main

development branch will have files created by all team members.

4. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.

UNIT II	HTML	15

Introduction – Web Basics – Multitier Application Architecture – Cline-Side Scripting versus Server-side Scripting – HTML5 – Headings – Linking – Images – Special Characters and Horizontal Rules – Lists – Tables – Forms – Internal Linking – meta Elements – Form input Types – input and datalist Elements – Page-Structure Elements.

List of Exercise/Experiments:

1. Create web pages using the following:
   - Tables and Lists
   - Image map
   - Forms and Form elements Frames

UNIT III	CSS	15

Inline Styles – Embedded Style Sheets – Conflicting Styles – Linking External Style Sheets – Positioning Elements – Backgrounds – Element Dimensions – Box Model and Text Flow – Media Types and Media Queries – Drop-Down Menus – Text Shadows – Rounded Corners – Colour – Box Shadows – Linear Gradients – Radial Gradients – Multiple Background Images – Image Borders – Animations – Transitions and Transformations – Flexible Box Layout Module – Multicolumn Layout.

List of Exercise/Experiments:

1. Apply Cascading style sheets for the web pages created.

UNIT IV	JAVASCRIPT BASICS	15

Introduction to Scripting – Obtaining user input – Memory Concepts – Arithmetic – Decision Making: Equality and Relational Operators – JavaScript Control Statements – Functions – Program Modules – Programmer-defined functions – Scope rules – functions – Recursion – Arrays – Declaring and Allocating Arrays – References and Reference Parameters – Passing Arrays to Functions – Multidimensional arrays.

List of Exercise/Experiments:

1. Form Validation (Date, Email, User name, Password and Number validation)using JavaScript.

UNIT V	JAVASCRIPT OBJECTS	15

Objects – Math, String, and Date, Boolean and Number, document Object – UsingJSON to Represent objects – DOM: Objects and Collections – Event Handling.

List of Exercise/Experiments:

1. Implement Event Handling in the web pages.

Mini Projects-Develop any one of the following web applications (not limited to one)using above technologies.

a. Online assessment system
b. Ticket reservation system
c. Online shopping
d. Student management system
e. Student result management system
f. Library management

g. Hospital management
h. Attendance management system
i. Examination automation system
j. Web based chat application

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Apply agile development methods in software development practices.
CO2: Set up and create a GitHub repository.
CO3: Develop static and dynamic webpages using HTML.
CO4: Design interactive personal or professional webpages using CSS.
CO5: Develop web pages using Java script with event-handling mechanism.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGrawHill International Edition, Nineth Edition, 2020.
2. Scott Chacon, Ben Straub, "Pro GIT", Apress Publisher, 3rd Edition, 2014.
3. Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Pearson, 5th Edition, 2018.

REFERENCES:

1. Roman Pichler, "Agile Product Management with Scrum Creating Products that Customers Love", Pearson Education, 1 st Edition, 2010.
2. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective",Pearson Education, 2011.
3. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition, 1999.
4. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition,Wiley Publications, 2009.
5. Gopalan N.P. and Akilandeswari J., "Web Technology", Second Edition, PrenticeHall of India, 2014.
6. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094421427470336209 9_shared/overview

LIST OF EQUIPMENTS:

Systems with either Netbeans or Eclipse
Java/JSP/ISP Webserver/Apache Tomcat /
MySQL / Dreamweaver or
Equivalent/ Eclipse, WAMP/XAMP

22EC101	DIGITAL PRINCIPLESAND SYSTEMS DESIGN (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To acquire the knowledge in Digital fundamentals and its simplification methods.
- To familiarize the design of various combinational digital circuits using logicgates.
- To realize various sequential circuits using flip flops.
- To interpret various clocked sequential circuits.
- To elucidate various semiconductor memories and related technology.
- To build various logic functions using Programmable Logic Devices.

UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms, min term and max term, Simplification of Boolean expressions-Karnaugh map, Implementation of Boolean expressions using logic gates and universal gates.

List of Exercise/Experiments:

1. Implementation of Boolean expression using logic gates.

UNIT II	COMBINATIONAL LOGIC CIRCUITS	9

Design of combinational circuits - Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/De-mux, Parity Generator/Checker

List of Exercise/Experiments:

1. Design of adders
2. Design of subtractors.
3. Design of binary adder using IC7483
4. Design of Multiplexers &Demultiplexers.
5. Design of Encoders and Decoders.
6. Implementation of a boolean function using a multiplexer.

UNIT III	SEQUENTIAL CIRCUITS	9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Asynchronous and Synchronous Counters Design - Shift registers, Universal Shift Register

List of Exercise/Experiments:

1. Design and implementation of 3 bit ripple counters.
2. Design and implementation of 3 bit synchronous counter
3. Design and implementation of shift registers

UNIT IV	SYNCHRONOUSSEQUENTIAL CIRCUITS DESIGN	9

Design of clocked sequential circuits - Moore/Mealy models, state minimization, state assignment, circuit implementation

UNIT V	MEMORY AND PROGRAMMABLE LOGIC DEVICES	9

Basic memory structure ROM: PROM – EPROM – EEPROM –RAM – Static and dynamic RAM – Programmable Logic Devices: Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL.

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to: CO1:

Implement digital circuits using simplified Boolean functions.

CO2: Realize Combinational circuits for a given function using logic gates.

CO3: Demonstrate the operation of various counters and shift registers using FlipFlops.

CO4: Analyze Synchronous Sequential circuits.

CO5: Summarize the various types of memory devices.

CO6: Design the Combinational circuits using Programmable Logic Devices.

CO7: Perform practical exercises as an individual and / or team member to manage thetask in time.

CO8: Express the experimental results with effective presentation and report.

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, Pearson, 2018.

2. S.Salivahanan and S.Arivazhagan, Digital Circuits and Design, 5th Edition, Oxford University Press, 2018.

REFERENCES:

1. A.Anandkumar, Fundamental of digital circuits, 4th Edition, PHI Publication,2016.

2.WilliamKleitz, Digital Electronics-A Practical approach to VHDL, Prentice Hall International Inc, 2012.

3. Charles H.Roth, Jr. andLarry L. Kinney, Fundamentals of Logic Design, 7th Edition, Thomson Learning, 2014.

4. Thomas L. Floyd, Digital Fundamentals, 11th Edition, Pearson Education Inc, 2017. 5.John.M Yarbrough, Digital Logic: Applications and Design, 1st Edition, Cengage India, 2006.

NPTEL LINK: https://nptel.ac.in/courses/108/105/108105132/

22GE111	COMPUTER AIDED ENGINEERING GRAPHICS (Common to All Branches)	L	T	P	C
		1	0	2	2

OBJECTIVES:

The Course will enable learners to:

- To help students understand universal technical drawing standards.
- To provide training on drafting software to draw part models.
- To demonstrate the concepts of orthographic and isometric projections.
- To use drawing skills for communicating concepts, ideas for engineeringproduct design.
- Use pictorial views to visualize and draw the isometric view of the objects.

UNIT I	INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWINGAND CONIC SECTIONS	9

Introduction to Engineering Drawing - Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size,layout and folding of drawing sheets – Lettering and dimensioning. Conic curves - Ellipse, Parabola and Hyperbola by Eccentricity method.

(Theory - 3)

Drawing of a title block with necessary text, projection symbol and lettering usingdrafting software.

Drafting of Conic curves - Ellipse, Parabola and Hyperbola

(Laboratory - 6)

UNIT II	ORTHOGRAPHIC PROJECTION	9

Visualization concepts and Orthographic Projection - Layout of views – Orthographic Projection- Conversion of pictorial diagram into orthographic views.

(Theory - 3)

Drawing orthographic view of simple solids like Prism, Pyramids, Cylinder, Cone, etc,and dimensioning.
Drawing of orthographic views from the given pictorial diagram.

(Laboratory -6)

UNIT III	PROJECTION OF PLANES	9

Projection of planes (polygonal and circular surfaces) inclined to both the planes byrotating object method.

(Theory - 3)

Drawing of plane Surface inclined to HP.
Drawing of plane Surface inclined to VP.

(Laboratory -6)

UNIT IV	PROJECTION OF SOLIDS	9

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis isinclined to HP by rotating object method.

(Theory - 3)

Drawing of simple solids like prism and pyramids when the axis is inclined to HP. Drawing of simple solids like cylinder and cone when the axis is inclined to HP.

(Laboratory -6)

UNIT V	ISOMETRIC DRAWING	9

Principles of isometric view – Isometric view of simple solids – Prism, Pyramid, Cylinderand Cone.

(Theory - 3)

Drawing isometric projection of simple solids. Modeling of 2D to 3D objects using drafting software.

(Laboratory -6)

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explain the various engineering standards required for drafting and exploreknowledge in conic sections.

CO2: Draw the orthographic views of 3Dprimitive objects.

CO3: Describe the projection of plane surfaces by the rotating plane method. **CO4:** Apply the projection concepts and drafting tools to draw projections of solids.**CO5:** Sketch the pictorial views of the objects using CAD tools.

TEXT BOOKS:

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition, 2019.

REFERENCES:

1. Bhatt N.D. "Engineering Drawing", Charotar Publishing House, 53rd edition ,2019.
2. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw HillPublishing Company Limited, New Delhi, 3rd Edition, 2019.
3. Engineering Drawing Practice for Schools and Colleges BIS SP46:2003 (R2008), Published by Bureau of Indian Standards (BIS), 2008.
4. Parthasarathy. N.S and Vela Murali, "Engineering Graphics", Oxford University,Press, New Delhi, 2019.
5. Gopalakrishna. K.R., Engineering Drawing Vol. 1 & 2, Subhas Publications, 27th Edition, 2017.

22GE112	PRODUCT DEVELOPMENT LAB - I (Common to All Branches)	L	T	P	C
		0	0	2	1

The students may be grouped into 3 to 4 and work under a project supervisor. The device/system/component/prototype Idea to be developed by the students and a final presentation to be done by the students about the idea generated at the end of the semester.

OBJECTIVES:

The Course will enable learners to:

- Understand the functionalities and limitation of various machine/equipment
- Demonstrate various operations that can be performed to machines
- Summarize the basic principles of machines to convert their ideas into products

I

1. Study of Manufacturing Processes (Carpentry, Plumbing, Machines andWelding).
2. Study of fundamental operations of 3D Printer and Scanner with Software.
3. Study of Smart Machining (CNC and Laser cutting) and Engraving Techniques.II
    1. Study of Fundamental of Circuit Design.
4. Study of PCB Milling Machine.
5. Study of Soldering and Desoldering.
6. 1. Study of Computer Peripheral Devices (Processing Information Devices)
    1. Present the Product Idea Presentation - Phase – I.

TOTAL: 30 PERIODS

Note:

The students can select the prototype to be made of their choice after learning theabove exercises.

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the concept of manufacturing processes.

CO2: Describe the working of the machine element.

CO3: Discuss the various applications of engineering materials

CO4: Summarize the basics of core engineering concepts.

CO5: Describe the process for converting ideas into products

LIST OF EQUIPMENTS:

1. CNC Router – 1 No.
2. 3D Printer – 1 No.
3. 3D Scanner – 1 No.
4. Laser cutting Machine – 1 No.
5. Centre lathe – 2 Nos.
6. Arc welding transformer with cables and holders – 2 Nos.
7. Plumbing tools – 2 Nos.
8. Carpentry tools – 2 Nos.
9. Multimeter – 10 Nos.
10. Drilling Machine – 1 No.
11. Solder Stations 5 Sets
12. Desoldering Machine – 1 No.
13. PCB Milling Machine – 1 No.
14. Variable Power Supply – 1 No.
15. Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor,etc. – 10 Sets
16. Personal Desktop Computers – 30 Nos.

SEMESTER – II

22GE101	HERITAGE OF TAMILS (Common to All Branches)	L	T	P	C
		1	0	0	1

OBJECTIVES:

The Course will enable learners to:

- Recognize Tamil literature and its significance in Tamil culture.
- Introduce the Tamils' rich artistic and cultural legacy.
- Familiarize the different types of folk and martial arts that are unique to Tamil Nadu.
- Acquaint the concept of Thinai in Tamil literature and culture.
- Comprehend the significance of Tamil in developing Indian culture.

UNIT I	LANGUAGE AND LITERATURE	3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry – Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -- Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III	FOLK AND MARTIAL ARTS	3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV	THINAI CONCEPT OF TAMILS	15

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONALMOVEMENT AND INDIAN CULTURE	3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL:15PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: State the role of Tamil literature in shaping Tamil Cultural roots.

CO2: Express the cultural and religious significance of Tamil art and sculptures.

CO3: Identify and describe the techniques of folk and martial arts.

CO4: Classify the role of Thinai concept in Tamil culture and literature.

CO5: Compare the idea of cultural and intellectual contributions of Tamils.

TEXT BOOKS & REFERENCES:

1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL –(in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S .Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) –Reference Book

22MA201	TRANSFORMS AND NUMERICAL METHODS (Common to CSE / IT / ADS / CSD)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Introduce the concepts of Laplace transforms and Z-transforms.
- Illustrate the application of transforms in solving differential and difference equations.
- Explain the Numerical methods for handling algebraic and transcendental equations.
- Introduce the numerical techniques for interpolation, differentiation and integration.

UNIT I	LAPLACE TRANSFORMS	15

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only).

Theory: 9

Experiments using SCILAB:

1. Finding Laplace transform of a function.
2. Finding inverse Laplace Transforms.
3. Determine the input for given output function of Laplace Transform.

Laboratory: 6

UNIT II	Z – TRANSFORMS	15

Z-transforms – Elementary properties – Inverse Z-transforms – partial fractions method –residues method – Convolution theorem.

Theory: 9

Experiments using SCILAB:

1. Finding Z –transform of a sequence.
2. Finding convolution of two sequences.
3. Plotting the input and output function of Z transform.

Laboratory: 6

UNIT III	SOLUTION OF DIFFERENTIAL AND DIFFERENCE EQUATIONS	15

Solution of linear ordinary differential equation of second order with constant coefficients and first order simultaneous equations with constant coefficients using Laplace transform. Formation of difference equations – Solution of first and second order difference equations with constant coefficients using Z-transform.

Theory: 9

Experiments using SCILAB:

1. Solving second order Ordinary Differential Equation.
2. Finding the Laplace transform and its inverse of a function numerically.
3. Finding the Z-transform numerically

Laboratory: 6

UNIT IV	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	15

Solution of algebraic and transcendental equations by Newton Raphson method - Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel Iterative method– Eigenvalues of a matrix by Power method.

Theory: 9

Experiments using SCILAB:

1. Finding the real roots of algebraic and transcendental equations using Newton Raphson method.
2. Finding the largest Eigenvalue by power method.
3. Solving system of linear equations using Gauss Seidel Method.

Laboratory: 6

UNIT V	NUMERICAL DIFFERENTIATION AND INTEGRATION	15

Finite differences – Forward and Backward differences – Interpolation – Newton's forward and backward interpolation formulae - Lagrange's interpolation for unequal intervals - Numerical Differentiation - Newton's and Lagrange's formulae - Numerical integration using Trapezoidal and Simpson's 1/3 rules – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Theory: 9

Experiments using SCILAB:

1. Finding approximately the missing value using Lagrange interpolation.
2. Evaluating line integrals by trapezoidal rule.
3. Evaluating line integrals by Simpson's rule.

Laboratory: 6

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Determine Laplace transform and inverse transform of simple functions.

CO2: Determine Z- transform and inverse transform of simple functions.

CO3: Solve ordinary differential equations using Laplace transform and difference equations using Z-Transform.

CO4: Compute the solutions of algebraic, transcendental and the system of equations.

CO5: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

TEXTBOOKS:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Erwin. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Jain R.K. and Iyengar S. R. K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
4. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
5. Sastry S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

LIST OF EQUIPMENTS:

1. SCILAB - Open source

22CS201	DATA STRUCTURES (Common to CSE, ECE, IT and AIML)		L	T	P	C
			3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To understand the concepts of List ADT.
- To learn linear data structures – stacks and queues ADTs.
- To understand and apply Tree data structures.
- To understand and apply Graph structures.
- To analyze sorting, searching and hashing algorithms.

UNIT I	LINEAR DATA STRUCTURES – LIST	15

Algorithm analysis - running time calculations - Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists - circularly linked lists - doubly-linked lists – applications of lists – Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

List of Exercise/Experiments:

- Array implementation of List ADTs.
- Linked list implementation of List ADTs.

UNIT II	LINEAR DATA STRUCTURES – STACKS, QUEUES	15

Stack ADT – Stack Model - Implementations: Array and Linked list - Applications - Balancing symbols - Evaluating arithmetic expressions - Conversion of Infix to postfix expression - Queue ADT – Queue Model - Implementations: Array and Linked list - applications of queues - Priority Queues – Binary Heap – Applications of Priority Queues.

List of Exercise/Experiments:

- Array implementation of Stack and Queue ADTs.
- Linked list implementation of Stack and Queue ADTs.
- Applications of List – Polynomial manipulations
- Applications of Stack – Infix to postfix conversion and expression evaluation.

UNIT III	NON-LINEAR DATA STRUCTURES – TREES	15

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT– AVL Tree.

List of Exercise/Experiments:

- Implementation of Binary Trees and operations of Binary Trees.
- Implementation of Binary Search Trees.
- Implementation of Heaps using Priority Queues.

UNIT IV	NON LINEAR DATA STRUCTURES - GRAPHS	15

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Applications of graphs – BiConnectivity – Euler circuits.

List of Exercise/Experiments:

- Graph representation and Traversal algorithms.

UNIT V	SEARCHING, SORTING AND HASHING TECHNIQUES	15

Searching- Linear Search - Binary Search - Sorting - Bubble sort - Selection sort - Insertionsort – Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

List of Exercise/Experiments:

- Implement searching and sorting algorithms.

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Implement abstract data types for list.

CO2: Solve real world problems using appropriate linear data structures.

CO3: Apply appropriate tree data structures in problem solving.

CO4: Implement appropriate Graph representations and solve real-world applications.

CO5: Implement various searching and sorting algorithms.

TEXTBOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson Education, 2014.
2. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Silicon paper publications, 2004.

REFERENCES:

1. Rajesh K. Shukla, "Data Structures using C and C++", Wiley India Publications, 2009.
2. Narasimha Karumanchi, "Data Structure and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles", Career Monk Publications, 2020.
3. Jean-Paul Tremblay and Paul Sorenson, "An Introduction to Data Structures with Application", McGraw-Hill, 2017.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in Java", Third Edition, Pearson Education, 2012.
5. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.
6. Ellis Horowitz, Sartaj Sahni, Dinesh P Mehta, "Fundamentals of Data Structures inC++", Second Edition, Silicon Press, 2007.
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013501578165051392105 84/overview

LIST OF EQUIPMENTS:

Systems with Linux/Ubuntu Operating System with gnu C++ compiler

22PH201	PHYSICS FOR COMPUTER SCIENCE AND INFORMATION TECHNOLOGY (CSE, IT, AIML)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Learn the fundamental concepts of Physics and apply this knowledge toscientific, engineering and technological problems.
- Make the students enrich basic knowledge in electronics and quantumconcepts and apply the same in computing fields.

UNIT I	LASER AND FIBRE OPTICS	15

Population of energy levels – Einstein's A and B coefficients derivation - Resonant cavity - Optical amplification (qualitative) - Semiconductor lasers: homo junction and hetero junction- Engineering applications of lasers in data storage (qualitative). Fibre optics: Principle and propagation of light through optical fibre - V-number - Types of optical fibres (Material, refractive index and mode) - Losses in optical fibre - Fibre optic communication - Fibre optic sensors (pressure and displacement).

(Theory -9)

List of Experiments:

1. Determination of divergence of laser beam
2. Determination of acceptance angle and numerical aperture of an optical fibre

(Laboratory -6)

UNIT II	ELECTRON THEORIES OF MATERIALS	15

Classical free electron theory - Expressions for electrical conductivity and thermal conductivity - Wiedemann-Franz law - Success and failures of CFT- Effect of temperature on Fermi function- Density of energy states and average energy of electron at 0 K - Energy bands in solids.

(Theory -9)

List of Experiments

1. Determination of thermal conductivity of a bad conductor by Lee's disc method
2. Measurement of the internal resistance using potentiometer

(Laboratory -6)

UNIT III	SEMICONDUCTOR PHYSICS	15

Intrinsic Semiconductors – E-kdiagram-Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors- Band gap determination-Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductors -Electrical conductivity of intrinsic and extrinsic semiconductors -Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.

(Theory-9)

List of Experiments

1. Bandgap determination of intrinsic semiconductor.
2. Determination of wavelength of semiconductor laser

(Laboratory -6)

UNIT IV	INTRODUCTION TO NANO DEVICES AND QUANTUM COMPUTING	15

Introduction to nanomaterial -Electron density in a bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structures - Band gap of nanomaterial.

Quantum computing: Quantum states - classical bits - quantum bits or qubits - CNOT gate - multiple qubits - Bloch sphere - quantum gates - advantages of quantum computing over classical computing.

(Theory - 9)

List of Experiments

1. Synthesis of nanoparticles by sol-gel method
2. Determination of particle size using laser source

(Laboratory - 6)

UNIT V	MAGNETIC AND SUPERCONDUCTING MATERIALS	15

Introduction- Bohr magneton -magnetic dipole moment - origin of magnetic moments - types of magnetic materials-Ferromagnetism: Domain Theory - antiferromagnetism - ferrimagnetism - magnetic principle in computer data storage

- Magnetic hard disc (GMR sensor) - Introduction to spintronics. Superconducting materials – properties, types of superconductors, applications –SQUID and MAGLEV trains - *superconducting qubits in quantum computing.*

(Theory -9)

List of Experiments

1. Determination of hysteresis loss using B-H loop
2. Determination of magnetic susceptibility of a paramagnetic liquid usingQuincke's apparatus

(Laboratory -6)

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Discuss the basic principles of working of laser and their applications infibre optic communication

CO2: Summarize the classical and quantum electron theories and energy bandstructures

CO3: Describe the conductivity in intrinsic and extrinsic semiconductors andimportance of Hall effect measurements

CO4: Associate the properties of nanoscale materials and their applications inquantum computing

CO5: Interpret the properties of magnetic and superconducting materials andtheir applications in computer data storage

TEXTBOOKS:

1. **S.O. Kasap**,Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition) 2020.
2. **Jasprit Singh**, Semiconductor Devices: Basic Principles, Wiley (IndianEdition) 2007.
3. **Parag K Lala**, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition) 2020.

REFERENCES:

1. **R.P. Feynman**, The Feynman Lectures on Physics - Vol. II, The NewMillennium Edition, 2012.
2. **M.A.Wahab**, Solid State Physics, 3rd Edition, Narosa Publishing House Pvt.Ltd., 2015.
3. **B.Rogers, J. Adams and S.Pennathur**,Nanotechnology: UnderstandingSmall System, CRC Press, 2014.
4. **C.P. Williams,** Explorations in Quantum Computing, Springer-Verlag London, 2011.
5. **Wilson J.D. and Hernandez C.A.,** Physics Laboratory Experiments,Houghton Mifflin Company, New York 2005.
6. **Department of Physics,** Physics laboratory manual, R.M.K. Group of Institutions, 2021.

LIST OF EQUIPMENTS:

1.	Semiconductor Laser	6 Nos.
2.	Determination of optical fibre parameters	6 Nos.
3.	Lee's disc apparatus	6 Nos.
4.	Potentiometer	6 Nos.
5.	Bandgap determination set up	6 Nos.
6.	Sol-gel synthesis	2 Nos.
7.	B-H loop set-up	5 Nos.
8.	Quincke's apparatus	2 Nos.

22HS101	PROFESSIONAL COMMUNICATION (Common to All Branches)	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Strengthen basic reading and writing skills.
- Comprehend listening contexts competently.
- Inculcate reading habit and develop effective reading skills.
- Improve active and passive vocabulary.
- Acquire speech clarity with right pronunciation.
- Develop vocabulary of a general kind and enhance grammatical accuracy.
- Imbibe Content and Language Integrated Learning (CLIL).

UNIT I **FORMAL AND INFORMAL COMMUNICATION** **12**

Listening: Short Texts, Short Formal and Informal Conversations **Speaking:** Self Introduction, Exchanging Personal Information **Reading:** Practice in Skimming, Scanning and Predicting, Reading Comprehension
Writing: Free Writing, Hints Development **Grammar:** Parts of Speech, Prepositions. **Vocabulary:** Compound Nouns, Technical Words.

(Theory 6)

1. Familiarization of Vowel Sounds-Monophthongs, Diphthongs and Consonant Sounds
2. Listening to Formal Conversations in British and American Accents
3. Guided Writing

(Laboratory 6)

UNIT II **GRAMMAR AND LANGUAGE DEVELOPMENT** **12**

Listening: Telephonic Conversations.
Speaking: Sharing information of a personal kind - Greetings – Taking leave. **Reading:** Short comprehension passages - Pre-reading and Post-reading (multiple choice questions shortquestions / open and close ended questions)
Writing: Instructions, Recommendations, Checklists **Grammar:** Tenses, Framing 'Wh' & 'Yes' or 'No' questions **Vocabulary:** Numerical Adjectives, Collocations

. (Theory 6)

1. Communication Etiquettes
2. Self -Introduction using SWOT Analysis

(Laboratory 6)

UNIT III **BASIC TECHNICAL WRITING AND STUDY SKILLS** **12**

Listening: Listening to longer texts and filling up the tables **Speaking:**
Asking about routine actions and expressing opinions
Reading: Short texts (Cloze Test)
Writing: Formal letters, E-mail writing, Interpretation of Charts and Graphs **Grammar:**
Cause and Effect expressions**,** Conditional Clauses **Vocabulary:** Often misspelled and confusing words

(Theory 6)

Mechanics of Reading Skills News
Reading–Cloze Tests

(Laboratory 6)

UNIT IV **GROUP DISCUSSION AND JOB APPLICATIONS** **12**

Listening: Listening to recorded dialogues of conversations and completing exercises based on them
Speaking: Discussion on Social issues.
Reading: Reading text from magazines
Writing: Purpose Expressions, Letter of Application, Minutes of Meeting.
Grammar: Modal Verbs, Subject-Verb agreement
Vocabulary : Sequence Words

(Theory 6)

1. Group Presentation, Group Discussion: Do's and Don'ts of GroupDiscussion
2. Discussions on failure and success in interviews of famous personalities Spotting Errors

(Laboratory 6)

UNIT V	ART OF REPORTING	12

Listening: Listening to TED talks **Speaking:** Debate & Presentations **Reading:** Biographies
Writing: Definitions (Single line & Extended), Report Writing (Industrial visit, Accident and Feasibilityreports)
Grammar: Reported speech
Vocabulary : Verbal Analogies (Theory 6)

1. Writing based on listening to academic lectures and discussions
2. Leadership skills, Negotiation skills
3. Mechanics of Report Writing

(Laboratory 6)

LIST OF PROJECTS

1. Create a podcast on a topic that will be interesting to college students
2. Read and Review (Movie/Book/Technical Article)
3. Presentation on Social Issues
4. Submit a report on "Global English: A study"

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Comprehend conversations and short talks delivered in English
CO2: Participate efficiently in informal conversations and develop an awareness of the self and apply well-defined techniques
CO3: Read articles of a general kind in magazines and newspapers efficiently
CO4: Write short general essays, personal letters and E-mails in English CO5: Develop vocabulary of a general kind by enriching reading skills

TEXT BOOKS:

1. **Kumar, Suresh E, & Sreehari, P.** *Communicative English*. Orient Black Swan, 2007.
2. **Richards, Jack C.** Interchange Students' Book-2 New Delhi: CUP,2015.

REFERENCES:

1. **Bailey, Stephen.** Academic Writing: *A practical guide for students*. New York: Rutledge,2011.
2. **Dhanavel, S P.** English and Soft Skills, Volume Two, Orient Black Swan.
3. **Elbow, Peter.** *Writing Without Teachers*. London: Oxford University Press, 1973.
4. **Larsen, Kristine.** *Stephen Hawking*: *A Biography*, Greenwood: Publishing Group, 2005.
5. **Redston, Chris & Gillies Cunningham.** Face2Face (Pre- intermediate Students' Book &Workbook) Cambridge University Press, New Delhi: 2005.
6. Lewis, Norman. Word Power Made Easy, Latest Edition: Penguin Random House India: 2015

WEB REFERENCES:

1. Basics of Business Communication
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0126
   88768083632128308_shared/overview
2. communicating to Succeed
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0126
   86653619175424640_shared/overview
3. Business English
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683227498151936
   279_shared/overview
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013267708367904
   768573/overview (lab support)
4. Business Writing
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012689
   47760100966433_shared/overview
5. Email Etiquettes
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329462
   386556108817682_shared/overview
6. Email Writing Skills
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012689543
   63013529666_shared/overview
7. Time Management
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0129859
   21210736640721_shared/overview
8. Understanding Body Language
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012979737
   65144576024689_shared/overview
9. ONLINE RESOURCES:
   https://infyspringboard.onwingspan.com/web/en/page/home

22CS202	JAVA PROGRAMMING (Common to All Branches	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To explain object-oriented programming concepts and fundamentals of Java
- To apply the principles of packages, interfaces and exceptions
- To develop a Java application with I/O streams, threads and generic programming
- To build applications using strings and collections.
- To apply the JDBC concepts

UNIT I	JAVA FUNDAMENTALS	15

An Overview of Java - Data Types, Variables, and Arrays – Operators - Control Statements – Class Fundamentals – Declaring objects – Methods – Constructors – this keyword – Overloading methods - Overloading constructors - Access Control –Static – Final

List of Exercise/Experiments:

1. Develop a Java application to generate Electricity bill. You must use one super class called EB Bill and must have two sub classes namely Domestic Bill and Commercial Bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff

   If the type of the EB connection is domestic, calculate the amount to be paid asfollows:
   First 100 units - Rs. 1 per unit 101-200 units - Rs. 2.50 per unit 201 -500 units - Rs. 4 per unit > 501 units - Rs. 6 per unit

   If the type of the EB connection is commercial, calculate the amount to be paid asfollows:
   First 100 units - Rs. 2 per unit 101-200 units - Rs. 4.50 per unit 201 -500 units - Rs. 6 per unit > 501 units - Rs. 7 per unit

2. Arrays Manipulations: (Use Methods for implementing these in a Class)
   a. Find kth smallest element in an unsorted array
   b. Find the sub array with given sum
   c. Matrix manipulations – Addition, Subtraction, Multiplication
   d. Remove duplicate elements in an Array

      Accept an integer value N and print the Nth digit in the integer sequence 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and so on till infinity.

      Example: The 11th digit in the sequence 12345678910111213…. is 0.

UNIT II	INHERITANCE, INTERFACES AND EXCEPTION HANDLING	15

Inheritance: Inheritance basics, Using super, Method Overriding, Using Abstract Classes, Using final with Inheritance - Package and Interfaces: Packages, Packages and member access, Importing Packages, Interfaces, Static Methods in an Interface – Exception Handling: Exception- Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.

List of Exercise/Experiments:

1. Develop a Java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, milesto KM and vice versa), time converter (hours to minutes, seconds and vice versa)using packages.
2. Develop a Java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. AddBasic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate
pay slips for the employees with their gross and net salary.
3. Design a Java interface for ADT Stack. Implement this interface using array andbuilt-in classes. Provide necessary exception handling in both the implementations.
4. Write a Java Program to create an abstract class named Shape that containstwo integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extendsthe class Shape. Each one of the classes contains the methods print Area () thatprints the area of the given shape and Numberofsides() that prints the number ofsides of the given shape.
5. Write a Java program to apply built-in and user defined exceptions.

UNIT III	MULTITHREADING, I/O AND GENERIC PROGRAMMING	15

Multithreaded Programming: Creating a Thread, Thread Priorities, Synchronization, Interthread Communication – I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files – Generics: Introduction, Generic class, Bounded Types, Generic Methods, Generic Interfaces, Generic Restrictions.

List of Exercise/Experiments:

1.Write a Java program to read and copy the content of one file to other by handling all file related exceptions.

UNIT IV	STRING HANDLING AND COLLECTIONS	15

Lambda Expressions - String Handling – Collections: The Collection Interfaces,The CollectionClasses – Iterator – Map - Regular Expression Processing.

List of Exercise/Experiments:

1.String Manipulation:

a. Reversing a set of words and count the frequency of each letter in the string.
b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there shouldnot be any other character except 0 in the [0] sequence in a given binary string.
c. Remove all the occurrences of string S2 in string S1 and print the remaining.
d. Find the longest repeating sequence in a string
e. Print the number of unique string values that can be formed by rearranging theletters in the string S.

2. Write a Java program that correctly implements producer consumer problemusing the concept of inter thread communication.
3. Collections:

a. Write a program to perform string operations using ArrayList. Write functions forthe following

i. Append - add at end
ii. Insert – add at particular index
iii. Search
iv. List all string starts with given letter

b. Find the frequency of words in a given text.

UNIT V	JDBC CONNECTIVITY	15

JDBC – DataSource, Configurations, Connection, Connection Pools, Driver Types, ResultSet,Prepared Statement, Named Parameter, Embedded SQL (Insert, Update, Delete, Join, union etc), ResultSet Navigation, Connection Close and Clean up.

List of Exercise/Experiments:

- Mini Project (using JDBC)

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the object-oriented programming concepts and fundamentals ofJava.
CO2: Develop Java programs with the packages, interfaces and exceptions.
CO3: Build Java applications with I/O streams, threads andgenerics programming.
CO4: Apply strings and collections in developing applications.
CO5: Implement the concepts of JDBC.

TEXTBOOKS:

1. Herbert Schildt, “Java: The Complete Reference”, 11th Edition, McGraw Hill Education, 2019.

REFERENCES:

1. Cay S. Horstmann, Gary Cornell, “Core Java Volume – I Fundamentals”, 11th Edition, Prentice Hall, 2019.

2. Paul Deitel, Harvey Deitel, Java SE 8 for programmers, 3rd Edition,Pearson, 2015.
3. Steven Holzner, Java 2 Black book, Dream tech press, 2011.
4. Timothy Budd, Understanding Object-oriented programming with Java,Third Edition, Pearson Education, 2008.
5. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29959473947367270000_shared/overview

LIST OF EQUIPMENTS:

Java and Eclipse / NetBeans IDE or Equivalent

22IT201	DATABASE MANAGEMENT SYSTEMS (Common to CSE/ IT/AIML)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To understand the basic concepts of Data modeling and Database Systems.
- To understand SQL and effective relational database design concepts.
- To learn relational algebra, calculus and normalization.
- To know the fundamental concepts of transaction processing, concurrency controltechniques, recovery procedure and data storage techniques.
- To understand query processing, efficient data querying and advanceddatabases.

UNIT I	DATABASE CONCEPTS	15

Concept of Database and Overview of DBMS - Characteristics of databases - Data Models, Schemas and Instances - Three-Schema Architecture - Database Languages and Interfaces - Introductions to data models types - ER Model- ER Diagrams - Enhanced ER Model - reducing ER to table Applications: ER model of University Database Application – Relational Database Design by ER- and EER-to-Relational Mapping.

List of Exercise/Experiments:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting,updating and retrieving Tables and Transaction Control statements

UNIT II	STRUCTURED QUERY LANGUAGE	15

SQL Data Definition and Data Types – Constraints – Queries – INSERT, UPDATE, and DELETE in SQL - Views - Integrity Procedures, Functions, Cursor and Triggers - Embedded SQL - Dynamic SQL.

List of Exercise/Experiments:

1. Database Querying – Simple queries, Nested queries, Sub queries and Joins
2. Views, Sequences, Synonyms
3. Database Programming: Implicit and Explicit Cursors

UNIT III	RELATIONAL ALGEBRA, CALCULUS AND NORMALIZATION	15

Relational Algebra – Operations - Domain Relational Calculus- Tuple RelationalCalculus - Fundamental operations.

Relational Database Design - Functional Dependency – Normalization (1NF, 2NF3NF and BCNF) – Multivalued Dependency and 4NF – Joint Dependencies and 5NF

- De-normalization.

List of Exercise/Experiments:

1. Procedures and Functions
2. Triggers

UNIT IV	TRANSACTIONS, CONCURRENCY CONTROL AND DATA STORAGE	15

Transaction Concepts – ACID Properties – Schedules based on Recoverability, Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Transaction Recovery – Concepts – Deferred Update – Immediate Update.

Organization of Records in Files – Unordered, Ordered – Hashing Techniques – RAID – Ordered Indexes – Multilevel Indexes - B+ tree Index Files – B tree Index Files.

List of Exercise/Experiments:

1. Exception Handling
2. Database Design using ER modeling, normalization and Implementation for any application
3. Database Connectivity with Front End Tools

UNIT V	QUERY OPTIMIZATION AND ADVANCED DATABASES	15

Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics.

Distributed Database Concepts – Design – Concurrency Control and Recovery –NOSQL Systems – Document-Based NOSQL Systems and MongoDB.

List of Exercise/Experiments:

1. Case Study using real life database applications anyone from the following list

a) Inventory Management for a EMart Grocery Shop
b) Society Financial Management
c) Cop Friendly App – Eseva
d) Property Management – eMall
e) Star Small and Medium Banking and Finance

- Build Entity Model diagram. The diagram should align with the business andfunctional goals stated in the application.
- Apply Normalization rules in designing the tables in scope.
- Prepared applicable views, triggers (for auditing purposes), functions for enablingenterprise grade features.
- Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
- Ability to showcase ACID Properties with sample queries with appropriate settings

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Map ER model to Relational model to perform database design effectively.
CO2: Implement SQL and effective relational database design concepts.
CO3: Apply relational algebra, calculus and normalization techniques in databasedesign.
CO4: Understand the concepts of transaction processing, concurrency control,recovery procedure and data storage techniques.
CO5: Apply query optimization techniques and understand advanced databases.

TEXTBOOKS:

1. Elmasri R. and S. Navathe, “Fundamentals of Database Systems”, Pearson Education, 7th Edition, 2016.
2. Abraham Silberschatz, Henry F.Korth, “Database System Concepts”, TataMcGraw Hill , 7th Edition, 2021.

REFERENCES:

1. Elmasri R. and S. Navathe, Database Systems: Models, Languages, Designand Application Programming, Pearson Education, 2013.Raghu Ramakrishnan, Gehrke "Database Management Systems", MCGraw Hill, 3rdEdition 2014.
2. Plunkett T., B. Macdonald, "Oracle Big Data Hand Book" , McGraw Hill, First Edition, 2013
3. Gupta G K , "Database Management Systems" , Tata McGraw Hill EducationPrivate Limited, New Delhi, 2011.
4. C. J. Date, A.Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2015.
5. Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi, Oracle NoSQLDatabase: Real-Time Big Data Management for the Enterprise, McGraw Hill Professional, 2013.
6. Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Pearson, 6th Edition, 2015.
7. Database Management System Part – 1
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672 82022456_shared/overview
8. Database Management System Part – 2
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012767300 5629194241_shared/overview
9. Online Resources:
https://infyspringboard.onwingspan.com/web/en/page/home

LIST OF EQUIPMENTS:

1. MySql and Eclipse / NetBeans IDE or Equivalent

22GE211	PRODUCT DEVELOPMENT LAB - II (Common to All Branches)	L	T	P	C
		0	0	2	1

The students may be grouped into a batch of strength 3 or 4 to work under a project supervisor. The student batches should study the device/system/component and will do literature review to develop prototype idea. Further at the end of the semester they will make a final presentation to exhibit the conceptual design skills and the process to develop a product.

OBJECTIVES:

The Course will enable learners to:

- Use the innovative design methodology to articulate the product concepts.
- Summarize the requisite Engineering Principles for transforming concepts into products.
- Conduct basic tests to extract the qualitative and quantitative performance factors.

List of Exercise/Experiments

1. Study of Basic Engineering Design Concepts.
2. Conduct a literature survey on the implementation of the design concepts.
3. Prepare the design concepts for an identified literature gap.
4. Present the Product Idea Presentation – Phase II.

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the working and capacity of various engineering systems.
CO2: Infer the outcomes in the product development process.
CO3: Perform basic engineering and material characterization tests.
CO4: Demonstrate the ability to provide conceptual design strategies for a product.
CO5: Implement the Science, Engineering, Technology and Mathematics (STEM) forproduct design.

22MC102	ENVIRONMENTAL SCIENCE ANDSUSTAINABILITY (Common to All Branches)	L	T	P	C
		2	0	0	MC

OBJECTIVES:

The Course will enable learners to:

- To gain knowledge of the environment and various natural resources.
- To identify the Scientific and Technological solutions to pollution issues and waste management.
- To understand the significance of the conservation of biodiversity.
- To recognize the needs and benefits of sustainability and its management.
- To comprehend the effects of human population on the environment.

UNIT I	NATURAL RESOURCES	7

Definition, scope and importance of environment – need for public awareness. Introduction to natural resources - Types - Forest resources: Use and over-exploitation, deforestation and its impacts, Food resources: effects of modern agriculture, organic farming, Renewable energy sources - Solar, Wind, Geothermal, Tidal, OTE and Biomass.

Field activity -Tree plantation

UNIT II	POLLUTION AND WASTE MANAGEMENT	7

Pollution - Definition –causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Nuclear hazards - nuclear accidents and holocaust -Role of an individual in prevention of pollution –Case studies.

Waste management- Municipal solid wastes, e- waste, plastic waste.

Field study – Solid waste management of the institution

UNIT III	BIODIVERSITY AND ITS CONSERVATION	6

Biodiversity: types – values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species, extinct, rare, vulnerable species of India – conservation of biodiversity: In-situ and ex-situ method.

Field study – Biodiversity of the institution

UNIT IV	SUSTAINABILITY AND MANAGEMENT	5

Sustainability-concept, needs and challenges-Circular economy -Sustainable Development Goals- Concept of Carbon footprint, Environmental Impact Assessment, Clean Development Mechanism, solutions.

Field study – Carbon footprint of the institution

UNIT V	HUMAN POPULATION	5

Introduction - Population growth, variation among nations,population explosion, Environment and human health – endemic/epidemic/pandemic– Role of information technology in environment and human health.

Case Study – Pandemics of 21st century

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Investigate and use conservational practices to protect natural resources.

CO2: Identify the causes of pollutants and illustrate suitable methods for pollution abatement.

CO3: Adapt the values of biodiversity and its conservation methods.

CO4: Recognize suitable sustainable development practices and apply it in day-to-daylife.

CO5: Assess the impacts of human population and suggest suitable solutions.

TEXTBOOKS:

1. Anubha Kaushik and C.P. Kaushik, “Perspectives in environmental studies”,New Age International Publishers,2nd edition, 2021.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, NewDelhi, 2017.
3. Gilbert M.Masters, Introduction to Environmental Engineering and Science, 3rd edition, Pearson Education, 2014.
4. Erach Bharuch, Textbook of Environmental Studies for Undergraduate Courses, Third Edition, Universities Press(I) Pvt. Ltd., Hyderabad, 2021.

REFERENCES:

1. William P.Cunningham & Mary Ann Cunningham Environmental Science: AGlobal Concern, McGraw Hill, 14th edition, 2017.
2. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Oxford University Press, 2015.
3. G. Tyler Miller and Scott E. Spoolman, ―Environmental Science, CengageLearning India Pvt, Ltd., Delhi, 2014.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall, 2012.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainabledesign and development, Cengage learning, 2015.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006 and subsequent amendments, 2022

SEMESTER III

21GE301	UNIVERSAL HUMAN VALUES II: UNDERSTANDING HARMONY	L	T	P	C
		2	1	0	3

OBJECTIVES:

The objective of the course is fourfold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures (2 lecture hours) and 14 practice sessions (2 Tutorial hour) in 5 Units:

UNIT I	**Course Introduction - Need, Basic guidelines, Content and Process for Value Education**	

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- The basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: Understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT II	**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' - happiness and physical facility
- Understanding the body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- 'Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss programs for ensuring health vs dealing with disease

UNIT III	**Understanding harmony in the family and society- Harmony in human-human relationship**	

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect; Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, Fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided society, Universal order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institutes extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT IV	**Understanding Harmony in the Nature and Existence - Whole existence as coexistence**	

- Understanding the harmony in nature
- Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V	**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, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.
- 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 organizations
- Sum up.

Include practice exercises and case studies will be taken up in practice (tutorial) sessions eg. To discuss the conduct as an engineer or scientist etc.

OUTCOMES:

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

CO1: Would become more aware of themselves, and their surroundings (family, society, nature).

CO2: Would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: Would have better critical ability.

CO4: Would become sensitive to their commitment towards what they have understood (human values, human relationship, and human society).

CO5: Would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

TEXT BOOK:

1. R R Gaur, R Sangal, G P Bagaria, "Human Values and Professional Ethics", Excel Books, New Delhi, Second Edition 2019.

REFERENCES:

1. A Nagaraj, "Jeevan Vidya: Ek Parichaya", Jeevan Vidya Prakashan, Amarkantak, 1999.
2. E. F Schumacher, "Small is Beautiful", Vintage classics, London, 1993.
3. A.N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, Third Edition 2020.
4. Maulana Abdul Kalam Azad, "India Wins Freedom", Oriental blackswan private limited, Hyderabad, 2020.
5. Mahatma Gandhi, "Hind Swaraj or Indian Home Rule", Maheswari Publications, Delhi 2020.
6. Romain Rolland, "The life of Vivekananda and the universal gospel", Publication house of Ramakrishna Math, Kolkata, Thirty second edition 2018.
7. Romain Rolland, "Mahatma Gandhi: The man who become one with the universal being ", Srishti Publishers & Distributors, New Delhi, Sixth Edition 2013.
8. Heaton, Dennis P. "The story of stuff." (2010): 553-556.
9. Gandhi, Mohandas Karamchand, "The story of my experiments with truth: An autobiography", Om Books International, 2018.
10. Andrews, Cecile, "Slow is beautiful: new visions of community, leisure, and joie de vivre", New society publishers, 2006.
11. Kumarappa, Joseph Cornelius, "The economy of permanence. CP", All India Village Industries Assn., 1946.
12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland (English)

22GE201	TAMILS AND TECHNOLOGY (Common to All Branches)	L	T	P	C
		1	0	0	1

OBJECTIVES:

The Course will enable learners to:

- Recognize the historical significance of weaving and pottery technologies in ancient Tamil civilization.
- Highlight the concepts of design and construction technology during the Sangamage.
- Provide an overview of manufacturing technology and its role in Tamil society.
- Illustrate the agricultural and irrigation techniques employed in ancient Tamil society.
- Promote scientific Tamil and Tamil computing.

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3

Designing and Structural construction House & Designs in household materials duringSangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram – Great

Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III	MANUFACTURING TECHNOLOGY	3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL:15PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Identify the role of weaving and ceramic technology in ancient Tamil Culture.

CO2: Assess the design and construction technology ideas in the current Tamil society.

CO3: Identify the different types of manufacturing technology used in Tamil society andtheir significance.

CO4: Classify agricultural and irrigation technologies in ancient Tamil society and its current relevance.

CO5: Discuss the fundamentals of scientific Tamil and Tamil computing.

TEXTBOOKS& REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S .Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Publishedby: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & TamilNadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book

22MA301	DISCRETE MATHEMATICS (Common to CSE, IT)	L	T	P	C
		3	1	0	4

OBJECTIVES:

The Course will enable learners to:

- Describe the arguments using connectives and rules of inference.
- Introduce the basic concept of counting and generating functions.
- Define the graphs and it's models.
- Understand the concept of group theory, lattices and Boolean algebra.

UNIT I	LOGIC AND PROOFS	15

Propositional logic - Propositional equivalences - Predicates and quantifiers - Nested quantifiers - Rules of inference - Introduction to proofs - Proof methods and strategy.

UNIT II	COMBINATORICS	15

Mathematical induction - Strong induction and well ordering The basics of counting - The pigeonhole principle - Permutations and combinations - Recurrence relations - Solving linear recurrence relations - Generating functions - Inclusion and exclusion principle and its applications.

UNIT III	GRAPHS	15

Graphs and graph models - Graph terminology and special types of graphs - Matrix representation of graphs and graph isomorphism - Connectivity - Euler and Hamilton paths.

UNIT IV	ALGEBRAIC STRUCTURES	15

Algebraic systems - Semi groups and monoids - Groups - Subgroups - Homomorphism's - Normal subgroup and cosets - Lagrange's theorem - Definitions and examples of Ringsand Fields.

UNIT V	LATTICES AND BOOLEAN ALGEBRA	15

Partial ordering - Posets - Lattices as posets - Properties of lattices - Lattices as algebraic systems - Sub lattices - Direct product and homomorphism - Some special lattices - Boolean algebra.

TOTAL:75PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Validate the arguments using connectives and rule of inference.
CO2: Solve linear recurrence relations.
CO3: Determine Euler's path and Hamilton paths.
CO4: Identify algebraic structures of groups, rings, and fields.
CO5: Interpret lattices as algebraic structures.

TEXTBOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2021.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2017.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2014.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

22CS301	ADVANCED JAVA PROGRAMMING (Common to CSE, IT)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To use the functionalities of Collections and IO Streams
- To use the functionalities of Java Stream API and unit testing framework using Junits.
- To provide a framework to map object-oriented domain models to relational databases for web applications using ORM Hibernate tool.
- To provide infrastructure support using Spring Framework.
- To Implement Model – View – Controller design pattern using Spring MVC.

UNIT I	COLLECTIONS AND IO STREAMS	9+6

The NavigableSet interface, the Queue interface, the Dequeue interface – The Collection classes – PriorityQueue – ArrayDeque – EnumSet – Comparators – More Utility Classes –StringTokenizer - Date – Calendar – Comparable interface – Observer Interface – Streams Types of Streams - The Byte-stream I/O hierarchy - Character Stream Hierarchy – Random Access File class - the java.io.Console Class – Serialization – Dates - Numbers, and Currency - Working with Dates - Numbers and Currencies – Parsing - Tokenizing and Formatting - Locating Data via Pattern Matching, Tokenizing.

List of Exercises:

1. Write a Java program to create an ArrayList of integers and add elements to it. Display the contents of the ArrayList.
2. Write a Java program to create a HashSet of strings and perform various operations like adding, removing, and checking the presence of elements.
3. Write a program to copy the contents of one file to another file using FileInputStream and FileOutputStream

UNIT II	STREAM API AND JUNIT	9+6

Count -Parallel Streams - Declarative/Functional Style Approach - Stream Pipeline – Iterating with stream - Max, Min & Comparators - Distinct and Collectors.toSet() - Filtering and Transformations - Find Any Vs Find First - Reduce and Flatmap - Joining Strings Implementation of Stream in API". Junit - Introduction to JUnit, JUnit with Eclipse, Assert method, Annotations, Parameterized tests, Test suite, Test runner.

List of Exercises

1. Write a Java program to filter out the even numbers from a list of integers using the Stream API.
2. Create a program that uses the Stream API to find the average of a list of floating-point numbers.
3. Implement a Java program that uses the Stream API to count the number of occurrences of a specific word in a given text file.
4. Write a JUnit test case to check if a given string is palindrome or not.
5. Create a JUnit test case to verify the correctness of a method that calculates the factorial of a given number.
6. Implement a JUnit test case to ensure that a specific exception is thrown when invalid input is provided to a method.

UNIT III	HIBERNATE FRAMEWORK	9+6

Hibernate Framework - Hibernate - Mapping Types - Hibernate Inheritance Mapping - Collections Mappings - Association mapping - HCQL (Hibernate Criteria Query Language) – Hibernate Query Language (HQL) - Caching in Hibernate - Log4j in Hibernate.

List of Exercises

1. Write a Java program to create a Hibernate configuration file (hibernate.cfg.xml) and establish a database connection.
2. Implement a Java program to perform CRUD operations (Create, Read, Update, Delete) using Hibernate.
3. Develop a Java program to implement a one-to-many relationship between two entity classes using Hibernate mappings.
4. Write a Java program to perform transaction management using Hibernate, including rollback and commit operations.
5. Develop a Java program to configure and use Hibernate caching mechanisms for optimizing database access.
6. Write a Java program to integrate Hibernate with Spring framework and develop a web application with database operations.

UNIT IV	SPRING FRAMEWORK	9+6

Spring Framework - Dependency Injection by Constructor Example - Autowiring in Spring - Constructor Injection with Collection - Spring DAO - Inheriting Bean in Spring Dependency Injection by setter method.

List of Exercises

1. Create a basic Spring application that demonstrates dependency injection using constructor injection.
2. Write a program to demonstrate the use of Spring annotations like @Autowired, @Component, and @Configuration.
3. Implement a Spring bean that uses setter injection to inject dependencies.

UNIT V	SPRING MVC	9+6

Spring MVC - Spring Java Mail - Spring Security- Aspect Oriented Programming (AOP) - Web Services – postman - Design Patterns in Java

List of Exercises

1. Write a Spring MVC program to create a simple registration form with fields like name, email, and password, and validate the form inputs.
2. Implement a Spring MVC program that retrieves data from a database and displays it on a web page using the Model-View-Controller pattern.
3. Build a Spring MVC application that implements user authentication and authorization using Spring Security.

TOTAL:75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Apply collections and IO Streams to efficiently manage and process data structures and perform input/output operations in Java.

CO2: Apply Java Stream API and Junits to streamline data manipulation and perform unit testing for robust code development.

CO3: Develop a Seamlessly integrate object-oriented programming with database operations for web applications using hibernate.

CO4: Construct the power of the Spring Framework to provide a solid foundation for building scalable and maintainable applications.

CO5: Organize application logic, user interface, and data flow using the Spring MVC framework for efficient and modular development.

TEXTBOOKS:

1. Craig Walls, "Spring in Action",5th Edition, Manning Publications, 2018
2. Paul deck, "Spring MVC: A Tutorial" , Brainy Software, 2016

REFERENCES:

3. Maurice Naftalin and Philip Wadler, "Java Generics and Collections" , O'Reilly Media inc., 2023
4. Joshua Bloch , "Effective Java" , Addison – Wesley Professional, 2017
5.Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft , "Java 8 in Action: Lambdas, Streams, and functional-style programming" , Manning Publications, 2014
6.Christian Bauer and Gavin King ,"Java Persistence with Hibernate", Manning Publications, 2015
7. AmuthanG."Spring MVC: Beginner's Guide" ,Packt Publishing, 2014
8. PetarTahchiev, Felipe Leme, Vincent Massol, and Gary Gregory ,"JUnit in Action" , Manning Publications, 2010

WEB REFERENCES:

9. Java Developer Certification, https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0131933845400207362 64_shared/overview

ONLINE RESOURCES:

1. https://infyspringboard.onwingspan.com/web/en/page/home

LIST OF EQUIPMENTS:

1.Java Development Kit (JDK), IO classes, JUnit library, Spring Framework libraries and dependencies (such as spring-core, spring-context, spring-beans, Spring MVC framework.

22CS303	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE, IT, AIML)	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Critically analyze the efficiency of alternative algorithmic solutions for the sameproblem Illustrate brute force and divide and conquer design techniques.
- Explain dynamic programming for solving various problems.
- Apply greedy technique and iterative improvement technique to solve optimization problems
- Examine the limitations of algorithmic power and handling it in different problems.

UNIT I	INTRODUCTION	6+6

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving –Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties. Analysis Framework –Mathematical analysis for Recursive and Non-recursive algorithms

List of Exercise/Experiments:

1. Perform the recursive algorithm analysis.
2. Perform the non-recursive algorithm analysis.

UNIT II	BRUTE FORCE ANDDIVIDE AND CONQUER	6+6

Brute Force - String Matching - Exhaustive Search - Knapsack Problem -Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort - Multiplication of Large Integers – Closest-Pair and Convex Hull Problems - Transform and Conquer Method: Heap Sort

List of Exercise/Experiments:

1. Write a program to search an element using binary search
2. Write a program to sort the elements using merge sort and find time complexity.
3. Write a program to sort the elements using quick sort and find time complexity.
4. Write a program to sort the elements using heap sort

UNIT III	DYNAMIC PROGRAMMING	6+6

Dynamic programming – Principle of optimality – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees - Longest common subsequence - Matrix-chain multiplication – Travelling Salesperson Problem – Knapsack Problem and Memory functions.

List of Exercise/Experiments:

1. Solve Floyd’s algorithm
2. Write a program to find optimal binary search tree for a given list of keys.
3. Solve the multi-stage graph to find shortest path using backward and forward approach
4. Write a program to find the longest common subsequence

UNIT IV	GREEDY TECHNIQUE AND ITERATIVE IMPROVEMENT	6+6

Greedy Technique – Prim‘s algorithm and Kruskal’s Algorithm –Huffman Trees. The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem

List of Exercise/Experiments:

1. Write a program to find minimum spanning tree using Prim’s algorithm
2. Implement Kruskal’s algorithm to find minimum spanning tree
3. Write a program to solve maximum flow problem

UNIT V	BACKTRACKING AND BRANCH AND BOUND	6+6

P, NP NP- Complete and NP Hard Problems. Backtracking – N-Queen problem - SubsetSum Problem. Branch and Bound– LIFO Search and FIFO search - Assignment problem – Knapsack Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem

List of Exercise/Experiments:

1. Write a program to implement sum of subset problem.
2. Write a program to solve N-Queen problem
3. Solve the assignment problem using branch and bound technique
4. Solve knapsack problem using branch and bound technique

TOTAL:60PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Solve mathematically the efficiency of recursive and non-recursive algorithms

CO2: Design and Analyse the efficiency of divide and conquer and transform andconquer algorithmic techniques

CO3: Implement and analyse the problems using dynamic programming

CO4: Solve the problems using and greedy technique and iterative improvementtechnique for optimization

CO5: Compute the limitations of algorithmic power and solve the problems usingbacktracking and branch and bound technique.

TEXTBOOKS:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein,Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.

2. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
3. http://nptel.ac.in/

LIST OF EQUIPMENTS:

Standalone PC with C/C++/Java

22CS304	OPERATING SYSTEMS (Common to CSE, IT, AIML)	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Explain the basic concepts of operating systems and process.
- Discuss threads and analyse various CPU scheduling algorithms.
- Describe the concept of process synchronization and deadlocks.
- Analyse various memory management schemes.
- Describe I/O management and file systems.

UNIT I	INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES	6+6

Introduction: Computer system organization - architecture – Resource management - Protection and Security – Virtualization - Operating System Structures: Services - User and Operating-System Interface - System Calls - System Services - Design and Implementation - Building and Booting an Operating System – Processes: Process Concept - Process Scheduling - Operations on Processes – Inter process Communication - IPC in Shared-Memory Systems - IPC in Message-Passing Systems

List of Exercise/Experiments:

1. Basic Unix file system commands such as ls, cd, mkdir, rmdir, cp, rm, mv, more, lpr,man, grep, sed, etc..
2. Programs using Shell Programming.
3. Implementation of Unix System Calls.
4. Implementation of IPC using message queue
   a. Get the input data (integer value) from a process called sender
   b. Use Message Queue to transfer this data from sender to receiver process
   c. The receiver does the prime number checking on the received data
   d. Communicate the verified/status result from receiver to sender process, thisstatus should be displayed in the Sender process.

Note: Simultaneously execute two or more processes. Don't do it as a single process

UNIT II	THREADS AND CPU SCHEDULING	6+6

Threads & Concurrency: Overview - Multicore Programming - Multithreading Models - Thread Libraries - Implicit Threading - Threading Issues - CPU Scheduling: Basic Concepts – Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multi-Processor Scheduling - Real-Time CPU Scheduling

List of Exercise/Experiments:

1. Write a program to implement the following actions using pthreads
   a. Create a thread in a program and called Parent thread, this parent thread creates another thread (Child thread) to print out the numbers from 1 to 20. The Parent thread waits till the child thread finishes
   b. Create a thread in the main program, this program passes the 'count' as arguments to that thread function and this created thread function has to print your name 'count' times.
2. Write C programs to implement the various CPU Scheduling Algorithms.

UNIT III	PROCESS SYNCHRONISATION AND DEADLOCKS	6+6

Process Synchronization: The critical-section problem – Peterson's Solution, Synchronization hardware, Mutex locks, Semaphores, monitors - Classic problems of synchronization: Bounded Buffer Problem - Reader's & Writer Problem, Dinning Philosopher Problem. Deadlock: System model - Deadlock characterization, Methods for handling deadlocks - Deadlock prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlock.

List of Exercise/Experiments:

1. Process Synchronization using Semaphores. A shared data has to be accessed by two categories of processes namely A and B. Satisfy the following constraints to access the data without any data loss.
   a. When a process A1 is accessing the database another process of the same category is permitted.
   b. When a process B1 is accessing the database neither process A1 nor another 74 processB2 is permitted.
   c. When a process A1 is accessing the database process B1 should not be allowed toaccess the database. Write appropriate code for both A and B satisfying all the above constraints using semaphores.

   Note: The time-stamp for accessing is approximately 10 sec.
2. Bankers Algorithm for Deadlock Avoidance

UNIT IV	MEMORY MANAGEMENT	6+6

Memory Management: Contiguous Memory Allocation - Paging - Structure of the Page Table – Swapping - Virtual Memory: Demand Paging – Copy-on write – Page Replacement – Allocation of frames – Thrashing – Memory Compression

List of Exercise/Experiments:

1. Analysis and Simulation of Memory Allocation and Management Techniques
   i. First Fit ii. Best Fit iii. Worst Fit
2. Implementation of Page Replacement Techniques
   i. FIFO ii. LRU iii. Optimal page replacement

UNIT V	STORAGE MANAGEMENT	6+6

Mass Storage Structure: Overview of Mass Storage Structure- HDD scheduling – Swap Space Management, I/O systems: I/O Hardware, Application I/O interface, Kernel I/O Subsystem, File System Interface: File Concept – Access Methods – Directory Structure
– Protection, File-System Implementation: File-System Structure- File-System Operations - Directory Implementation - Allocation Methods - Free-Space Management,
- Case Study-Linux

List of Exercise/Experiments:

1. Simulation of File Allocation Techniques
   i. Sequential ii. Linked list iii. indexed
2. Implementation of File Organization Strategies
   Single level directory ii. Two level directory iii. Hierarchical level directory

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Implement the basic concepts of operating systems and process.
CO2: Analyze various CPU scheduling algorithms and thread mechanism.
CO3: Implement the concepts of process synchronization and deadlocks.
CO4: Design various memory management schemes to given situation.
CO5: Implement various I/O and file management techniques.

TEXTBOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating SystemConcepts" II, 10th Edition, John Wiley and Sons Inc., 2018.

2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.
REFERENCES:
1. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition,Prentice Hall, 2018.
2. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.
LIST OF EQUIPMENTS:
Standalone desktops with C/C++/Java/Equivalent compiler.

22IT301	DESIGN THINKING	L	T	P	C
		2	1	0	3

OBJECTIVES:

The Course will enable learners to:

- Familiarize design thinking and its phases.
- Perform immersion activity in empathize phase of design thinking.
- Create problem statements in the define phase of design thinking.
- Ideate and find solutions to the problem defined.
- Develop a prototype and perform testing

UNIT I	INTRODUCTION	9

Introduction to design thinking - Importance of design thinking for business – Phases of design thinking – Experiential activity – Case study.

UNIT II	EMPATHIZE PHASE	9

Empathize phase - Steps involved - Immersion activity- Questionnaire – Empathy map for case study

UNIT III	DEFINE PHASE	9

Creation of personas in define phase – steps in problem statement creation – problem statement definition – Examples – Key problem statements.

UNIT IV	IDEATION PHASE	9

Ideation phase steps – Ideation games – Ideate to find solutions – Doodling – Storytelling in presenting ideas and prototypes.

UNIT V	PROTOTYPE AND TESTING	9

Importance of prototype in design thinking –Guidelines - Prototyping the idea – Value proposition statement – Testing in design thinking – Prototype tests – Documentation– Design thinking in functional work – Mapping design thinking to agile methodologies.

TOTAL: 45 Periods

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the phases of design thinking process..

CO2: Conduct an immersion activity to create an empathy map

CO3: Define the key problems of the personas created.

CO4: Apply the ideation phase steps to present the prototype ideas

CO5: Create a prototype with value propositions and test the prototype

TEXTBOOKS:

1. Christian Müller- Roterberg, “Handbook of Design Thinking”, Kindle Direct Publishing, November 2018.
2. Dan Senor and Saul Singer, “Start-Up Nation”, Grand Central Publishing, Twelfth Edition, 2009.

REFERENCES:

1. NirEyal and Ryan Hoover, “Hooked: How to Build Habit-Forming Products”, Library of Congress, 2014
2. Corral, Luis &Fronza, Ilenia, “Design Thinking and Agile Practices for Software Engineering: An Opportunity for Innovation”, 2018.

22GE311	PRODUCT DEVELOPMENT LAB – III (Design and Analysis Phase) (Common to All Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The Course will enable learners to:

- To provide an adequate understanding of project/product concepts and creative design process.
- Create a methodology to develop solutions to complex systems.

The students can form a team of 3 or 4 to work on the approved topic by the faculty in-charge. All approved product/process topics should have the following stages as listed under activities. The faculty in-charge conducts a periodic review to endorse the work process and during the review, the faculty shall provide suggestions/ideas to improvise the project towards completion. An interim report (consisting of literature, photographs, proof of the work done, etc..) for all listed activities should be submitted by the team during periodic review for evaluation. A final project report is required at the end of the semester for evaluation.

LIST OF ACTIVITIES:

1. Develop the design stage for a product from the concept.
    - Researching it in-depth.
    - Ideating possible solutions.
    - Selecting a promising solution.
    - Make a mock-up model
    - Comprehend the design features of the mock-up model.
2. Evaluate the pros-cons of the mock-up (& with the existing product).
3. Generate the Design for Manufacturing and Assembly (DFMA) process route for the product with necessary interdisciplinary collaborations.

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1 Enhance their skills in design concepts, rules and procedures.
CO2 Develop their cognitive strategy to think, organize, learn and behave.
CO3 Demonstrate the ability to provide conceptual design strategies for a product.
CO4 Describe the procedure for designing a Mock-up model.
CO5 Recognize and apply appropriate interdisciplinary and integrative strategies for solving complex problems

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Equipment Name	Quantity
1	CNC Router	1 No
2	3D Printer	1 No
3	3D Scanner	1 No
4	Laser cutting Machine	1 No
5	Centre lathe	2 Nos
6	Arc welding transformer with cables and holders	2 Nos
7	Plumbing tools	2 Sets
8	Carpentry tools	2 Sets
9	Multimeter	10 Nos
10	Drilling Machine	1 No
11	Solder Stations	5 Sets
12	Desoldering Machine	1 No
13	PCB Milling Machine	1 No
14	Variable Power Supply	1 No
15	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor, etc.	10 Sets
16	Personal Desktop Computers	30 Nos
17	3D Modelling software – Creo/ AutoCAD/ etc.,	30 Licence

22CS311	APTITUDE AND CODING SKILLS – I (Common to All Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The Course will enable learners to:

- Develop vocabulary for effective communication and reading skills.
- Build the logical reasoning and quantitative skills.
- Develop error correction and debugging skills in programming.

List of Exercises:

1. English – Phase I

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering

2. Logical Reasoning – Phase I

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

3. Quantitative Ability - Phase I

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability

4. Automata Fix – Phase I

Logical, Compilation and Code reuse

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Develop vocabulary for effective communication and reading skills.
CO2: Build the logical reasoning and quantitative skills.
CO3: Develop error correction and debugging skills in programming.

SEMESTER IV

22MA401	PROBABILITY AND STATISTICS (Common to CSE, IT, AIML)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Provide the necessary basic concepts of random variables and to introduce somestandard distributions.
- Test the hypothesis for small and large samples.
- Introduce the concepts of Analysis of Variances.
- Understand the concept of statistical quality control.

UNIT I	ONE-DIMENSIONAL RANDOM VARIABLES	15

Basic probability definitions- Independent events- Conditional probability (revisit) - Random variable - Discrete and continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

List of Exercise/Experiments using R Programming:

1. Finding conditional probability.

Finding mean, variance and standard deviation.

UNIT II	TWO-DIMENSIONAL RANDOM VARIABLES	15

Joint distributions - Marginal and conditional distributions - Covariance - Correlation andlinear regression - Transformation of random variables.

List of Exercise/Experiments using R Programming:

1. Finding marginal density functions for discrete random variables.
2. Calculating correlation and regression.

UNIT III	TESTING OF HYPOTHESIS	15

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t and F distributions for mean and variance - Chi-square test- Contingency table (test for independent) - Goodness of fit.

List of Exercise/Experiments using R Programming:

1. Testing of hypothesis for given data using Z - test.
2. Testing of hypothesis for given data using t - test.

UNIT IV	DESIGN OF EXPERIMENTS	15

One way and Two-way classifications - Completely randomized design – Randomized block design - Latin square design.

List of Exercise/Experiments R Programming:

1. Perform one-way ANOVA test for the given data.
2. Perform two-way ANOVA test for the given data.

UNIT V	STATISTICAL QUALITY CONTROL	15

Control charts for measurements ($\bar{X}$ and R charts) - Control charts for attributes (p, c and npcharts) - Tolerance limits.

List of Exercise/Experiments using R Programming:

1. Interpret the results for $\bar{X}$-Chart for variable data.
2. Interpret the results for R-Chart for variable data.

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Calculate the statistical measures of standard distributions.

CO2: Compute the correlation & regression for two dimensional random variables.

CO3: Apply the concept of testing the hypothesis.

CO4: Implement the concept of analysis of variance for various experimental designs.

CO5: Demonstrate the control charts for variables and attributes**.**

TEXTBOOKS:

1. R.A. Johnson, I. Miller and J. Freund, "Miller and Freund's Probability andStatistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. J.S. Milton and J.C. Arnold, "Introduction to Probability and Statistics", Tata McGrawHill, 4th Edition, 2017.

REFERENCES:

1. J.L. Devore, "Probability and Statistics for Engineering and the Sciences",Cengage Learning, New Delhi, 9th Edition, 2016.
2. S.M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 6th Edition, Elsevier, 2020.
3. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
4. R.E.Walpole, R.H.Myers, S.L. Myers and K.Ye, "Probability and Statistics for Engineers and Scientists". Pearson Education, Asia, 9th Edition, 2012

LIST OF EQUIPMENTS:

22IT401	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Understand the concept of Artificial Intelligence
- Familiarize with Knowledge based AI systems and approaches
- Apply the aspect of Probabilistic approach to AI
- Identify the Neural Networks and NLP in designing AI models
- Recognize the concepts of Machine Learning and its deterministic tools

UNIT I	PROBLEM SOLVING AND SEARCH STARTEGIES	9+6

Introduction: What Is AI, the Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art. Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, And The Structure of Agents. Solving Problems by Searching: Problem-Solving Agents, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. Beyond Classical Search: Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions and Partial Observations, Online Search Agents and Unknown Environments. Constraint Satisfaction Problems: Definition, Constraint Propagation, Backtracking Search, Local Search, The Structure of Problems

List of Exercise/Experiments

1. Implementation of uninformed search algorithm (BFS and DFS).
2. Implementation of Informed Search algorithm (A* and Hill Climbing Algorithm)

UNIT II	KNOWLEDGE REPRESENTATION AND REASONING	9+6

Logical Agents: Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic. First Order Logic: Syntax and Semantics, Knowledge Engineering in FOL, Inference in First-Order Logic, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Planning: Definition, Algorithms, Planning Graphs, Hierarchical Planning, Multi-agent Planning. Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World

List of Exercise/Experiments

1. Implementation of forward and backward chaining.
2. Implementation of unification algorithms.

UNIT III	LEARNING	9+6

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks. Applications: Human computer interaction (HCI), Knowledge management technologies, AI for customer relationship management, Expert systems, Data mining, text mining, and Web mining, Other current topics

List of Exercise/Experiments

1. Numpy Operations
2. NumPy arrays
3. *NumPy Indexing and Selection*
4. NumPy Exercise:

(i) Write code to create a 4x3 matrix with values ranging from 2 to 13.

(ii) Write code to replace the odd numbers by -1 in the following array.

(iii) Perform the following operations on an array of mobile phones prices 6999, 7500, 11999, 27899, 14999, 9999.

a) Create a 1d-array of mobile phones prices

b) Convert this array to float type

c) Append a new mobile having price of 13999 Rs. to this array

d) Reverse this array of mobile phones prices

e) Apply GST of 18% on mobile phones prices and update this array.

f) Sort the array in descending order of price

g) What is the average mobile phone price.

UNIT IV	FUNDAMENTALS OF MACHINE LEARNING	9+6

Motivation for Machine Learning, Applications, Machine Learning, Learning associations, Classification, Regression, The Origin of machine learning, Uses and abuses of machine learning, Success cases, How do machines learn, Abstraction and knowledge representation, Generalization, Factors to be considered, Assessing the success of learning, Metrics for evaluation of classification method, Steps to apply machine learning to data, Machine learning process, Input data and ML algorithm, Classification of machine learning algorithms, General ML architecture, Group of algorithms, Reinforcement learning, Supervised learning, Unsupervised learning, Semi-Supervised learning, Algorithms, Ensemble learning, Matching data to an appropriate algorithm.

List of Exercise/Experiments

1. Build linear regression models to predict housing prices using python , using data set available Google colabs.
2. Stock Ensemble-based Neural Network for Stock Market Prediction using Historical Stock Data and Sentiment Analysis.

UNIT V	MACHINE LEARNING AND TYPES	9+6

Supervised Learning, Regression, Linear regression, Multiple linear regression, A multiple regression analysis, The analysis of variance for multiple regression, Examples for multiple regression, Overfitting, Detecting overfit models: Cross validation, Cross validation: The ideal procedure, Parameter estimation, Logistic regression, Decision trees: Background, Decision trees, Decision trees for credit card promotion, An algorithm for building decision trees, Attribute selection measure: Information gain, Entropy, Decision Tree: Weekend example, Occam's Razor, Converting a tree to rules, Unsupervised learning, Semi Supervised learning, Clustering, K – means clustering, Automated discovery, Reinforcement learning, Multi-Armed Bandit algorithms, Influence diagrams, Risk modeling, Sensitivity analysis, Casual learning.

List of Exercise/Experiments

Use Cases

Case Study 1: Churn Analysis and Prediction (Survival Modelling)

Cox-proportional models

Churn Prediction

Case Study 2: Credit card Fraud Analysis

Imbalanced Data

Neural Network

Case study 3: Sentiment Analysis or Topic Mining from New York Times
Similarity measures (Cosine Similarity, Chi-Square, N Grams)
Part-of-Speech Tagging
Stemming and Chunking
Case Study 4: Sales Funnel Analysis
A/B testing
Campaign effectiveness, Web page layout effectiveness
Scoring and Ranking
Case Study 5: Recommendation Systems and Collaborative filtering
User based
Item Based
Singular value decomposition–based recommenders
Case Study 6: Customer Segmentation and Value
Segmentation Strategies
Lifetime Value
Case Study 7: Portfolio Risk Conformance
Risk Profiling
Portfolio Optimization
Case Study 8: Uber Alternative Routing
Graph Construction
Route Optimization

TOTAL:45+30=75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Able to build a model using AI and ML, and able to predict based on various events.
CO2: Working knowledge on tools and frameworks.
CO3: Provide a basic exposition to the goals and methods of Artificial Intelligence.
CO4: Study of the design of intelligent computational techniques.
CO5: Improve problem solving skills using the acquired knowledge in the areas of, reasoning, natural language understanding, computer vision, automatic programming and machine learning.

TEXTBOOKS:

1. Introduction to Artificial Intelligence and Machine Learning (IBM ICE Publications).
2. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education *I* Prentice Hall of India, 2010.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.
2. Dan W.Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI, 2006.
3. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.

LIST OF EQUIPMENTS:

1. 8GB RAM, 50 GB HDD
2. Stable Internet Connection (At least 10Gbps) to work with Google Co labs

22IT402	COMPUTER ARCHITECTURE AND MICROPROCESSORS	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of building datapath.
- To understand the memory hierarchies, cache memories and virtual memories, and I/O systems
- To familiarize with 8086 Microprocessor

UNIT I	BASIC STRUCTURE OF A COMPUTER SYSTEM	9+6

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing modes.

List of Exercise/Experiments

1. To familiarize the use of QtSPIM simulator
2. To use basic instructions of MIPS to understand various addressing modes using QtSPIM simulator.

UNIT II	ARITHMETIC FOR COMPUTERS	9+6

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism.

List of Exercise/Experiments

1. To perform basic addition, subtraction, multiplication, and division programs in QtSPIM simulator using MIPS instructions.
2. To perform floating point addition and multiplication in QtSPIM simulator using MIPS instructions.

UNIT III	PROCESSOR AND CONTROL UNIT	9+6

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

List of Exercise/Experiments

1. Design an 8-bit ALU using MODELSIM
2. To implement Verilog code for 16-bit Single-Cycle MIPS processor

UNIT IV	MEMORY & I/O SYSTEMS	9+6

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits - USB.

List of Exercise/Experiments

1. Simulating cache read/write using Paracache simulator.
2. Learning address translation in virtual memory system using Paracache simulator.

UNIT V	INTRODUCTION TO 8086 MICROPROCESSOR	9+6

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and

Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

List of Exercise/Experiments

1. Write and execute 8086 ALP for performing Addition, Subtraction, Multiplication and division of two 8-bit numbers using 8086 Emulator.
2. Write and execute 8086 ALP for reversing the given number using 8086 Emulator.

TOTAL: 45 + 30 = 75 Periods

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the basics structure of computers, operations and instructions.

CO2: Design arithmetic and logic unit.

CO3: Understand simple and pipelined datapath construction

CO4: Understand the various memory systems and I/O communication.

CO5: Understand the architecture and assembly programming of 8086 microprocessor

TEXTBOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.
3. Sunil Mathur, Microprocessor 8086-Architecture, Programming and Interfacing, Prentice Hall of India, 2011

REFERENCES:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. Douglas V Hall, SSSP Rao, Microprocessors and Interfacing: Programming and Hardware, McGraw-Hill, 2017

LIST OF EQUIPMENTS:

1. QtSPIM simulator
2. Modelsim 18.1
3. Paracache simulator
4. EMU 8086 Emulator

22IT403	WEB DEVELOPMENT FRAMEWORKS	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To understand web semantics and related tools and framework
- Able to get hands on latest JS based web frameworks
- To develop a scalable and responsive web application
- To develop an industry ready application web enterprise feature

UNIT I	ADVANCED JAVASCRIPT	9+6

Introduction to HTML5 and CSS3, Media Queries, JS, DOM, BootStrap, Variables, Loops, Operators, Scope, Hoisting, Arrays, Spread, REST, DeStructuring

List of Exercise/Experiments

1) Create a JS Object for Bank Account (w attributes like à customer name, account type, balance, data of creation, bank name, branch name, pan card number). Using JS Object keyword, try to perform following activities
   - List down all the entries of the bank object
   - Check the existence of a key
   - If key found, get the value for the key
2) Spread Operator
   - Merge Customer and Account Arrays
   - Update the Customer Object with the new values
   - Develop a function that takes an Spread Argument and calculates total balance.

UNIT II	INTRODUCTION TO REACTJS	9+6

Class-Inheritance, Methods, Extended Class-Map, filter and Reduce Functions, Functions - Arrow Functions, Lambda Expressions , REST - Introduction, Why JSX, Hello World Apps, Project Structure

List of Exercise/Experiments

1) Create a list of Bank Objects (same kind of object you used in above lab, but in a array format)
   - Display the banks where balance is greater than 200
   - deduct 10% of the Bank account balance, as part of monthly service fees
   - Display the banks where balance is greater than 200 and branch code is “Chennai”
   - Add a new Bank to the given array
   - Delete a bank from the array (use splice operator)
   - Calculate the total balance of all bank accounts
2) Develop a Scientific calculator that does following operations
   - Rounded Value
   - Area of Circle
   - Calculating of Sin, Cos and Tan functions
   - Permiter of an Rectangle
   - Employ Arrow functions
   - Employ HOC

UNIT III	REACT COMPONENTS AND HOOKS	9+6

Class vs Functional Components, React Class Based Components – component DidMount, WillUpdate, shouldupate, didcatchetc - State - UseState, UseRef, USeEffect,UseHistory Usage and Props(difference, when to use what, mutable or immutabilty, direction of flow), PropTypes, Auxillary

Components, Controlled and Uncontrolled Components, Component Interaction (Parent to Child and Child to Parent), Iteration & Conditional Response

List of Exercise/Experiments

1) Create a collection of Customer by using
   - Weak Map and Map Collection in JS
   - Show Case the different feature set of the same.
2) Add Login Page, Dash Board Page, Admin Page
   - Enable React Routing
   - Add React Protected Route, for authorization

UNIT IV	**REACT LIBRARY - I**	**9+6**

Event Bubbleup - Component Wrapper - Integration of CSS Modules - Forms Validations(YUP, Formik, Standard), Events Handling, Data Binding

List of Exercise/Experiments

1) Develop a React application that has User Registration Form w field level validations, data submission to a rest api end point, boot strap for responsive.
   - Use YUP or Formik to implement the same

UNIT V	**REACT LIBRARY - II**	**9+6**

Custom Hooks, HTTP - Fetch, Axios, Services, Behaviour Subjects - StateLess, StateFull and Container Components, Error Handling - Build, Env, CORS, Unit Testing w React Testing Library - Introduction to react-native - Introduction to Story Book

List of Exercise/Experiments

1) Employ back end api for Login Page functionality (authentication). Post login, store the user context (received from the back end server) in browser's session storage as objects. And use the same as creds during protected route verification
   - On the dashboard page, have a grid of Students. The data has to be bought from back end API
   - Employ useref, useeffect &usestate, and useHistory
   1) Enable Exception Handling
   2) Enable HOC and Aux Components
   3) Implement React-Testing Library

Business Use Case Implementations

1) Student Management System
2) Retail Bank System
3) eCommerce System
4) Student LMS Management System

TOTAL:45+30=75 PERIODS

OUTCOMES:

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

CO1: Personalize web pages using text formatting, graphics, audio, and video.

CO2: Hands on knowledge on Rest API , propTypes

CO3: Able to develop a web application using latest React Framework

CO4: Apply various React features including functions, components, and services.

CO5: Able to develop application using ReactJshooks .

TEXTBOOKS:

1) David Flanagan, Javascript The Definitive Guide, Paperback, 7th Edition, 2020.
2) David Choi ,Full-Stack React, TypeScript, and Node: Build cloud-ready web applications

using React 17 with Hooks and GraphQL Paperback – Import, 18 December 2020

3) Mehul Mohan, Advanced Web Development with React Paperback – 1 January 2020

REFERENCES:

1. PARENTAL WEBSITE - https://reactjs.org/
2. The Road to Learn React: Your journey to master plain yet pragmatic React.js by Robin Wieruch
3. Learning React: Functional Web Development with React and Redux by Alex Banks and Eve Porcello
4. Learning React by Kirupa Chinnathambi
5. "React Up & Running" by StoyanStefanov
6. https://www.edureka.co/reactjs-redux-certification-training

ONLINE LEARNING PLATFORMS :

- CodePen,
- CodeSandbox (ß Preferred)
- Stackblitz.

LIST OF EQUIPMENTS:

- NodeJS (v9.11.2)
- Github as code repository
- Visual studio code as IDE
- RTL as unit testing framework
- Responsive design w bootstrap
- ReactJS installation (v17)
- Chrome / FireFox Browsers (latest)
- Responsive using Media Queries & Bootstrap Material & Antdesign
- Design based Apps

22IT404	APPLICATION SYSTEM DESIGN WITH UML	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Understand the fundamentals of object-oriented modeling
- Capture the requirements specification for an intended software system
- Translate the analysis phase to design modeling
- Design with static UML diagrams.
- Design with the UML dynamic and implementation diagrams.
- Understand the concepts of Design Patterns

UNIT I	INTRODUCTION TO AN OBJECT-ORIENTED TECHNOLOGIES AND UML	9+6

Software development process: The Waterfall Model vs. The Spiral Model. -The Software Crisis, description of the real world using the Objects Model. -Classes, inheritance and multiple configurations. -Quality software characteristics. - Descriptionof the Object Oriented Analysis process vs. the Structure Analysis Model. Introduction to the UML Language. Standards. -Elements of the language. -General description of various models. -The process of Object Oriented software development.-Description of Design Patterns.

List of Exercise/Experiments

1. Develop Problem statement for software System

UNIT II	REQUIREMENT ANALYSIS AND STATIC DIAGRAMS	9+6

Analysis of system requirements. -Actor definitions. -Writing a case goal. –Use Case Diagrams. - Use Case Relationships. - Use case Modeling — Relating Use cases — include, extend and generalization – When to use Use-cases- The Class Diagram Model. -Attributes descriptions. - Operations descriptions. - Connections descriptions in the Static Model. - Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity. Package Diagram Model. - Description of the model. -White box, black box. -Connections between packagers. - Interfaces. - Create Package Diagram. Drill Down

List of Exercise/Experiments

1. Document the Software Requirements Specification (SRS) for the identifiedsystem
2. Identify use cases and develop the Use Case model.
3. Identify the conceptual classes and develop Class Diagram

UNIT III	INTERACTION DIAGRAMS	9+6

Description of goal. -Defining UML Method, Operation, Object Interface, Class. - Sequence Diagram. -Finding objects from Flow of Events. - Describing the process of finding objects using a Sequence Diagram. - Describing the process of finding objectsusing a Collaboration Diagram

List of Exercise/Experiments

1. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence Diagram

UNIT IV	DYNAMIC AND IMPLEMENTATION DIAGRAMS	9+6

Description of the State Diagram. -Events Handling. - Description of the Activity Diagram. - Exercise in State Machines. Component Diagram Model. - Physical Aspect. -Logical Aspect.- Connections and Dependencies. -User face. - Initial DB design in a UML environment. Deployment Model.- Processors. -Connections. - Components. -Tasks. -Threads. - Signals and Events

List of Exercise/Experiments

1. Draw relevant State Chart and Activity Diagrams for the same system.

2. Develop UML Component and Deployment diagram

UNIT V	DESIGN PATTERNS	9+6

Design Patters – SOLID Principle – Standard Architecture Principles - Java Blue Print Patterns – Structural. Behavioral and Creational Patterns – Reference Implementations

List of Exercise/Experiments

1. Evaluate the different pattern interactions between various physical components and the user, managing a design solution through visual representations.

To develop a mini-project by using the following Use Cases listed below:

Use Case 1
POS (Point of Sale) Terminal
Features to be handled:-
1. Order Entry,
2. Item Management and Categorization,
3. Tax Calculation,
4. Payment Mode, Payment Status, User Management

Use Case 2
Hotel Room Management
Features to be handled:-
1. Rooms type and Category
2. Check in and Check Out
3. Room occupation Status
4. Room Service Request
5. Guests Management and allocation Room
6. Billing Calculation, User management

Use Case 3
Banking Portal
1. Funds Transfer within Same Bank, Intra Bank
2. Forex Conversion
3. Bene Management
4. Customer and Accounts Management
5. Funds Transfer Transaction Status

Use Case 4
Mobile Phone Service Center
1. Mobile Phone Parts Management
2. Mobile Phone Models
3. Service Request Registration
4. Service Request Status Check
5. Service Request Engineer Allocation
6. Payment
7. Customer Management

TOTAL: 45+30= 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To understand business problem statement in object-oriented notation
CO2: Covert the analysis phase to design modeling.
CO3: Identify various scenarios based on software requirements
CO4: Implement Static diagrams and Dynamic modeling using UML Modeling
CO5: To build an extendable and scalable solution using Design patterns
CO6: Develop and implement simple applications that make use of classes, packages and interfaces

TEXTBOOKS:

1. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: using UML, Patterns, and Java.., 2009
2. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software., First Edition.

REFERENCES:

1. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, ―Design patterns: Elements of Reusable Object-Oriented Software‖, Addison-Wesley, 1995.
2. Martin Fowler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Language‖, Third edition, Addison Wesley, 2000
3. Craig Larman, ―Applying UML and Patterns: An Introduction to Object- Oriented Analysis and Design and Iterative Development‖, Third Edition, Pearson Education, 2005
4. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999

LIST OF EQUIPMENTS:

1. STANDALONE DESKTOPS 30
2. ArgoUML, StarUML Visual Paradigm Or Equivalent Eclipse IDE And Junit

22GE411	PRODUCT DEVELOPMENT LAB - IV (Prototype Phase) (Common to All Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The Course will be able learners to:

- Analyze the real-time problems in product development from an engineering perspective.
- Implement the DFMA process route to make and assemble the product.
- Test and qualify the product or a system with acquired knowledge.
- Identify the business opportunities for the developed product or process.

The student batch of PDD Lab 3 shall continue their product/ process design work under the guidance of the faculty in charge. All batches should cover the following stages of prototyping work as listed under activities. The faculty in charge shall conduct periodic reviews to endorse the work progress and during the review, the faculty shall provide suggestions/ideas to improvise the project towards completion. An interim report (consisting of BoM, Stages of Prototyping, photographs, proof of work done, etc..) for all listed activities should be submitted by the team during periodic review for evaluation. A final project report is required at the end of the semester and the evaluation is based on an oral presentation in front of the examiner panel constituted by the Head of the Department.

LIST OF ACTIVITIES:

1. Develop Engineering BoM for the approved industrial Mock-up from Phase III. Transform the Engineering BoM to develop a Prototype.
2. Devise / Plan an economically efficient manufacturing process to make the Prototype and testing.
3. Deliberation of the Product / Process outcome – Phase IV. Preparation and submission of a project report.

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1 Identify the real-time problems through literature.

CO 2 Develop feasible solutions for the problems.

CO 3 Evaluate the methods to develop solutions to the problem.

CO 4 Analyze the business opportunities for a new product.

CO 5 Prepare a detailed report for the experimental dissemination.

22CS411	APTITUDE AND CODING SKILLS – II (Common to All Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The Course will enable learners to:

- Develop advanced vocabulary for effective communication and reading skills.
- Build an enhanced level of logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.
- To apply data structures and algorithms in problem solving.

List of Exercises:

1. **English – Phase II**

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering

2. Logical Reasoning – Phase II

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

3. Quantitative Ability - Phase II

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations,Probability

4. Automata Fix – Phase II

Logical, Compilation and Code reuse

5. Automata -Phase II

Data Structure Concepts: Array and Matrices, Linked list, String processing andmanipulation, Stack/Queue, Sorting and Searching

Advanced Design and Analysis Techniques: Greedy Algorithms, Minimum Spanning Trees, String Matching, Divide and Conquer, Computational Geometry

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Develop advanced vocabulary for effective communication and reading skills.
CO2: Build an enhanced level of logical reasoning and quantitative skills.
CO3: Develop error correction and debugging skills in programming.
CO4: Apply data structures and algorithms in problem solving.

PROFESSIONAL ELECTIVES - I

Sl. No	Vertical	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	I	22IT901	Data Science for Engineers	PEC	4	2	0	2	3
2.	II	22IT902	Cyber Security	PEC	4	2	0	2	3
3.	III	22IT903	Software Testing and Automation	PEC	4	2	0	2	3
4.	IV	22IT904	Computer Graphics	PEC	4	2	0	2	3
5.	V	22IT905	Blockchain Technologies	PEC	4	2	0	2	3
6.	VI	22IT906	Soft Computing	PEC	4	2	0	2	3
7.	VII		Linear Algebra	PEC	4	2	0	2	3

22IT901	DATA SCIENCE FOR ENGINEERS	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Learn the fundamentals of Data Science
- Acquire skills in data preparatory and preprocessing steps
- Learn the tools and packages in Python for Data Science
- Understand the various Excel Function to solve Data Science Problem
- Acquire knowledge in data interpretation and visualization techniques

UNIT I	INTRODUCTION	6+6

Need for data science – benefits and uses of Data Science and Big Data – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

List of Exercise/Experiments:

1. Download, install and explore the features of R/Python for data analytics
    - Installing Anaconda
    - Basic Operations in Jupiter Notebook
    - Basic Data Handling

UNIT II	NUMPY FOR DATA SCIENCE	6+6

Introduction to Numpy- The Basics of NumpyArrays- Universal Functions-Aggregation-Computation on Arrays- Comparisons,Masks and Boolean Logic-Fancy Indexing – Sorting Arrays –Structured Data :Numpy's Structured array

List of Exercise/Experiments:

1. Creation of numpy array using the tuple
2. Determine the size,shape and dimension of the array
3. Manipulation with array Attributes
4. Creation of Sub array
5. Perform the reshaping of the array along the row vector and column vector
6. Create Two arrays and perform the concatenation among the arrays
7. Perform the Statistics operation for the data (the sum, product, median, minimum and maximum, quantiles, argmin, argmax etc.).
8. Use any data set compute the mean, standard deviation, Percentile.

UNIT III	MANIPULATION WITH PANDAS	6+6

Data manipulation with Pandas – Data Indexing and Selection – Handling missing data – Hierarchical indexing – Combining datasets – Aggregation and Grouping – String operations – Working with time series – High performance Pandas.

List of Exercise/Experiments:

1.Perform the fundamental Pandas data structures operations: the Series, DataFrame , and Index.

2.Implement the Data Selection Operations

3.Implement the Data indexing operations like: loc, iloc, and ix

4. From the given sample data set perform the operations of handling the missing data like None,Nan .

5.Manipulate on the operation of NullVaues (is null(), not null(), dropna(), fillna())

UNIT IV	DATA SCIENCE IN SPREADSHEET	6+6

Importing Data into Excel from Different Data Source –Data Cleansing and Preliminary Data Analysis-Correlations and the importance of Variables Technical requirements - Implementing Time Series

List of Exercise/Experiments:

1.Explore the Basic functions in Excel

2.Perform the task of importing the data in to Excel from data set

3.Do the data processing operations like data cleansing, data preparation

UNIT V	DATA VISUALIZATION	6+6

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization –three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

List of Exercise/Experiments:

1.Exploring the Data Visualization using Excel
2. Basic plots using Matplotlib .
3. Implementation of Scatter Plot.
4. Construction of Histogram,bar plot, Subplots,Line Plots.
5. Implement the three dimensional potting

TOTAL:30+30=60 PERIODS

OUTCOMES:

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

CO1: Apply the Skillset in data Processing
CO2: Interpreting the various uses of libraries
CO3: Understand the real-world data and information.
CO4: Apply data science using excel& Python
CO5: Interpret data using visualization tools in Python

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (first two chapters for Unit I)
2. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016
3. Julio Cesar Rodriguez Martino, “Hands-on Machine Learning with Microsoft Excel”, Packt Publication, 2019

REFERENCES:

1. Roger D. Peng, R Programming for Data Science, Lulu.com, 2016
2. Laura Igual, Santi Seguí, "Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications", 1st Edition, Springer, 2017
3. Peter Bruce, Andrew Bruce, "Practical Statistics for Data Scientists: 50 Essential Concepts", 3rd Edition, O'Reilly, 2017
4. Hector Guerrero, “Excel Data Analysis: Modelling and Simulation”, Springer International Publishing, 2nd Edition, 2019

22IT902	CYBER SECURITY	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- To provide the knowledge on foundations and vulnerabilities of Cyber Security
- To introduce symmetric and Asymmetric Cryptography and message authentication techniques
- To create awareness on cyberlaws and forensics.
- To deliver insights on Ethical Hacking and various attacks

UNIT I	FOUNDATIONS OF CYBER SECURITY CONCEPTS	6+6

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits - Cyber Security Vulnerabilities: Internet Security, Cloud Computing and Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness.

UNIT II	CRYPTOGRAPHY	6+6

Cryptography: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography

UNIT III	CYBER LAWS	6+6

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyber space, National Cyber Security Policy 20

UNIT IV	FORENSICS	6+6

Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations.

UNIT V	INTRODUCTION TO ETHICAL HACKING	6+6

LINUX and Networking, Doxing, Website/ IP information Gathering, Network Mapping oGoogle Hacking, d Discovering IP Range and Open Port, Identifying Target Operating System and Services, Secure Bypassing Firewalls while Scanning, Understanding Wireless Networks , De-authentication attack, Fragmentation Attacks, Chop Chop attack, Fake authentication ,Evil Twin Attack, Cafe-latte attack, Reveal Hidden SSID's, WPA and WPA2 wireless password, hacking techniques, Cracking Wireless Passwords using Rainbow tables, Brute force techniques

List of Exercise/Experiments:

1. Implement Confidentiality and Authentication using RSA
2. Implement the Signature Scheme- Digital Signature Standard
3. Implement the following algorithms- DES, Diffie Hellman Algorithm
4. Demonstrate Intrusion Detection System (IDS) using any tool (snort or any others/w)
5. How to Recover Deleted Files using Forensics Tools
6. Hiding and extract any text files behind an image file/Audio file.
7. Cracking Wireless Passwords using Rainbow tables
8. Investigations on Email Crime.
9. Study of sniffing
10. Study of Fake authentication

TOTAL: 30+30=60 PERIODS

OUTCOMES:

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

CO1: Discuss the foundations of Cyber Security Concepts.
CO2: Identify the vulnerabilities in the given Information system.
CO3: Demonstrate the cryptography techniques.
CO4: Interpret Cyber law and Forensics
CO5: Discriminate ethical hacking techniques

TEXTBOOKS

1. William Stallings, Cryptography and Network Security, 7th Edition, PearsonEducation,2017.

REFERENCES:

1. Bothra Harsh,"Hacking",Khanna Publishing House,Delhi,2017.
2. V.K.Pachghare,"Cryptography and Information Security",PHILearning,2019
3. GuptaSarika,"Information and CyberSecurity",Khanna Publishing House,Delhi. .
4. https://www.eckovation.com/course/ethical-hacking-and-cyber-security.
5. https://nptel.ac.in/courses/106105217/

22IT903	SOFTWARE TESTING AND AUTOMATION	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- To introduce the basics and necessity of software testing.
- To provide various testing techniques along with concepts of software bugs and its impact.
- To develop and validate a test plan.
- To build a testing team required.
- To understand the need for and challenges in test automation and to develop testing scripts.

UNIT I	TESTING PRINCIPLES AND AXIOMS	6+6

Testing as a Process – Testing Axioms –Software Testing Principles – Origins and Cost of Defects – Defect Classes and Examples – Developer/Tester Support of Developing a Defect Repository – Defect Prevention Strategies.

List of Exercise/Experiments

- Flipped classroom on testing axioms.
- Identify and analyze syntax error, semantic error, bug and defect for programs.
- Identify the various types of errors, bugs and defects for a case study.

UNIT II	BLACK BOX, WHITE BOX TESTING AND TEST ADEQUACY	6+6

Test Case Design Strategies – Black Box Approach – Boundary Value Analysis – Equivalence Class Partitioning – State-Based Testing – User Documentation Testing – White Box Approach – Static Testing vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Cyclomatic Complexity – Test Adequacy Criteria.

List of Exercise/Experiments

- Flipped classroom on test adequacy criteria.
- External learning – Exploring white box testing tools like veracode, eclemma, rcunit, cppunit, Junit, JSUnitetc.
- Analyzing the cyclomatic complexity of code segments.
- Assignments on white box testing tools like Selenium, Appium, Robotium and carrying out simple BBT and WBT using tools.
- Solving problems related to cyclomatic complexity.

UNIT III	LEVELS OF TESTING	6+6

Unit Test – Planning – Designing the Unit Test Process – Running the Unit Tests and Recording Results – Integration Test Planning – Scenario Testing – Defect Bash Elimination System Testing – Acceptance Testing – Performance Testing – Regression Testing – Internationalization Testing – Ad-Hoc Testing – Alpha, Beta Tests

List of Exercise/Experiments

- External learning – Exploring the integration testing tools for various programming

languages – VectorCAST/C++, CITRUS (Java), FitNesse (open source), Rational test integration tester, Protractor (Angular, Angular JS), Jasmine (JavaScript), Spock (Java) and the regression testing tools – Sahi Pro, Watir, IBM Rational Regression Tester, TestDrive etc.

- Flipped classroom on alpha and beta testing.
- Analyzing various levels of testing required for a software product.

UNIT IV	TEST MANAGEMENT	6+6

Organization Structures For Testing Teams – Testing Services – Test Planning Attachments – Locating Test Items – Test Management – Reporting Test Results – The Role of Three Groups in Test Planning and Policy Development – Introducing the Test Specialist – Skills Needed by a Test Specialist – Building a Testing Group.

List of Exercise/Experiments

- Flipped classroom on reporting test results.
- External learning – Exploring the organization structures and organizational behaviour in the context of software testing.
- Analyzing how to build testing groups for various types of projects and organizations.

UNIT V	TEST AUTOMATION	6+6

Software Test Automation – Skill Needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Test Metrics and Measurements – Project, Progress and Productivity Metrics – Maintenance of Documents During Testing.

List of Exercise/Experiments

- Flipped classroom on Test metrics and measurements.
- External learning – Exploring the risks involved in automated testing and exploring the ways to improve your testing skills apart from using testing tools.
- Practical – Install and learn popular software testing tools like Selenium, WinRunner, LoadRunner, Performance Tester etc.
- Learning to write test scripts.

TOTAL: 30+ 30=60PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Obtain an insight to software testing.

CO2: Apply both black box testing and white box testing.

CO3: Understand and apply multiple levels of testing.

CO4: Understand the role of a tester as an individual and as a team member.

CO5: Apply software testing for large projects using automated testing tools.

CO6: Maintain documentation on testing.

TEXTBOOKS

4. Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", Fourth Edition, CRC Press, 2013.
5. Dorothy Graham, Mark Fewster, "Experiences of Test Automation: Case Studies of Software Test Automation", Pearson Education, 2012.

REFERENCES:

1. Glenford J. Myers, Tom Badgett, Corey Sandler, "The Art of Software Testing", Third Edition, John Wiley & Sons, 2012.
2. SrinivasanDesikan, Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2009. .
3. Boris Beizer, "Software Testing Techniques", Dream Tech Press, 2009.
4. Mauro Pezze, Michal Young, "Software Testing and Analysis Process Principles and Techniques", Wiley India, 2008.
5. Ali Mili, FairouzChier, "Software Testing: Concepts and Operations", Wiley, 2015.

22IT904	COMPUTER GRAPHICS	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- To learn the basic principles of 3-dimensional computer graphics.
- Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.

UNIT I	GRAPHICS SYSTEM AND MODELS	6+6

Graphics system and models: applications of computer graphics, graphics system, physical and synthetic images, imaging systems, graphics architectures.

UNIT II	OBJECTS AND TRANSFORMATIONS	6+6

Geometric objects and transformations: scalars, points and vectors, three-dimensional primitives, coordinate systems and frames, frames in OpenGL, matrix and vector classes, modelling a colored cube, affine transformations - translation, rotation and scaling, transformations in homogeneous coordinates, concatenation of transformations, transformation matrices in OpenGL, interfaces to 3D applications, quaternion. Vertices to fragments: basic implementation strategies, four major tasks, clipping - line clipping, polygon clipping, clipping of other primitives, clipping in three dimensions, polygon rasterization, hidden-surface removal, anti aliasing, display considerations.

UNIT III	LIGHTING AND SHADING	6+6

Lighting and shading: light and matter, light sources, the Phong reflection model, computation of vectors, polygonal shading, approximation of a sphere by recursive subdivision, specifying lighting parameters, implementing a lighting model, shading of the sphere model, per-fragment lighting, global illumination. Hierarchical modeling : symbols and instances, hierarchical models, a robot arm, trees and traversal, use of tree data structures, other tree structures, scene graphs, open scene graph.

UNIT IV	RENDERING TECHNIQUES	6+6

Discrete techniques: buffers - digital images - writing into buffers - mapping methods - texture mapping - texture mapping in OpenGL - texture generation - environment maps - reflection map - bump mapping - compositing techniques - sampling and aliasing. Advanced rendering: going beyond pipeline rendering - ray tracing - building a simple ray tracer - the rendering equation - radiosity - Renderman - parallel rendering - volume rendering - Iso surfaces and marching cubes - mesh simplification - direct volume rendering - image-based rendering.

UNIT V	FRACTALS AND MODELLING	6+6

Fractals: modelling - Sierpinski Gasket - coastline problem - fractal geometry - fractal dimension - recursively defined curves - Koch curves - c curves - dragons - space filling curves - turtle graphics - grammar based models - Graftals - volumetric examples – k midpoint subdivision - fractal Brownian motion - fractal mountains - iteration in the complex plane - Mandelbrot set. Virtual reality modelling language: introduction, exploring and building a world, building object, lighting, sound and complex shapes, animation and user interaction, colors, normals and textures, nodes references. Special applications: stereo display programming, multiport display systems, multi-

screen display system, fly mode navigation, walk through navigation, virtual track ball navigation.

List of Exercise/Experiments:

1. Write a program to draw a line using DDA algorithm and Bresenham‘s algorithm
2. Write a program to draw a circle using midpoint algorithm and Bresenham‘s algorithm
3. Implementation of color conversion from RGB to HSV and HSV to RGB
4. Write a program to perform 2D Transformation on a line.
5. Write a program to perform shear transformation on a rectangle.
6. Write a program to rotate a circle (alternatively inside and outside) around the circumference of another circle.
7. Write a program to draw a cube using in build library function and perform 3D Transformations
8. Write a program to implement line clipping (Cohen Sutherland algorithm).
9. Implement basic drawing shapes, modelling, shading and textures using Blender tool

TOTAL: 30+30=60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To list the basic concepts used in computer graphics.
CO2: To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
CO3: To define the fundamentals of animation, virtual reality and its related technologies.
CO4: To design an application with the principles of virtual reality using rendering techniques..
CO5: To apply the concepts of fractals and modeling in real time applications.

TEXTBOOKS

1. Donald Hearn and Pauline Baker, “Computer Graphics C Version”, Pearson Education.
2. Edward Angel, “Interactive Computer Graphics: A Top-Down Approach Using OpenGL”, Addison-Wesley

REFERENCES:

1. Foley James D, Van Dam, Feiner and Hughes, “Computer Graphics: Principles and Practice”, Pearson Education.
2. Rajesh K. Maurya, Computer Graphics with Virtual Reality System, John Wiley & Sons.

22IT905	BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- To understand how block chain systems (mainly Bitcoin and Ethereum) work
- To securely interact with them
- To design, build, and deploy smart contracts and distributed applications,
- To integrate ideas from block chain technology into their own projects.

UNIT I	INTRODUCTION	6+6

What is BlockChain, Types of BlockChain, What is Distributed Ledgers, Consensus Algorithm, Blocks, Transaction, Double spending etc Hashing Techniques, Block Hashing, Distributed Ledgers vs Centralized Controls Ledgers. What is BitCoin, how it works, public ledgers, Minersroles, Pros and Cons.

UNIT II	CONSENSUS ALGORITHMS	6+6

Consensus Algorithms-Proof of Work, Proof of Stake, practical Byzantine Fault Tolerance (pBFT), Istanbul Byzantine Fault Tolerant, Proof of Burn, Proof of Capacity, Proof of Elapsed Time Understanding between Permissioned vs Permission less Block Chain platforms- Data privacy - Authorization- Multi Partner Setup- Private Channels.

UNIT III	ETHEREUM AND SOLIDITY	6+6

Solidity Introduction and Installation, Strings, Variables, Struct, Enums, Map, Events, Conversions, Ether Units, Payable, View, Pure Functions, Address, Functions, Function Modifiers, Fall back Function, Math and Crypto Functions, Object Oriented and Error Handling Understanding on EVM, Remix, Gas/Gas-limit, Accounts, Address, Ethereum Value.

UNIT IV	ETHEREUMS DAAPS DEVELOPMENT	6+6

Installation of NodeJS -- Truffle suite -- Ganache -- Metamask -- Visual Studio Code Edition -- Solidity Compiler -- React Web Application Design and Development of Web3Appsusing Daap Applications using Solidity on Ethereum Platform

UNIT V	REACT BASED WEB APPLICATION	6+6

The solution will have React based web application as front end, which will communicate with deployed Smart Contracts via Web3js package. Use Case - Academics, Financial Domain, Life Science Domain

List of Exercise/Experiments

Exercise 1:

Develop a Pet Shop Platform, which buys and sells different set of Pets using ETHcurrencies. The pet owner can able to declare availability of the Pet(s) with expected cost The buyer who has enough money can able to claim and purchase the pet

The balance gets debited from Buyer account and gets credited to Owner AccountThe pet owner can able to query on who owns the pet, and current eth balance Payload Validation during Sell

and Buy actions

Web Interface to the Contract deployed in Ethblock chain via web3js interface

Exercise 2:

Develop a Learning Management System, where Block Chain is used to store and maintain the learnings the candidates has completed/on going.As part of the process, the following attributes/entities will be captured as part of Learning

- Learning Catalogues
- Student details
- Learning Management
  - StudentID
  - Learning ID
  - Status– completed/on going /planned /delayed
  - Completion date
  - ManagerID

The learner can able to view the available courses and details. The learner can be able to enroll to a course

The learner can be able to delist from a course. The learner can able to go-through the course

The status of the learning gets updated accordingly

The admin can able to view the learners details for a given student / given course /between a date range

The admin can able to manage the student details

The admin can able to manage the Learning Catalogues details

Web Interface using React and Web3

Exercise 3:

Funds Transfer Service

Customer– will have customer details like First Name, Last Name, list of mapped bank accounts w balance

Bene– will have first name, last name, email, bene account

Setting up the Customer of a given bank, with Accounts details, and with available Balance (in the form of eth)

Setting up the Bene (who will receive the money or eth from the customer) The owner can transfer

money from one account to another bene

Money in the form of Eth gets debited from the customer's account and gets credited to Bene account

Ability to view the customer & Bene balance
Web Interface using React and Web3

TOTAL: 30+30=60PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Describe the basic concepts and technology used for blockchain

CO2: Illustrate the concepts of Bitcoin and their usage

CO3 : Describe the concepts of Consensus Algorithm

CO4: Implement Ethereum, block chain contract.

CO5 : Implement web3 apps using Solidity on Ethereum Platform

CO6: Use smart contract in real world applications

TEXTBOOKS

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, PacktPublishing,2018
2. A.Narayanan, J.Bonneau, E.Felten, A.Miller, S.Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton UniversityPress,2016

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands On Approach", VPT,2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, "Mastering Bitcoin", O"Reilly,2014.
3. Roger Wattenhofer, "The Science of the Blockchain" Create Space Independent Publishing,2016
4. Alex Leverington, "Ethereum Programming" PacktPublishing,2017.

22IT906	SOFT COMPUTING	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- To give students knowledge of soft computing theories and fundamentals.
- To design a soft computing system required to address a computational task and use heuristics based on human experience.
- To understand fuzzy sets and fuzzy logic for problem solving.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

UNIT I	FUZZY COMPUTING	6+6

Basic Concepts of Fuzzy Logic – Fuzzy Sets and Crisp Sets – Fuzzy Set Theory and Operations – Properties of Fuzzy Sets – Fuzzy and Crisp Relations – Fuzzy to Crisp Conversion – Membership Functions – Interference in Fuzzy Logic – Fuzzy If-Then Rules, Fuzzy-Implications and Fuzzy Algorithms – Fuzzifications and Defuzzificataions – Fuzzy Controller – Industrial Applications

UNIT II	FUNDAMENTALS OF NEURAL NETWORKS	6+6

Neuron, Nerve Structure and Synapse – Artificial Neuron and its Model – Activation Functions – Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks – Various Learning Techniques: Perception and Convergence Rule, Auto-Associative and Hetero-Associative Memory.

UNIT III	BACK PROPAGATION NETWORKS	6+6

Back Propagation Networks Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perception Model – Back Propagation Learning Methods – Effect of Learning Rule Co-Efficient – Factors Affecting Back Propagation Training – Applications. the error rate with iterations.

UNIT IV	COMPETETIVE NEURAL NETWORKS	6+6

Kohenen's Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization, Learning by LVQ – Adaptive Resonance Theory – Learning procedure – Applications.

UNIT V	GENETIC ALGORITHM	6+6

Basic Concepts – Working Principle – Procedures of GA – Flow Chart of GA – Genetic Representation: (Encoding) Initialization and Selection – Genetic Operators: Mutation, Generational Cycle – Applications.

List of Exercise/Experiments

- Install MATLAB, Fuzzy Logic Toolbox and ANN toolbox to design and simulate systems.
- Implement GA for the Travelling Salesman problem to find the shortest path that visits all cities in a set exactly once.
- Develop a supervised model to train neural net that uses the AND/OR/XOR two input binary/bipolar input and output data and learn linear models to understand the importance of initialization parameters.
- Train neural net that uses the XOR three input binary/bipolar input and output data and learn

linear models to understand the importance of learning parameters.

- Train a linear / non linear model with one hidden layer, two hidden layers.
- Observe the performance with different learning rates and draw the graph depicting
- Train a neural net that uses any dataset and plot the cluster of patterns.
- Implementation evaluation with new input set.

TOTAL: 30+30=60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Identify and describe soft computing techniques and their roles in building intelligent machines.

CO2: Recognize the feasibility of applying a soft computing methodology for a particular problem.

CO3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO4: Apply genetic algorithms to optimization problems.

CO5: Design neural networks for pattern classification and regression problems. CO6: Compare different neural network approaches.

TEXTBOOKS

1. S. Rajasekaran, G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", Prentice Hall of India, 2010.
2. J.S.R. Jang, C.T. Sun, E. Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004

REFERENCES:

1. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Second Edition, Wiley-India, 2007.
2. Siman Haykin, "Neural Networks", Prentice Hall of India, 1999. . .
3. Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 2016.
4. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education, 2008.

Recommended in the Sixth BOS Meeting Held on 12.04.2023
(III and IV Semester)