

**S.A ENGINEERING COLLEGE, CHENNAI – 77**  
**(An Autonomous Institution Affiliated to Anna University)**  
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)**  
**REGULATION-2024**  
**CHOICE BASED CREDIT SYSTEM**  
**CURRICULUM AND SYLLABUS**

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

- Graduates will gain in-depth domain-specific knowledge and develop a robust foundation for lifelong learning, ensuring proficiency in their field throughout their careers.
- Graduates will develop, analyze, evaluate, and deploy secure cyber-physical systems that meet desired constraints adhering ethical practices, addressing professional ,societal ,and environmental concerns
- Graduates shall Work competently for different sectors like academia, industry, research and development, entrepreneurship, and start-up initiator in an individual or collaborative manner utilizing interpersonal skills.
- Graduates will demonstrate competence in various sectors, including academia, industry, research and development, entrepreneurship, and start-ups effectively utilizing interpersonal skills to work collaboratively.

**PROGRAMOUTCOMES(POs):**

- **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- **Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- **Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- **Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- **Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

- **The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

#### **PROGRAMMESPECIFICOUTCOMES**

- Analyze, and develop computer programs in areas such as cryptography, networking, web development, database management, cloud computing, IoT and data analytics leading to excellence and excitement towards research, to provide elegant solutions to complex problems.
- Develop strategies for protecting data, resources, and assets for organizations, processes, and individuals, utilizing cybersecurity-centric skills.

### SEMESTER- I

SL.N O.	SUBJE CT CODE	SUBJECT	TEGORY	L	T	P	CONTAC T PERIOD S	CREDITS
<b>THEORY</b>								
1.	HS3101	Professional English I	HSMC	3	0	0	3	3
2.	MA3101	Matrices and Calculus	BSC	3	1	0	4	4
3.	PH3101	Engineering Physics	BSC	3	0	0	3	3
4.	CY3101	Chemistry for Engineers	BSC	3	0	0	3	3
5.	CS3101	Programming for Problem Solving using C	ESC	3	0	0	3	3
<b>PRACTICALS</b>								
6.	BS3101	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
7.	CS3102	Programming for Problem Solving using C Laboratory	ESC	0	0	4	4	2
8.	GE3201	Engineering Practices Laboratory	ESC	0	0	0	4	2
<b>MANDATORY COURSE</b>								
9.	TA3101	Heritage of Tamils	HSMC	1	0	0	1	1
TOTAL				16	1	12	29	23

## SEMESTER-II

SL. NO	SUBJECT CODE	SUBJECT	CATEGORY	L	T	P	CONTACT PERIODS	CREDITS
<b>THEORY</b>								
1.	HS3201	Professional English II	HSMC	3	0	0	3	3
2.	MA3202	Discrete Mathematics	BSC	3	1	0	4	4
3.	PH3201	Physics for Information Science	BSC	3	0	0	3	3
4.	CS3201	Programming in Python	ESC	3	0	0	3	3
5.	CS3202	Essentials and Practices of Software Development(Lab Integrated)	PCC	3	0	2	5	4
6.	TA3201	Tamils and Technology	HSMC	1	0	0	1	1
7.	ME3101	Engineering Graphics	ESC	2	0	2	4	3
<b>PRACTICALS</b>								
8.	CS3203	Programming in Python Laboratory	ESC	0	0	4	4	2
<b>MANDATORY COURSE</b>								
9.	CY3201	Environmental Sciences and Sustainability	HSMC	1	0	0	1	1
TOTAL				19	1	8	28	24

### SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDI TS
				L	T	P		
THEORY								
1.	MA3301	Algebra and Number Theory	BSC	3	1	0	4	4
2.	CS3301	Data Structures	PCC	3	0	0	3	3
3.	CS3302	Digital Principles and Computer Organization	ESC	3	0	0	3	3
4.	CB3301	Software System Design	PCC	3	0	0	3	3
5.	CS3303	Design thinking	PCC	3	0	0	3	3
6.	IT3301	Object Oriented Programming	PCC	3	0	0	3	3
PRACTICALS								
7.	CS3304	Data Structures Laboratory	PCC	0	0	3	3	1.5
8.	IT3302	Object Oriented Programming Laboratory	PCC	0	0	3	3	1.5
EMPLOYABILITY ENHANCEMENT COURSES								
9.	CS3305	Aptitude Skills-I	EEC	0	0	3	3	0
10.	CS3306	Value added Course-I	EEC	0	0	3	3	0
TOTAL				18	1	12	31	22

### SEMESTER IV

S. N O	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CRED ITS
				L	T	P		
THEORY								
1.	MA3401	Probability and Statistics	BSC	3	1	0	4	4
2.	CB3401	Artificial Intelligence and Machine Learning	PCC	3	0	0	3	3
3.	CB3402	Database Management Systems and Security	PCC	3	0	0	3	3
4.	CB3403	Operating Systems and Security(Lab Integrated)	PCC	3	0	2	5	4
5.	CB3404	Cryptography and Information Security	PCC	3	0	0	3	3
6.	HS3401	Universal Human Values II: Understanding Harmony	ESC	2	1	0	3	3
PRACTICALS								
7.	CB3405	Cryptography and Information Security Laboratory	PCC	0	0	3	3	1.5
8.	CB3406	Database Management Systems and Security Laboratory	PCC	0	0	3	3	1.5
9.	CB3407	Artificial Intelligence and Machine Learning Laboratory	PCC	0	0	3	3	1.5
EMPLOYABILITY ENHANCEMENT COURSES								
	HS3403	English Language Enhancement and Business Communication Laboratory	EEC	0	0	3	3	1.5
	CS3406	Aptitude Skills-II	EEC	0	0	2	2	1*
	CS3407	Value added Course-II	EEC	0	0	3	3	0
TOTAL				17	1	19	37	25

### SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDIT S
				L	T	P		
THEORY								
1	CB3501	Computer Networks and Security(Lab Integrated)	PCC	3	0	2	5	4
2.	CS3502	Distributed and Cloud Computing(Lab Integrated)	PCC	3	0	2	5	4
3.	CB3502	Secure Software Engineering	PCC	3	0	0	3	3
4.	CS3503	Theory of Computation	PCC	3	0	0	3	3
5.		Professional Elective I	PEC	3	0	0	3	3
6.		Professional Elective II	PEC	3	0	0	3	3
7.		Open Elective I	OEC	3	0	0	3	3
EMPLOYABILITY ENHANCEMENT COURSES								
8.	CB3503	Advanced Coding Skills-III	EEC	0	0	2	2	0
9.	CB3504	Value added Course-III	EEC	0	0	3	3	1*
TOTAL				21	0	9	30	23

## SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDIT S
				L	T	P		
THEORY								
1.	CB3601	Cyber Forensics and threats (Lab Integrated)	PCC	3	0	2	5	4
2.	CS3602	Embedded Systems and IoT	PCC	3	0	0	3	3
3	CB3602	Advanced Ethical Hacking	PCC	3	0	0	3	3
4.		Open Elective – II	OEC	3	0	0	3	3
5.		Professional Elective III	PEC	3	0	0	3	3
6.		Professional Elective IV	PEC	3	0	0	3	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	CB3603	Mini Project	EEC	0	0	3	3	1.5
8	HS3605	Professional and Career Development laboratory	ESC	0	0	3	3	1.5
9	CB3604	Advanced Coding Skills-IV	EEC	0	0	3	3	0
10	CB3605	Value added Course-IV	EEC	0	0	3	3	0
		Self Learning Course						1*
TOTAL				18	0	14	32	22



**SEMESTER VII / VIII\***

S. NO .	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDIT S
				L	T	P		
THEORY								
1.	CB3701	Cyber Security Practices(Lab Integrated)	PCC	3	0	2	5	4
2.		Principles of Management	HSC	3	0	0	3	3
3	CB3702	Secure Web Application Development	PCC	3	0	0	3	3
4.			Professional Elective V	PEC	3	0	0	3
5.		Professional Elective VI	PEC	3	0	0	3	3
EMPLOYABILITY ENHANCEMENT COURSES								
6.	CB3703	Value added Course-V	EEC	0	0	3	3	0
7	CB3704	Advanced coding skills-V	EEC	0	0	3	3	0
8.	CB3705	Summer internship	EEC	0	0	0	0	2
MANDATORY								
9.	MC3701	Indian Constitution	MC	2	0	0	2	0
TOTAL				17	0	8	25	18

**SEMESTER VIII /VII\***

S. N O .	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	CB3801	Project Work/Internship	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

**TOTAL CREDITS:167**

HS3101	PROFESSIONAL ENGLISH I	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b> <ul style="list-style-type: none"><li>● To improve the communicative competence of learners</li><li>● To learn to use basic grammatical structures in suitable contexts</li><li>● To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text</li><li>● To help learners use language effectively in professional contexts</li><li>● To develop learners’ ability to read and write complex texts, summaries, articles, blogs, Definitions, essays and user manuals</li></ul>					
UNIT I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	9			
Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails and introduction to effective communication. Listening - Listening for gist, Innovative Video making; Writing - Writing emails, letters in general contexts. Grammar - Content vs Function words; Question types: Wh/ Yes or No/ and Tags. Vocabulary - Sentence Completion; Abbreviations & Acronyms (as used in technical contexts).					
UNIT II	NARRATION AND SUMMATION	9			
Reading - Reading biographies, travelogues, Excerpts from literature, Writing - Guided writing—Paragraph writing (Analytical, Narrative, Compare & Contrast), Short Report on an event (field trip etc.) Grammar –Tenses (All three tenses) Worksheet 2; and Prepositions. Vocabulary - Word forms (prefixes&; suffixes); Phrasal verbs. Speaking- Asking & Giving Directions. Listening-Listening to INK Talks.					
UNIT III	DESCRIPTION OF A PROCESS/PRODUCT	9			
Reading – Reading advertisements, gadget reviews and user manuals, reviewing a short story. Writing – Writing definitions; Instructions. Grammar – Subject-Verb agreement; Adjectives; Degrees of comparison; Vocabulary - Compound Nouns, discourse markers (connectives & sequence words).					
UNIT IV	CLASSIFICATION AND RECOMMENDATIONS	9			
Reading – Newspaper articles and Non Verbal Communication ( tables, pie charts etc.) Writing –Note-making / Note-taking (*Study skills to be taught, not tested)Flash Cards; Writing recommendations; Transferring information from non- verbal ( chart , graph etc. to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary – Collocation and Compound Nouns; Fixed/Semi fixed expressions.					
UNIT V	EXPRESSION	9			
Reading – Reading Sports Articles; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar –Punctuation; and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions. Speaking - PPT preparation and poster presentation					
TOTAL: 45 PERIODS					
<b>COURSE OUTCOMES:</b> <b>On the successful completion of the course, students will be able to</b> CO1: Use appropriate words in a professional and general context and read and infer the denotative and connotative meanings of technical contexts.					

CO2: Gain understanding of basic grammatical structures and use them in paragraph writing.

CO3: Write definitions, descriptions and narrations.

CO4: Interpret the information in any form and give probable suggestions

CO5: Write essays on various topics

### TEXTBOOKS

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K N. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.

### REFERENCES

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English by Lakshminarayanan, SciTech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, McGraw Hill Education, ISBN: 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.
6. English Grammar in Use – Raymond Murphy- Cambridge, Fifth edition.

### CO's-PO's and PSO's MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	0	0	0	0	0	1	3	3	3	3	2	0	0
CO2	0	0	0	0	0	3	3	3	2	2	1	0	0
CO3	0	0	0	0	0	1	2	3	3	3	2	0	0
CO4	0	0	0	0	0	3	3	3	2	1	2	0	0
CO5	0	0	0	0	0	1	2	3	3	3	1	0	0

MA3101	MATRICES AND CALCULUS							L	T	P	C
								3	1	0	4

### COURSE OBJECTIVES:

- To Understand the concepts of Matrices which are needed for practical applications.
- To familiarize the students with differential calculus.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations of higher order that model in various engineering problems.
- To familiarize the student with functions of several variables that is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I	MATRICES							12			
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Eigen values and Eigen vectors of a real matrix – Properties of Eigen values - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form.

<b>UNIT II</b>	<b>DIFFERENTIAL CALCULUS</b>	<b>12</b>
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Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules Maxima and Minima of functions of one variable

<b>UNIT III</b>	<b>DIFFERENTIAL EQUATIONS</b>	<b>12</b>
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Higher order linear differential equations with constant coefficients- Method of undetermined coefficients - Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

<b>UNIT IV</b>	<b>MULTIVARIABLE CALCULUS</b>	<b>12</b>
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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– Lagrange’s method of undetermined multipliers.

<b>UNIT V</b>	<b>MULTIPLE INTEGRALS</b>	<b>12</b>
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Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

**TOTAL: 60 PERIODS**

#### **COURSE OUTCOMES :**

**On the successful completion of the course, students will be able to**

- Use the matrix algebra methods to diagonalize the matrix.
- Apply differential calculus tools in solving various engineering problems
- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- The subject helps the students to develop the fundamentals and basic concepts in ODE
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

#### **TEXTBOOKS**

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.
3. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015.

#### **REFERENCES**

1. Bali,N.P., Goyal,M.,Watkins,C.,Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited, 2007.
2. Boyce,W.E.,andDiPrima,R.C., Elementary Differential Equations and Boundary Value Problems, Wiley India, 2012.
- 3.Dennis G,Zill, Michael R.Cullen., “Differential Equations with boundary value problems”, Cengage Learning, 7th Edition, New Delhi, 2009.
- 4.GeorgeB.Thomas Jr.,MauriceD.Weir,JoelR.Hass,Thomas'Calculus:Early Transcendental, 13th Edition, Pearson Education, 2013.
5. O’Neil. P. V., “Advanced Engineering Mathematics”, 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
6. T.Veerarajan, Engineering Mathematics, Mc Grawhill Publications, New Delhi 2017.

**CO's-PO's and PSO's MAPPING**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	1	1	0	0	2	0	2	3	1	0
CO2	3	3	1	1	1	0	0	2	0	2	3	1	0
CO3	3	3	1	1	1	0	0	2	0	2	3	1	0
CO4	3	3	1	1	1	0	0	2	0	2	3	1	0
CO5	3	3	1	1	1	0	0	2	0	2	3	1	0

<b>PH3101</b>	<b>ENGINEERING PHYSICS</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
								<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To Understand and identify different crystal structures and their imperfections
- To Explain the elastic and thermal properties of materials and understand their significance
- To Provide an overview of the production, detection and applications of ultrasound
- To Explain the origin of laser action, production of laser, fiber optics and their applications
- To Develop an understanding of quantum mechanical phenomena and their applications

<b>UNIT I</b>	<b>CRYSTAL PHYSICS</b>	<b>9</b>
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Crystalline and Amorphous solids – single crystalline and Polycrystalline solids - Lattice – Unit cell– Bravais lattice – Lattice planes – Miller indices – interplanar spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius –Packing factor for SC, BCC, FCC and HCP structures – Crystal Defects – Point, line and Volume defects.

<b>UNIT II</b>	<b>PROPERTIES OF MATTER AND THERMAL PHYSICS</b>	<b>9</b>
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Elasticity- Hooke's law - stress -strain diagram– Poisson's ratio –Factors affecting elasticity– Torsional stress & deformations – Twisting couple – Torsion pendulum - theory and experiment - Uniform & Non uniform bending: theory and experiment - I-shaped girders. Modes of heat transfer – conduction, convection and radiation - thermal conductivity– Lee's disc method – Heat transfer application in Engineering.

<b>UNIT III</b>	<b>ULTRASONICS AND NDT</b>	<b>9</b>
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Introduction – production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezo electric generator –properties –detection – cavitation –acoustic grating – velocity measurement – applications –Sonar –velocity of blood flow – NDT –Liquid Penetrant method – Ultrasonic flaw detector – A scan, B scan, C scan – X- ray radiography and fluoroscopy – Thermography- Strategies for minimizing transmission loss using coupling agents.

<b>UNIT IV</b>	<b>LASER AND FIBRE OPTICS</b>	<b>9</b>
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Characteristics of Laser - spontaneous emission - stimulated emission- population inversion – pumping methods - conditions for Laser action - Types of lasers – Nd: YAG, He – Ne, Semiconductor Lasers –

Homojunction diode Laser – Heterojunction diode Laser - Industrial and Medical Applications. Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle - Fibre Optical Communication system (Block diagram) – Mechanisms of Attenuation, Types of losses in fiber optic communication systems, , Applications of fiber optic communication system.

<b>UNIT V</b>	<b>BASIC QUANTUM PHYSICS</b>	<b>9</b>
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Inadequacy of classical physics- Photons and light waves- Electrons and matter waves- G.P.Thomson Experiment- wave function and physical significance- Schrodinger wave equation (Time dependent and independent forms) – Application of one dimensional of box- Barrier penetration and quantum tunneling(qualitative)- Scanning tunneling microscope.

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Analyze the crystal structures and their defects.

**CO2:** Demonstrate and explain the general concepts of elastic and thermal properties of materials

**CO3:** Analyze the applications of ultrasonic in engineering and medical disciplines

**CO4:** Elucidate the principle and working of lasers and optical fibers, and their applications in the field of industry, medicine and telecommunication

**CO5:** Understand the importance of quantum physics and apply quantum mechanical principles towards material diagnostics

### **TEXTBOOKS**

1. Gaur R.K and Gupta, S.L, Engineering Physics, Dhanpat Rai Publishers, 2012.
2. Serway R.A and Jewett J.W, Physics for Scientists and Engineers, Cengage Learning, 2010.

### **REFERENCES**

1. Halliday D, Resnick R and Walker J, Principles of Physics, Wiley, 2015.
2. Tipler P.A and Mosca G, Physics for Scientists and Engineers with Modern Physics, WH Freeman, 2007.
3. Avadhanulu M. N and Kshirsagar P. G, A Text Book of Engineering Physics, S. Chand & Co. Ltd., Ninth Revised Edition, 2012.
4. You tube link: <https://www.youtube.com/watch?v=XEzJCuWfVuo>
5. You tube link: <https://www.youtube.com/watch?v=kIVfjRW-INM>
6. You tube link: <https://www.youtube.com/watch?v=nMfOo7HhybY>

### **CO's-PO's and PSO's MAPPING**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
<b>CO1</b>	3	1	1	2	0	0	1	0	0	0	1	0	0
<b>CO2</b>	3	1	1	2	0	0	1	0	0	0	1	0	0
<b>CO3</b>	3	1	1	2	0	0	1	0	0	0	1	0	0
<b>CO4</b>	3	1	1	2	0	0	1	0	0	0	1	0	0
<b>CO5</b>	3	1	1	1	0	0	1	0	0	0	1	0	0

CY3101	CHEMISTRY FOR ENGINEERS	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b> <ul style="list-style-type: none"><li>● To make the students conversant with hardness, boiler feed water requirements, related problems and water treatment techniques</li><li>● To develop an understanding of different advanced polymeric materials.</li><li>● To impart knowledge about nanomaterial synthesis, properties and applications</li><li>● It enables the students to gain information about Electrochemical reaction, corrosion and its prevention.</li><li>● To make the students familiar with the different types of Engineering materials.</li><li>● To help the students to recognize different categories of sustainable energy sources.</li></ul>					
UNIT I	WATER TREATMENT AND TECHNOLOGY	9			
Introduction – Water quality parameters - Hardness of water – types – expression of hardness – units – Determination of Hardness by EDTA method. Boiler troubles (scale & sludge - Caustic Embrittlement) - Softening of hard water – external treatment process: Demineralization, internal treatment process: boiler compounds (phosphate, calgon and colloidal conditioning) – Application of Artificial intelligence in water treatment process - Desalination of brackish water by Reverse Osmosis.					
UNIT II	ADVANCED POLYMERIC MATERIALS	9			
Basics of Polymers -Definition, Classification, Properties. Advanced polymer introduction, preparation, properties and applications of:( 1) Conducting Polymer-Nafion; (2) Polymer optical fiber - PMMA; (3) Piezoelectric polymer-PVDF: (4) Intelligent polymers- (a)Shape memory polymer (SMP) –Polyurethane (b) Self-Healing Polymers-Hydrogel (c) Electro active polymer-PANI					
UNIT III	NANOCHEMISTRY	9			
Introduction to Nanoscience; Scope and General properties of bulk-materials and nanomaterials - Chemical methods of synthesis of Nanomaterials & its advantages - Chemical vapor deposition method, Precipitation method. Properties and applications of Nanowires, Nanorods, Nanotubes and Nanoclusters.; CNTs-Single walled & Multiwalled . CNTs. Nanomaterials for Green systems - Green materials including biomaterials, biopolymers, Bioplastics and composites. Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Application of Nanomaterials (Medicine, Electronics, Catalyst and Agriculture).					
UNIT IV	ELECTROCHEMISTRY AND CORROSION	9			
Introduction – Cell terminology –Electrodes–origin of electrode potential–single electrode potential, standard electrode. Electrochemical cells- Electrochemical series and its applications. Electrochemical techniques for corrosion measurement.Corrosion: Dry & wet corrosion – mechanism, Corrosion Control- Material selection and design aspects – corrosion prevention – corrosion inhibitors					
UNIT V	ENGINEERING MATERIALS	9			
Alloys-Properties of alloys- Significance of alloying- ferrous alloys (stainless steel and carbon steels) -non-ferrous alloys (brass and bronze) - Special alloys ( shape memory alloys). Lubricants - Characteristics of lubricants - viscosity, viscosity index, oiliness, flash point and fire point, cloud point and pour point - solid lubricant (graphite). Role of Machine learning in Materials selection					
TOTAL: 45 PERIODS					
<b>COURSE OUTCOMES:</b> <b>On the successful completion of the course, students will be able to</b> <b>CO1.</b> Categorize the hardness of water, related problems and its treatment and explore the utilization of AI					

in water treatment. (Understanding)

**CO2.** Recognize the characteristics and applications of various polymeric materials.

**CO3.** Classify the synthesis methods, properties, and applications of nano materials.

**CO4.** Exemplify electrochemical cells, categorize types of corrosion, and outline methods for corrosion control. (Understanding)

**CO5.** Select the appropriate materials for Engineering applications.

#### TEXTBOOKS

1.Jain P.C. and Monica Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010

#### REFERNCES BOOKS

1.Shashi Chawla, “Test book of engineering chemistry” Gagan Kapur publishers, 2020.

2.Shree Meenakshi, “Engineering Chemistry”, Bharathi Publishers, Chennai, 2021.

3.Dara S.S, Umare S.S, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2010.

#### CO's-PO's and PSO's MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	0	0	1	1	0	0	0	0	0	0
CO2	2	1	1	0	0	1	1	0	0	0	0	0	0
CO3	2	1	2	0	0	1	0	0	0	0	0	0	0
CO4	2	1	0	0	0	0	1	0	0	0	0	0	0
CO5	1	1	1	0	0	1	1	0	0	0	0	0	0

CS3101	PROGRAMMING FOR PROBLEM SOLVING USING C	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b> To develop C Programs with <ul style="list-style-type: none"><li>● Basic programming constructs.</li><li>● Arrays and strings.</li><li>● Functions and pointers.</li><li>● Applications in C using structures.</li><li>● Input/output and file handling in C.</li></ul>					
UNIT I	INTRODUCTION TO PROGRAMMING AND BASICS OF C PROGRAMMING				9
Introduction to programming paradigms. Introduction to components of a computer system, Idea and Representation of Algorithm, From algorithms to programs. Introduction to C,C Programming: Tokens, Identifiers, Keywords, Data Types, Variables, Constants, Input/ Output statements, C Operators, Expressions, Type conversion. Control structures: Decision-making statements, Looping statements, Switch case, Break, Continue, goto statements					
UNIT II	ARRAYS AND STRINGS				9



Introduction to Arrays. One dimensional array: Declaration, Initialization, Accessing the elements, Bubble sort, Selection sort, Linear search, Binary search. Two-dimensional arrays: Declaration, Initialization, Accessing the elements, Matrix Operations (Addition, Scaling, Multiplication, Transpose). Strings: Reading, Writing, String handling functions, String Arrays.

<b>UNIT III</b>	<b>FUNCTIONS AND POINTERS</b>	<b>9</b>
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Introduction to functions: Function prototype, function definition, function call, Built- in functions (string functions, math functions), User defined functions. Recursion, Types of Recursion, Computation of Sine series, Scientific calculator, Scope of variables, Storage Classes. Introduction to Pointers, Declaration, Null Pointers, Arrays of pointers, Parameter passing: Pass by value, Pass by reference.

<b>UNIT IV</b>	<b>STRUCTURES</b>	<b>9</b>
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Introduction to Structures, Declaration, Initialization, Accessing members. Nested Structures. Arrays of structures. Structures and functions. Pointers to structures. Unions. Programs using structures and Unions, Enumerated data type. Dynamic Memory Allocation

<b>UNIT V</b>	<b>FILE PROCESSING AND GRAPHICS PROGRAMMING</b>	<b>9</b>
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Introduction to Files, Types of files: text file, binary file. File operations: open, close, read, write, append. Sequential access file, Random access file, Introduction to Graphics Programming in C basic concepts in graphics programming.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

- CO1: Demonstrate simple applications in C using basic constructs
- CO2: Design and implement applications using arrays and strings
- CO3: Design and implement applications in C using functions and pointers.
- CO4: Develop applications in C using structures.
- CO5: Create applications using sequential and random-access file Processing.

**TEXTBOOKS:**

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Reema Thareja, "Computer fundamentals and programming in C "Second Edition New 2016
3. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2006

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh editin, Pearson Publication
2. Juneja, B.L and Anita Seth, "Programming in C", CENGAGE Learning India pvt.Ltd., 2011
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling
6. Kindersley (India) Pvt.Ltd., Pearson Education in South Asia, 2011.
7. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C",
8. McGraw-Hill Education, 1996. C", , McGraw-Hill Education, 1996.

**CO's-PO's and PSO's MAPPING**

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO1	PSO 2
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CO1	3	2	2	0	2	0	0	0	0	0	0	1	0
CO2	3	1	1	1	1	2	0	0	0	0	0	2	3
CO3	3	2	2	2	1	3	0	0	0	0	0	1	2
CO4	3	2	2	2	1	3	0	0	0	0	0	2	2
CO5	2	1	1	1	1	2	0	0	0	0	0	2	3

BS3101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

#### **COURSE OBJECTIVES:**

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics, and properties of matter for developing basic experimental skills.
- To impart the knowledge in the quantitative chemical analysis of water.
- To learn about the basics of instrumental analysis-conductivity meter, and potentiometer.
- To Examine the chloride content in water sample.

#### **LIST OF EXPERIMENTS (PHYSICS-OUT OF 7 ANY 5)**

EXP.I- Determination of Young's modulus of the material of the given beam by uniform bending method.  
 EXP.II-Determination of rigidity modulus of the material of the given wire using torsion pendulum.  
 EXP.III-Determination of velocity of sound in the given liquid and compressibility of the liquid using Ultrasonic interferometer.  
 EXP.IV-Determination of wavelength of laser, Numerical aperture, and acceptance angle of an optical fiber  
 EXP.V- Determination of energy band gap of the semiconductor.  
 EXP.VI-Determination of coefficient of thermal conductivity of the given bad conductor using Lee's disc.  
 EXP.VII-Determination of Solar cell characteristics

#### **LIST OF EXPERIMENTS (CHEMISTRY-OUT OF 7 ANY 5)**

EXP. I - Determination of total, temporary & permanent hardness of water by EDTA method.  
 EXP. II - Determination of DO content of water sample by Winkler's method.  
 EXP. III - Estimation of sulphate ion in drinking water by Conductivity method  
 EXP. IV- Estimation of iron content of the given solution using potentiometer.  
 EXP. V - Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.  
 EXP. VI- Conductometric titration of strong acid vs strong base.  
 EXP. VII - Determination of chloride content of water sample by Argentometric method.

#### **TEXTBOOKS**

1. J.D. Wilson& C.A. Hernandez Hall "Physics Laboratory Experiments"

#### **REFERENCES**

1. <https://www.vlab.co.in/broad-area-physical-sciences>
2. <https://vlab.amrita.edu/?sub=1>
3. Dr. D. Reuben Jonathan "Engineering Chemistry Laboratory Manual" ,2<sup>nd</sup> Edition, D.D. Publications (2010)

## CO's-PO's and PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO1 9	PO1 0	PO1 1	PSO1	PSO2
CO1	3	2	1	1	0	0	0	0	0	0	0	0	0
CO2	3	3	1	1	0	0	0	0	0	0	0	0	0
CO3	3	2	1	1	0	0	0	0	0	0	0	0	0
CO4	2	2	1	1	0	0	0	0	0	1	1	0	0
CO5	1	1	1	0	0	0	0	0	0	0	1	0	0

CS3102

### PROGRAMMING FOR PROBLEM SOLVING USING C LABORATORY

L T P C  
0 0 4 2

#### COURSE OBJECTIVES:

To develop C Programs with

- Basic programming constructs.
- Control Statements
- Arrays, Strings and Pointers
- Functions and structures.
- File Processing.

#### LIST OF EXPERIMENTS

1. Input and Output statements.
2. Control statements – Branching & Looping.
  - Write a C program to generate Pascal's triangle.
  - Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, / , % and use Switch Statement)
  - Write a C program to find the sum of individual digits of a positive integer.
  - A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
  - Write a C program to generate the first n terms of the sequence.
  - Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
  - Write a C program to swap Numbers Using Temporary Variables.
3. Arrays
  - Write a C program to search an array element using linear search.
  - Write a C program to find both the largest and smallest number in a list of integers.
  - Write a C program that uses functions to perform the following:
    - Addition of Two Matrices
    - Multiplication of Two Matrices
  - Write a C program to implement Bubble Sort.
4. Strings
  - Write a C program that uses functions to perform following operations
    - (i) To insert a sub-string in to given main string from a given position.
    - (ii) To delete n Characters from a given position in a given string.
  - Write a C program to determine if the given string is a palindrome or not

**5.Functions &Pointers:**

Write C programs that use recursive functions

(i) To find factorial of given number

(ii)To solve Towers of Hanoi Problem.

(iii)To swap the variables using call by value and call by reference.

6. Generate mark sheet of students using structures.

7. Compute Salary Slip for five employees using structures and functions Insert, Update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

**LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:**

HARDWARE: 30 terminals

SOFTWARE:C compiler

TOTAL: 60 PERIODS

**COURSE OUTCOMES:**

On the successful completion of the course, the student would develop

**CO1:** Simple applications making use of basic constructs

**CO2:** Control statements.

**CO3:** Involving Arrays, strings and pointers.

**CO4:** Involving functions, and structures.

**CO5:** Sequential and random access file processing.

**CO's-PO's and PSO's MAPPING**

CO	PO1	PO2	PO3	PO4	PO5		PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	0	2		0	0	0	0	0	0	1	0
CO2	3	1	1	1	1		2	0	0	0	0	0	2	3
CO3	3	2	2	2	1		3	0	0	0	0	0	1	2
CO4	3	2	2	2	1		3	0	0	0	0	0	2	2
CO5	2	1	1	1	1		2	0	0	0	0	0	2	3

**GE3201**

**ENGINEERING PRACTICES LABORATORY**

**L T P C**

**0 0 4 2**

**COURSE OBJECTIVES:**

- Drawing pipe line plan; laying and connecting various pipe fittings used in common Household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wire work.
- Welding Tee joint, Butt joint and lap job by using arc welding, Machining various process like drilling, Turning, tapping by using Lathe.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB

**GROUP – A (CIVIL & ELECTRICAL)**

**PLUMBING WORK:**

- a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- b) Preparing plumbing line sketches.
- c) Laying pipe connection to the suction side of a pump
- d) Laying pipe connection to the delivery side of a pump.
- e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

- a) Sawing,
- b) Planning and
- c) Making joints like T-Joint, Cross-lap joint and Dovetail joint.

**Wood Work Study:**

- a) Studying joints in door panels and wooden furniture
- b) Studying common industrial trusses using models.

**PART II      ELECTRICAL ENGINEERING PRACTICES****15**

- (a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
- (b) Staircase wiring
- (c) Fluorescent Lamp wiring with introduction to CFL and LED types.
- (d) Energy meter wiring and related calculations/ calibration
- (e) Study of Iron Box wiring and assembly
- (f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
- (g) Study of emergency lamp wiring/Water heater

**GROUP – B (MECHANICAL & ELECTRONICS)****PART III      MECHANICAL ENGINEERING PRACTICES****15****WELDING WORK:**

- a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- b) Demonstration of gas welding.

**BASIC MACHINING WORK:**

- a) (simple)Turning.
- b) (simple)Drilling.
- c) (simple)Tapping.

**SPECIAL MACHINES:**

- a) Demonstration on VMC Machine
- b) Demonstration on CNC Machine

**SHEET METAL WORK:**

- a) Making of a square tray

**FOUNDRY WORK:**

- a) Demonstrating basic foundry operations



**அலகு I மொழி மற்றும் இலக்கியம்:** 3  
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

**அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை:** 3  
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3  
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:** 3  
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3  
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கல்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

**TOTAL : 15 PERIODS**

#### TEXT-CUM-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. பொருளை - 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.

**TOTAL: 45 PERIODS**

HS3201	PROFESSIONAL ENGLISH II	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b> <ul style="list-style-type: none"><li>To engage learners in meaningful language activities to improve their LSRW skills</li><li>To enhance learners’ awareness of general rules of writing for specific audiences</li><li>To help learners understand the purpose, audience, contexts of different types of writing</li><li>To develop analytical thinking skills for problem solving in communicative contexts</li><li>To demonstrate an understanding of job applications and interviews for internship and placements</li></ul>					
UNIT I	MAKING PROFESSIONAL CORRESPONDENCE				9
Listening – Evaluative Listening: Advertisements, Product Descriptions,-Audio/video; Listening and filling a Graphic Organiser (Choosing a product or service by comparison) Speaking – Marketing a product, Persuasive Speech Techniques Reading - Reading advertisements, user manuals, brochure Vocabulary – Contextual meaning of words Writing – Professional Responses for business communication letters- Open ended Essay Grammar – Numerical adjectives, Mixed Tenses, Prepositional phrases					
UNIT II	USING APPROPRIATE FORMS OF WORDS & VOICES				9
Listening - Listening to longer technical talks and completing–gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects Speakin – Describing and discussing the reasons of accidents or disasters based on news reports Reading - Reading longer technical texts–Extracts from Literature – Essays, Short stories, Biography Writing-Minutes of Meeting Grammar - Active Passive Voice transformations, Infinitive and Gerunds Vocabulary – Word Formation (Noun-Verb-Adj-Adv), Adverbs.					
UNIT III	PROBLEM SOLVING				9
Listening – Listening to / Watching movie scenes / documentaries depicting a technical problem and suggesting solutions Speaking – Group Discussion (based on case studies) – Techniques and Strategies Reading - Technical case studies in General News reports news reports etc. Writing – Checklists, Conversations about problems and solutions Grammar – Error correction, conditional sentences Vocabulary – Compound Words, Sentence Completion.					
UNIT IV	REPORTING OF EVENTS AND RESEARCH				9
<b>Listening</b> – Listening Comprehension based on news report and domentaries – Precis writing, Summarising <b>Speaking</b> – Interviewing, Presenting an oral report, Mini presentations on select topics <b>Reading</b> – Research Articles <b>Writing</b> – Transcoding, Accident Report, Survey Report <b>Grammar</b> – Reported Speech, Modals Vocabulary – Conjunctions - use of prepositions.					
UNIT V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY				9
<b>Listening</b> – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance); <b>Speaking</b> – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids; <b>Reading</b> – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing –Job/Internship application – Cover letter & Resume; <b>Grammar</b> – Relative Clauses Vocabulary – Idioms					
TOTAL: 45 PERIODS					
<b>COURSE OUTCOMES :</b> <b>On the successful completion of the course, students will be able to</b> <ul style="list-style-type: none"><li>Compare and contrast products and ideas in technical texts.</li></ul>					



- Identify cause and effect in events, industrial processes through technical texts
- Analyze problems in order to arrive at feasible solutions and communicate them.
- Prepare a report of events and the processes of technical and industrial nature.
- Express their opinions in a planned and logical manner.

### TEXTBOOKS

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K. N. Shoba, and Dr. Lourdes Jeevani, Department of English, Anna University.

### REFERENCES

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V. N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji – Macmillan India Ltd. 1990, Delhi.

### CO's-PO's and PSO's MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	0	0	0	0	0	1	3	3	3	3	2	0	0
CO2	0	0	0	0	0	3	3	3	2	2	1	0	0
CO3	0	0	0	0	0	1	2	3	3	3	2	0	0
CO4	0	0	0	0	0	3	3	3	2	1	2	0	0
CO5	0	0	0	0	0	1	2	3	3	3	1	0	0

MA3202	Discrete Mathematics	L	T	P	C
		3	1	0	4
<b>Course Objectives :</b>					
<ul style="list-style-type: none"> <li>• To extend student's logical and mathematical maturity and ability to deal with abstraction.</li> <li>• To establish a solid foundation in set theory, lattices, and Boolean algebra..</li> <li>• To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.</li> <li>• To understand the basic concepts of combinatorics and graph theory.</li> <li>• To familiarize the applications of algebraic structures..</li> </ul>					
<b>UNIT I LOGIC AND PROOFS</b>					<b>12</b>

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference – Normal form - Introduction to proofs – Proof methods and strategy.	
<b>UNIT II SET THEORY</b>	<b>12</b>
Basic concepts – Algebra of sets – Types of relations and their properties – Relational matrix and the graph of a relation – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices and	
<b>UNIT 3 COMBINATORICS</b>	<b>12</b>
Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence	
<b>UNIT 4 GRAPHS</b>	<b>12</b>
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths – Dijkstra's shortest path algorithm – Trees and their Properties	
<b>UNIT 5 ALGEBRAIC STRUCTURES</b>	<b>12</b>
Algebraic systems – Definitions-Examples-Properties-Semi groups and monoids – Homomorphism's- Groups – Subgroups – Normal subgroup and cosets – Lagrange's theorem – Codes and group	
<b>Total Periods 60</b>	
<b>OUTCOMES:</b> On completion of the course, the students will be able to: <b>CO1:</b> Construct mathematical arguments using logical connectives and quantifiers. <b>CO2:</b> Employ the concept of lattice to solve the problems in data mining. <b>CO3:</b> Apply properties of combinatorial structures and properties – know the basic techniques in combinatorics and counting. <b>CO4:</b> Identify the graphs and apply appropriate graph algorithms for solving computing problems. <b>CO5:</b> Implement the concepts of group structures in coding theory and apply set theory and algebraic structures to solve real-world problems in cryptography, computer networks, and database theory.	
<b>TEXT BOOKS</b>	
1. Rosen, K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 7th Edition, Special Indian Edition, 2011. 2. Tremblay, J.P., and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 30th Reprint, 2nd Edition, 2011.	
<b>REFERENCES</b>	
1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007. 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, 1st Edition, 2006	

PH3201	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b> <ul style="list-style-type: none"> <li>Understand the transport properties of conducting materials and their modelling using classical and quantum theories.</li> <li>Acquire knowledge on basics of semiconductor physics and its application in various devices.</li> <li>Understand the origin of magnetism and data storage principles.</li> <li>Study the fundamentals of optical materials and their applications to display devices.</li> </ul>					

<ul style="list-style-type: none"> <li>Understand the basics of quantum structures and their applications and basics of quantum computing.</li> </ul>		
<b>UNIT I</b>	<b>ELECTRICAL PROPERTIES OF MATERIALS</b>	<b>9</b>
Classical free electron theory – Expression for electrical conductivity – Thermal conductivity – deduction of Wiedemann - Franz law – Success and drawbacks of classical free electron theory – Electrons in metals – Particle in a three-dimensional box – degenerate states – Fermi - Dirac statistics – Density of energy states and carrier concentration in metals.		
<b>UNIT II</b>	<b>SEMICONDUCTOR PHYSICS</b>	<b>9</b>
Intrinsic Semiconductors – Energy band diagram (qualitative) – Direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – Variation of carrier concentration with temperature - extrinsic semiconductors - N type and P type semiconductors (qualitative) – Hall Effect and Hall devices.		
<b>UNIT III</b>	<b>MAGNETIC MATERIALS AND DATA STORAGE PRINCIPLES</b>	<b>9</b>
Magnetism- Magnetic dipole moment – magnetic permeability and susceptibility – Magnetic material classification: dia, para and ferromagnetism – antiferromagnetism – ferrimagnetism – Domain Theory - M versus H behaviour – Hard and soft magnetic materials – Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor)- CD-ROM-WORM- Holographic optical data storage		
<b>UNIT IV</b>	<b>OPTICAL MATERIALS AND DISPLAY DEVICES</b>	<b>9</b>
Classification of optical materials – carrier generation and recombination processes – Absorption emission and scattering of light in metals, insulators, and semiconductors (concepts only) – LED – OLED - Photo detectors– Photo diodes and Photo conductors (concepts only) –Solar cell – Liquid crystal display - Charged Coupled Devices		
<b>UNIT V</b>	<b>NANODEVICES AND QUANTUM COMPUTING</b>	<b>9</b>
Introduction – quantum confinement – quantum structures: quantum wells, wires, and dots – band gap of nanomaterials. Tunnelling – Single electron phenomena: Coulomb blockade – tunnelling diode – single electron transistor (SET)– quantum system for information processing – quantum states – classical bits– quantum bits or qubits – multiple qubits- quantum gates – advantage of quantum computing over classical computing		
<b>TOTAL: 45 PERIODS</b>		
<b>COURSE OUTCOMES :</b> <b>On the successful completion of the course, students will be able to</b> <b>CO1:</b> Estimate the conducting properties of materials based on classical and quantum theories and understand the formation of energy band structures. <b>CO2:</b> Acquire knowledge on basics of semiconductor physics and its application. <b>CO3:</b> Get knowledge on magnetic properties of materials and their applications in data storage, <b>CO4:</b> Have the necessary understanding on the functioning of optical materials for optoelectronics <b>CO5:</b> Understand the basics of quantum structures and their applications and basics of quantum computing <b>CO6:</b> Understand the properties of different biomaterials used in engineering applications.		
<b>TEXTBOOKS:</b> <ol style="list-style-type: none"> <li>Adaptation by Balasubramanian, R, Callister's Material Science and Engineering, Wiley India Pvt .Ltd., 2ndEdition, 2014.</li> <li>Kasap,S.O., Principles of Electronic Materials and Devices, (Special Indian Edition) McGrawHill Education, 3<sup>rd</sup> Edition, 2017.</li> <li>Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.</li> <li>Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.</li> </ol>		

**REFERENCES:**

1. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Pearson, 2nd Edition, 2017.
2. Umesh K Mishra & Jasprit Singh, Semiconductor Device Physics and Design, Springer, 2008.
3. Wahab, M.A., Solid State Physics: Structure & Properties of Materials, Narosa Publishing House, 2009.
4. Gaur, R.K. & Gupta, S.L., Engineering Physics, Dhanpat Rai Publishers, 2012.
5. Salivahanan, S., Rajalakshmi, A., Karthie, S., Rajesh, N.P., Physics for Electronics Engineering & Information Science, McGraw Hill (India) Private Limited, 2018.

**Reference Video Links**

<https://www.youtube.com/watch?v=M4tmxU8oDQs&list=PLDLjpOBMA5mQTdbaRrtwF32xdjyhq2GB7>  
<https://www.youtube.com/watch?v=JA3sCmrv1lM&list=PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2>  
<https://www.youtube.com/watch?v=QQZ6EGf0Ju8>  
<https://www.youtube.com/watch?v=N01BYteinzE&list=PLbMVogVj5nJSvhvgeBfT3e6HFFuhq2xqz>  
[https://www.youtube.com/watch?v=7Dz7E4XGv5I&list=PLLy\\_2iUCG87AUZ9mkKZT7fu3HFispKve](https://www.youtube.com/watch?v=7Dz7E4XGv5I&list=PLLy_2iUCG87AUZ9mkKZT7fu3HFispKve)

CS3201	PROGRAMMING IN PYTHON	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"><li>• To know the basics of python Programming</li><li>• To read and write simple Python programs.</li><li>• To develop Python programs with conditionals and loops.</li><li>• To define Python functions and call them.</li><li>• To use Python data structures — lists, tuples, dictionaries.</li><li>• To use Object Oriented Programming concepts in Python.</li></ul>					
<b>UNIT I</b>	<b>INTRODUCTION TO PYTHON PROGRAMMING</b>				<b>9</b>
Introduction to Python, Program Verses Script, Compiler Verses Interpreter, Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions. String: Formatting, Comparison, Slicing, Splitting. Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points, exponentiation.					
<b>UNIT II</b>	<b>CONTROL STRUCTURES AND FUNCTIONS</b>				<b>9</b>
Selective statements – Iterative statements - Function: definition, call, return statement, parameters and arguments types (required, keyword, default, variable length), local and global scope, function composition, recursion, lambda functions. Illustrative programs: square root, gcd, sum an array of numbers, linear search, binary search.					
<b>UNIT III</b>	<b>LISTS, TUPLES, DICTIONARIES AND SET</b>				<b>9</b>
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; advanced list processing - list comprehension ;Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; Set operations. Illustrative programs: Students marks statement, Retail bill preparation, Intersection, Union, Symmetric Difference between sets.					
<b>UNIT IV</b>	<b>FILES AND EXCEPTION</b>				<b>9</b>
Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, multiple except block, modules, packages; Illustrative programs: word count, copy file, Voter’s age validation, Marks range validation					
<b>UNIT V</b>	<b>INTRODUCTION TO OBJECT ORIENTED PROGRAMMING USING</b>				<b>9</b>

## PYTHON

Introduction, Features of Object Oriented Programming, Merits and Demerits of Object Oriented Programming Language. Class and Objects: Defining classes, object creation, variables, public and private data members, class methods, static methods; Illustrative programs: Display student information using class and object, Deposit or Withdraw money in a bank account

**TOTAL: 45 PERIODS**

### COURSE OUTCOMES :

**On the successful completion of the course, students will be able to**

**CO1:** Understand the basics of Python Programming.

**CO2:** Be familiar with data expressions and statements.

**CO3:** Recognize control flow and function problems.

**CO4:** Comprehend lists, tuples and dictionaries.

**CO5:** Read and write data from/to files and exceptions in Python Programs.

### TEXTBOOKS

1. Reema Thareja, "Problem Solving and Programming with python", 2nd edition, Oxford University press, 2019.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, O'Reilly Publishers, 2016(<http://greenteapress.com/wp/thinkpython/>)
3. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.

### REFERENCES

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013.
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

### CO's-PO's and PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	0	0	0	0	0	1	1	1
CO2	3	3	2	2	2	0	0	0	0	0	2	1	1
CO3	3	3	2	2	2	0	0	0	0	0	2	1	1
CO4	3	3	2	2	2	0	0	0	0	0	2	0	0



- to be designed by a team member. Follow Git workflow, pull request and peer reviews.
5. Create web pages using the following:
    - Tables and Lists
    - Image map
    - Forms and Form elements
    - Frames
  6. Apply Cascading style sheets for the web pages created.
  7. Form Validation (Date, Email, User name, Password and Number validation) using JavaScript.
  8. Implement Event Handling in the web pages.
  9. Mini Projects-Develop any one of the following web applications (not limited to one) using above technologies.  
Online assessment system  
Ticket reservation system  
Online shopping  
Student management system  
Library management  
Hospital management

**THEORY:45 PERIODS**  
**PRACTICALS :30 PERIODS**  
**TOTAL:75 PERIODS**

#### **COURSE OUTCOMES :**

**On the successful completion of the course, 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.

#### **TEXTBOOKS**

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill International Edition, Ninth Edition, 2020.
2. Scott Chacon, Ben Straub, "Pro GIT", Apress Publisher, 3rd Edition, 2014.
3. Jennifer Kyrnin, Julie C. Meloni, "Sams Teach Yourself HTML, CSS, and JavaScript All in One", Pearson, Third Edition, 2019.

#### **REFERENCES**

1. Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Pearson, 5th Edition, 2018.
2. Roman Pichler, "Agile Product Management with Scrum Creating Products that Customers Love", Pearson Education, 1 st Edition, 2010.
3. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition, 1999.
5. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
6. Gopalan N.P. and Akilandeswari J., "Web Technology", Second Edition, Prentice Hall of India, 2014.

7. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_013382690411003904735\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview)
8. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_013094421427470336209\\_9\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094421427470336209_9_shared/overview)

### LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

**HARDWARE:** 30 terminals

**SOFTWARE:**

Systems with either Netbeans or Eclipse

Java/JSP/ISP Webserver/Apache

Tomcat / MySQL / Dreamweaver or

Equivalent/ Eclipse, WAMP/XAMP

### CO's-PO's and PSO's MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2	1	-	2	-	-	2	-	-	-	2	3
CO2	2	2	-	-	3	-	-	2	-	-	-	2	2
CO3	3	1	2	-	2	-	-	-	-	-	-	3	2
CO4	3	1	2	-	2	-	-	-	-	-	-	3	2
CO5	3	1	2	-	2	-	-	-	-	-	-	3	2

TA3201

தமிழரும் தொழில்நுட்பமும்

LTPC  
1001

### அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்புப் சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

### அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்

சங்க காலத்தில் கட்டுமான பொருட்களும் நடு கல்லும் - சிலப்பதிகாரத்தில் மேடை வடிவமைப்பு பற்றிய விவரங்கள், மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - சோழர் காலத்துப் பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் கால கோவில்கள், மீனாட்சியம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.

### அலகு 3 உற்பத்தி தொழில்நுட்பம்

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பு உருக்குதல், எஃகு - செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கம் தொழிற்சாலைகள் - கல் மணிகள்,



கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்பு துண்டுகள்- தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

#### **அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்**

அணை - ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவு சார் சமூகம்.

#### **அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்**

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

#### **TEXT – CUM – REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ்- முனைவர். இலசுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு).
4. பொருறை - 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) –

ME3101	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3
<b>COURSE OBJECTIVES:</b> <ul style="list-style-type: none"><li>• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.</li><li>• To expose them to existing national standards related to technical drawings</li></ul>					
UNIT I	PLANE CURVES AND FREE HAND SKETCHING	12			
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse,					

parabola and hyperbola by eccentricity method– construction of cycloid– Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views from pictorial views of objects-Principal planes.

<b>UNIT II</b>	<b>PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES</b>	<b>12</b>
Orthographic projections-principles-Principal planes-First angle projection-Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes.		
<b>UNIT III</b>	<b>PROJECTION OF SOLIDS</b>	<b>12</b>
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.		
<b>UNIT IV</b>	<b>PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES</b>	<b>12</b>
Sectioning of Prisms, pyramids, cylinders and cones in simple vertical position - the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.		
<b>UNIT V</b>	<b>ISOMETRIC AND PERSPECTIVE PROJECTIONS</b>	<b>12</b>
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.		

**TOTAL: 60 PERIODS**

### **COURSE OUTCOMES :**

**On the successful completion of the course, students will be able to**

- familiarize with the fundamentals and standards of Engineering graphics
- project orthographic projections of lines and plane surfaces.
- Apply the principles of projections to draw projections of solids and development of surfaces.
- visualize and to project isometric and perspective projections of simple solids.
- perform the basic geometrical constructions and multiple views of objects.

### **TEXTBOOKS**

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

### **REFERENCES**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50<sup>th</sup> Edition, 2010.
2. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2<sup>nd</sup> Edition, 2009.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008

<b>CS3203</b>	<b>PROGRAMMING IN PYTHON LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### **COURSE OBJECTIVES:**

- To study python programs with conditionals and loops
- To use functions for python structured programs.
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples and dictionaries.
- To read and write data from and to files in python.

### **LIST OF EXPERIMENTS:**

1. Write a program to display the largest number among three numbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform linear search and Binary search.
7. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
8. Programs that take command line arguments (word count)
9. Find the most frequent words in a text read from a file.
10. Write a program using Dictionaries to compute the following.
  - i)Students marks statement,
  - ii)Retail bill preparation,
11. Write a program using sets to compute the following.
  - i)Intersection,
  - ii)Union,
  - iii)Symmetric Difference between sets.
12. Write a program using exceptions to calculate the following.
  - i)Voter's age validation,
  - ii)Marks range validation (0-100).
13. Write a program to Display student information using class and object.
14. Write a program to Deposit or Withdraw money in a bank account using class and objects

### **LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**HARDWARE:** 30 terminals

**SOFTWARE:** Python 3 interpreter for Windows/Linux

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

On the successful completion of the course the student should be able to

**CO1:** Design simple programs using conditionals and loops.

**CO2:** Write functions to solve mathematical problems

**CO3:** Use strings for structuring Python programs.

**CO4:** Represent compound data using Python lists, tuples and dictionaries.

**CO5:** Identify to read and write data from and to files in python

<b>CY3201</b>	<b>ENVIRONMENTAL SCIENCE AND SUSTAINABILITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

**COURSE OBJECTIVES:**

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyse climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

<b>UNIT- I</b>	<b>ENVIRONMENT AND BIODIVERSITY</b>	<b>9</b>
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, Human-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In- situ and ex-situ.		
<b>UNIT- II</b>	<b>ENVIRONMENTAL POLLUTION</b>	<b>9</b>
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Artificial intelligence in pollution monitoring and management. Solid and E-Waste management. Disaster management –Flood, Land slide and Earth quake. Case studies .		
<b>UNIT- III</b>	<b>RENEWABLE SOURCES OF ENERGY</b>	<b>9</b>
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy, Solar and wind energy.		
<b>UNIT- IV</b>	<b>SUSTAINABILITY AND MANAGEMENT</b>	<b>9</b>
Sustainability- concept, needs and challenges-Economic and Social aspects of sustainability-from unsustainability to sustainability-millennium development goals, Sustainable Development Goals,Climate change-Green house effect,Global warming and Acid rain. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.		

<b>UNIT- V</b>	<b>SUSTAINABILITY PRACTICES</b>	<b>9</b>
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Sustainable development index, Sustainable transports. Sustainable energy: Green Engineering: Sustainable urbanization- Socio- economical and technological change.		
<b>TOTAL PERIODS:45</b>		
<b>COURSE OUTCOMES:</b> <b>On the successful completion of the course, students will be able to</b> <b>CO1:</b> Recognize and infer the functions of environment, ecosystems and biodiversity and their conservation. <b>CO2:</b> Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society. <b>CO3:</b> Identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations. <b>CO4:</b> Analyse the different goals of sustainable development and apply them for suitable technological advancement and societal development. <b>CO5:</b> Appreciate sustainability practices, identify green materials and the role of sustainable urbanization.		
<b>TEXTBOOKS</b> 1.Anubha Kaushik and C. P. Kaushik's Perspectives in Environmental Studies, 7th Edition, New Age International Publishers ,2021. 2.Benny Joseph, _Environmental Science and Engineering_, Tata McGraw-Hill, New Delhi, 2016. 3.Gilbert M.Masters, _Introduction to Environmental Engineering and Science_, 2nd edition, Pearson Education, 2004. 4.Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall. 1st Edition 2011. 5.Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, engage learning.		
<b>REFERENCES</b> 1.Cunningham, W.P. Cooper, T.H. Gorhani, Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001. 2.Rajagopalan, R, Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015. 3.Erach Bharucha —Textbook of Environmental Studies for Undergraduate Courses  Orient Blackswan Pvt. Ltd. 2013.		

<b>MA3301</b>	<b>ALGEBRA AND NUMBER THEORY</b>	<b>L T P C</b>
		<b>3 1 0 4</b>
<b>COURSE OBJECTIVES :</b> <ul style="list-style-type: none"> <li>• To introduce the basic notions of rings, fields which will then be used to solve related problems.</li> <li>• To introduce and apply the concepts of rings, finite fields and polynomials.</li> <li>• To understand the basic concepts in number theory.</li> <li>• To examine the key questions in the theory of numbers.</li> <li>• To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.</li> </ul>		
<b>UNIT I RINGS AND MODULAR ARITHMATIC</b>		<b>12</b>
Rings: Definition – Properties-Simple problems -Sub rings – Integral domain – Field – Integer modulo n – Ring homomorphism.		
<b>UNIT II FINITE FIELDS AND POLYNOMIALS</b>		<b>12</b>
Rings – Polynomial rings – Irreducible polynomials over finite fields – Factorization of polynomials over finite fields.		
<b>UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS</b>		<b>12</b>
Division algorithm – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		
<b>UNIT IV DIOPHANTINE EQUATIONS AND CONGRUENCES</b>		<b>12</b>
Linear Diophantine equations -Congruence's – Linear Congruence's – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems		
<b>UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS</b>		<b>12</b>
Wilson's theorem – Fermat's little theorem – Euler's theorem -Euler's Phi functions – Tau and Sigma functions – The order of a positive Integer – Primality test – Primitive roots for Primes – Composite with Primitive roots – Quadratic residues		
<b>TOTAL PERIODS</b>		
<b>COURSE OUTCOMES:</b> <b>Upon successful completion of the course, students should be able to:</b> <b>CO1:</b> Apply the basic notions rings, fields which will then be used to solve related problems. <b>CO2:</b> Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts. <b>CO3:</b> Demonstrate accurate and efficient use of advanced algebraic techniques. <b>CO4:</b> Demonstrate their mastery by solving non – trivial problems related to the concepts, and by proving simple theorems about the statements proven by the text. <b>CO5:</b> Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.		

<b>CS3301</b>	<b>DATA STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

- Comprehend the foundational concepts of Abstract Data Types (ADTs).
- Acquire knowledge and apply linear data structures, including lists, stacks, and queues.
- Analyze and explain non-linear data structures such as trees and graphs.
- Examine and interpret sorting, searching, and hashing algorithms.
- Utilize and implement tree and graph structures in relevant applications and scenarios.

<b>UNIT I</b>	<b>LINEAR DATA STRUCTURES – LIST</b>	<b>9</b>
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Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked List implementation – Singly linked lists- Doubly linked lists – Circularly linked list-Applications of Lists –Polynomial Manipulation-Case Study.

<b>UNIT II</b>	<b>LINEAR DATA STRUCTURES – STACKS, QUEUES</b>	<b>9</b>
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Stack ADT –Array based Stacks, Linked Stacks– Applications- Balancing Symbols-Infix to postfix expression- Postfix Expression Evaluation– Queue ADT – Array based Queue, Linked Queue – Circular Queue –Double Ended Queues – Applications of queues.

<b>UNIT III</b>	<b>NON LINEAR DATA STRUCTURES – TREES</b>	<b>9</b>
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Introduction to Tree ADT – Implementations of trees- Binary Tree ADT -Tree traversals -Expression Trees- Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – Priority Queue – Heaps-Binary Heaps.

<b>UNIT IV</b>	<b>MULTI WAY SEARCH TREE AND GRAPHS</b>	<b>9</b>
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Multi-way Search Trees- B-Tree- B+Tree- Graphs-Representations-Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS)-Topological Sort- Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm.

<b>UNIT V</b>	<b>SEARCHING, SORTING AND HASHING TECHNIQUES</b>	<b>9</b>
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Searching- Linear Search – Binary Search. Sorting – Bubble Sort – Selection Sort – Insertion Sort – Quick Sort- Merge Sort-Shell Sort – Radix Sort-Heap Sort- Hashing- Hash Functions – Separate Chaining – Open Addressing- Rehashing – Extendible Hashing-Case Study.

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES :**

On the successful completion of the course, the students should be able to:

**CO1:** Apply the concepts and operations associated with the List Abstract Data Type (ADT) in various scenarios.

**CO2:** Understand and implement the concepts and operations of Stack and Queue ADTs.

**CO3:** Analyze and demonstrate the knowledge of Tree ADTs and their applications in different contexts.

**CO4:** Utilize graph data structures to address real-world problems and scenarios.

**CO5:** Apply graph-based solutions to practical challenges.

### **CO's-PO's and PSO's MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
<b>CO1</b>	3	2	2	2	1	0	0	0	0	0	2	2	0
<b>CO2</b>	3	2	2	2	1	0	0	0	0	0	2	2	0

	<b>CO3</b>	3	2	2	2	1	0	0	0	0	0	2	2	0	
	<b>CO4</b>	3	2	2	2	1	0	0	0	0	0	2	2	0	
	<b>CO5</b>	3	2	2	2	1	0	0	0	0	0	2	2	0	



<b>CS3302</b>	<b>DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To analyze and design combinational circuits.
- To design and analyze clocked sequential circuits using both Moore and Mealy models.
- To understand the encoding of machine instructions and their role in computer operation.
- To gain knowledge of pipelined architecture in improving the efficiency and performance of digital systems.
- To understand the concept of various memories and I/O interfacing.

<b>UNIT I</b>	<b>COMBINATIONAL CIRCUITS</b>	<b>9</b>
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Number Systems – representation – conversions – Arithmetic operations – Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.

<b>UNIT II</b>	<b>SYNCHRONOUS SEQUENTIAL LOGIC</b>	<b>9</b>
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Introduction to Sequential Circuits – Flip-Flops – Operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, State minimization, State assignment, Circuit implementation - Registers – Counters.

<b>UNIT III</b>	<b>FUNDAMENTALS OF COMPUTER</b>	<b>9</b>
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Functional Units - Basic Operational Concepts - Eight great Ideas in Computer architecture - Performance - Instructions – Operations and Operands – Instruction representation – Arithmetic & Logical operations – control operations - Needs and types of various addressing modes- Flynn’s Taxonomy– SIMD and MIMD systems.

<b>UNIT IV</b>	<b>PROCESSOR AND CONTROL UNIT</b>	<b>9</b>
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Introduction- Building a data path for MIPS implementation –Control Implementation scheme – An Pipelining – Pipelined data path and control – Handling Data hazards &Control Hazards-Exceptions.

<b>UNIT V</b>	<b>MEMORY &amp; INPUT/ OUTPUT ORGANIZATION</b>	<b>9</b>
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Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Bus Arbitration-Buses-synchronous Bus-Asynchronous Bus- Standard I/O Interfaces-Universal serial Bus (USB).

**TOTAL:45 PERIODS**

**COURSE OUTCOMES:**

On the successful completion the course, the students should be able to:

**CO1 :** Design various combinational digital circuits using logic gates.

**CO2 :** Design sequential circuits and analyze the design procedures.

**CO3:** Articulate the necessity of different addressing modes and apply them to various scenarios in instruction execution

**CO4 :** Analyze different types of control design using pipelining and identify hazards.

**CO5 :** Identify the characteristics of various memory systems and I/O communication.

**TEXT BOOKS:**

1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

**REFERENCES:**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

**CO's-PO's and PSO's MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	3	3	2	0	0	0	0	3	3	3	1
CO2	3	3	3	2	0	0	0	0	2	1	3	1
CO3	3	2	2	0	0	0	0	0	0	1	2	1
CO4	3	2	2	0	0	0	0	0	0	1	2	1
CO5	2	2	2	0	0	0	0	0	0	1	2	1

CB3301	SOFTWARE SYSTEM DESIGN					L	T	P	C
						3	0	0	3

**COURSE OBJECTIVES:**

- Know the background to design, implement, and use mid size and large software systems.
- Know the software design aspects with special focus on Object Oriented Design with Design objectives.
- Learn the OO Design Principles.
- Learn the design Patterns with GoF dictum.
- Understand the issues emanating from the concept of "Separation of Concerns" with different Architectural realizations.
- Know the increasing role of Cloud services and how it affects the Architectural decisions through Case Studies discussions

**UNIT I INTRODUCTION TO ALGORITHM DESIGN, SOFTWARE DESIGN AND ARCHITECTURE 9**

What is Software System Design objectives, purpose and approaches of efficient system design, Functional Independence in Software Design with Coupling and Cohesion. Overview of OO

Design: Class Diagrams Object Diagrams. Sequence and Collaboration Diagrams, Static and dynamic modeling approaches for efficient design.

**UNIT II SOFTWARE DESIGN PRINCIPLES 9**

Role of Modeling and Design, Design Metrics, OO Software Design. Design Principles with applications. . Iterative Refinement Behavior, Iterative Refinement Minimalism. Mobile Software and Design: Characteristics and Requirements, Mobile Interaction designs, UX design.

**UNIT III DESIGN PATTERNS AND ARCHITECTURAL CONSIDERATION 9**

Recent Trends in Software Design with special focus on Mobile Apps Development. The GoF and evolution of Design Patterns, Design Patterns with Creational Design Patterns, Structural Design Patterns and Behavioural Design Patterns. Example elaborations of popular patterns with suggested areas of Applications

**UNIT IV ARCHITECTURE TYPES AND REPRESENTATION 9**

Role of Software Architecture, Module View, Data Flow View, Layers View. Technical Architecture, Business Architecture, Solutions Architecture & Enterprise Architecture. Architecture for Web enabled applications. Separation of Concerns, Developing Application Architecture with GUI and Database connectivity. Database Design and Data Centric Architectures.

**UNIT V ARCHITECTURAL IMPLEMENTATIONS 9**

MVC Architecture and Separation of Concerns, SOA and Web Services, RESTful services and API. Advances in Software Architecture. Recent Trends in Software Architecture: Cloud Based Architecture, Service Oriented Architecture etc

**TOTAL:45 PERIODS**

**COURSE OUTCOMES:**

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

- Understand the objectives of Software Architectural design.
- Learn various Software Architecture prevalent wrt MVC , SOA etc.
- Apply knowledge of Software Design techniques and apply appropriate architectural considerations to the project
- Analyze a problem, develop models and identify and define the functional and non-functional needs and requirements appropriate to its' business context and solution.
- Use current techniques, skills, and tools necessary for developing software systems.
- Apply current technical concepts and practices, students should develop the ability to explore recent advances.

**TEXT BOOKS:**

1. G. Booch, Object-Oriented Analysis and Design with Applications 2nd Edition, PHI, New Delhi, 1993.
2. Design Patterns by Ralph Johnson, John Vlissides, Richard Helm, and Erich Gamma.
3. Software Architecture: Foundations, Theory, and Practice by Richard N. Taylor et al. (John Wiley and Sons).

**REFERENCES:**

1. Frank Buschmann, Kelvin Henney & Douglas Schimdt, "Pattern-Oriented Software Architecture - A System of Patterns", Volume 1, Wiley, 2007.
2. Frank Buschmann, Kelvin Henney & Douglas Schimdt, "Pattern-Oriented Software Architecture – Pattern for Concurrent and Networked Objects", Volume 2, Wiley, 2000.
3. Mary Shaw, David Garlan, "Software architecture perspectives on a Emerging Discipline", IEEE, PH1, 1996.

**CO's-PO's and PSO's MAPPING**

	P O 1	P O 2	P O 3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
<b>C O1</b>	2	2	2	1	1	-	-	--	-		1	1	1	1	1
<b>C O2</b>	2	2	2	1	1	-	-	-	-		1	1	1	1	1
<b>C O3</b>	2	2	2	1	1	-	-	-	-		1	1	1	1	1
<b>C O4</b>	2	2	2	1	1	-	-	-	-		1	1	1	1	1
<b>C O5</b>	2	2	2	1	1	-	-	-	-		1	1	1	1	1

<b>CS3303</b>	<b>DESIGN THINKING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- Learn design thinking concepts and principles
- Use design thinking methods in every stage of the problem
- Learn the different phases of design thinking
- Apply various methods in design thinking to different problems
- Understand DevOps the advanced process of software engineering for faster problem resolution & team collaboration.

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
The need for design - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.		
<b>UNIT II</b>	<b>UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM</b>	<b>9</b>
Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.		
<b>UNIT III</b>	<b>IDEATION AND PROTOTYPING</b>	<b>9</b>
Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.		
<b>UNIT IV</b>	<b>TESTING AND IMPLEMENTATION</b>	<b>9</b>
Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.		
<b>UNIT V</b>	<b>SOFTWARE DESIGN USING DEVOPS</b>	<b>9</b>
Applying Design Thinking in the DevOps Lifecycle-Empathy in DevOps-Problem Definition in a DevOps Environment-Ideation and Innovation in Continuous Integration-Prototyping and Continuous Deployment-Testing and Continuous Feedback-Collaborative Tools and Techniques.		
<b>TOTAL:45 PERIODS</b>		
<b>COURSE OUTCOMES:</b> At the end of the course, the students should be able to: <b>CO1:</b> Demonstrate an understanding of the fundamental concepts and principles of design thinking, including its significance in problem solving and innovation. <b>CO2:</b> Apply design thinking processes such as empathizing, defining, ideating, prototyping, and testing to address real-world challenges. <b>CO3:</b> Utilize various creativity techniques and tools to generate innovative ideas and develop effective prototypes in a structured design thinking environment. <b>CO4:</b> Conduct thorough problem analysis, empathetic observations, and customer needs assessments to accurately define and reformulate design problems. <b>CO5:</b> Integrate DevOps principles and tools into the design thinking process to enhance collaboration, automation, and efficiency in software development and delivery.		

**TEXT BOOKS:**

1. Christian Mueller Roterberg, Handbook of Design Thinking: Tips & Tools for How to Apply Design Thinking, 1st Edition, 2018.
2. Jeanne Liedtka and Tim Ogilvie, Designing for Growth: A Design Thinking Toolkit for Managers, 1st Edition, 2011.

**REFERENCES:**

1. Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media, 2017.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve– Apply", Springer, 2011
4. Kallori Vikram, —Introduction to DevOps, 1 st Edition, Kallori Vikram Publication, 2016.
5. Joakim Verona, —Practical DevOps, 2 nd Edition, Packt. Publication, 2018.
6. Stephen Fleming, Pravin, —DevOps Handbook: Introduction of DevOps Resource Management—, 1st Edition, Createspace Independent Pub. , 2010.
7. Len Bass, Ingo Weber, Liming Zhu, G., —DevOps: A Software Architect's Perspective, 1st Edition, Addison Wesley Professional, 2015.
8. <http://ajjuliani.com/design0thinking0activities/>
9. <https://venturewell.org/class0exercises>.

**CO's PO's and PSO's MAPPING**

	<b>PO 1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PSO 1</b>	<b>PSO 2</b>
<b>CO1</b>	3	2	2	0	1	2	1	0	0	0	0	3	1
<b>CO2</b>	3	3	3	2	2	2	2	1	0	0	2	3	2
<b>CO3</b>	2	3	3	2	3	2	2	0	1	2	2	3	3
<b>CO4</b>	2	3	3	2	2	3	2	0	2	2	2	3	2
<b>CO5</b>	2	2	2	2	3	3	3	0	1	2	2	2	3

<b>IT3301</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	<b>L T P C</b> <b>3 0 0 3</b>
<b>OBJECTIVES:</b>		
To understand Object Oriented Programming concepts and basic characteristics of Java To know the principles of inheritance and interfaces and I/O Streams To define exception handling and multithreading To develop a java application with generics and collection frameworks To design and build simple GUI applications using JavaFX and JDBC.		
<b>UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS</b>		<b>9</b>
Object Oriented Programming - Java Buzzwords – Characteristics of Java – Fundamental Programming Structures in Java - Defining classes in Java – Constructors - Methods - Access specifiers - Static members – Over Loading - Packages: Packages – Member Access –Importing Packages - Strings – JavaDoc comments.		
<b>UNIT II INHERITANCE, INTERFACES AND I/O</b>		<b>9</b>
Inheritance – Super classes - sub classes – Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - inner classes– Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files.		
<b>UNIT III EXCEPTION HANDLING MULTITHREADING</b>		<b>9</b>
Exceptions - exception hierarchy – Exception handling Mechanisms– built-in exceptions, User Defined exceptions, Stack Trace Elements–Understanding Threads - Thread life cycle - Multi threading in java - Thread Priorities, Limitation of multithreading , Thread Synchronization, Inter-thread communication.		
<b>UNIT IV GENERICS AND COLLECTION FRAMEWORK</b>		<b>9</b>
Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations0 Collections Interfaces – Collection, Set, List, Queue, Collections Classes – Array List, Hash Set, Tree Set. Accessing a Collection via Iterators. Map Interfaces. Map Classes – Abstract Map, Hash Map, Tree Map.		
<b>UNIT V JAVA FX EVENT HANDLING AND JDBC</b>		<b>9</b>
JAVA FX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls –ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem. Introduction to JDBC, JDBC Drivers and Architecture, Accessing Databse with JDBC.		
<b>TOTAL: 45 PERIODS</b>		
<b>COURSE OUTCOMES:</b>		
<b>On the successful completion of the course, students will be able to:</b>		
<b>CO1:Develop Java programs using OOP principles</b>		

**CO2:**Develop Java programs with the concepts of inheritance and interfaces  
**CO3:**Build Java applications using exceptions handling and multithreading  
**CO4:** Design problems solutions using Generics and Collections frameworks  
**CO5:** Design and develop solutions using JavaFX and JDBC

#### TEXT BOOKS:

1. Herbert Schildt, —Java The complete reference, 13th Edition, McGraw Hill Education, 2024.
2. Cay S. Horstmann —Core Java Volume –I Fundamentals, 11th Edition, Pearson, 2020.

#### REFERENCES:

1. Allen B.Downey & Chris Mayfield Think Java, 2nd Edition, Oreilly, 2023.
2. MarcLoy,Patrick Niemeyer & Daniel LeuckLearning Java: An Introduction To Real0world Programming With Java, Sixth Edition Grayscale Indian Edition, 6th edition , Oreilly.
3. Kathy sierra, Bert Bates & Trisha Gee, 0 Head First Java: A Brain Friendly Guide Third edition , Shroff Publishers ,June 2022.

CS3304	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	1.5

#### COURSE OBJECTIVES:

- Develop and apply linear and non0linear data structures.
- **Analyze** and **demonstrate** the various operations associated with trees.
- **Execute** and **apply** graph algorithms to solve specific problems.
- **Explore** and **gain proficiency** in sorting, searching, and hashing algorithms.

#### LIST OF EXPERIMENTS

1. Array Implementation of List ADT.
2. Implementation of Singly Linked list and its application.
3. Stack Data Structure: Implementation and Applications.
4. Queue Data Structure: Implementation and Applications.
5. Circular Queue Implementation.
6. Implementation of Binary Search Tree.
7. Implementation of Dictionary ADT using AVL Trees.
8. Implementation of Priority Queues using Heaps.
9. Multi0way search tree: Implementation B Tree.
10. Graph Traversal: Implementing Depth First Search and Breadth First Search.
11. Implementation of graph representation using Array and Linked List.
12. Implementation of Topological Sorting.
13. Hashing Implementation: Separate Chaining and Open Addressing Techniques.
14. Implementation of Searching algorithms.
15. Implementation of Sorting algorithms.



**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

HARDWARE: 30 Terminals

SOFTWARE:C Compiler

**TOTAL: 60 PERIODS****COURSE OUTCOMES:****On the successful completion of the course, the students should be able to:****CO1:** Implement and apply operations for managing lists.**CO2:** Develop and demonstrate operations for Stack and Queue Abstract Data Types (ADTs). Utilize these operations to address real0world problems.**CO3:** Analyze and perform various operations on trees to solve specific problems.**CO4:** Execute graph traversal algorithms and techniques.**CO5:** Examine various sorting, and searching techniques and assess the performance of various algorithms in different scenarios.**CO's PO's and PSO's MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
<b>CO1</b>	3	3	2	1	1	0	0	2	1	0	2	2	0
<b>CO2</b>	3	3	2	1	1	0	0	2	1	0	2	2	0
<b>CO3</b>	3	3	2	1	1	0	0	2	1	0	2	2	0
<b>CO4</b>	3	3	2	1	1	0	0	2	1	0	2	2	0
<b>CO5</b>	3	3	2	1	1	0	0	2	1	0	2	2	0

**IT3302 OBJECT ORIENTED PROGRAMMING LABORATORY****L T P C****0 0 3 1.5****OBJECTIVES**

- To build software development skills using java programming for real0world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.

## LIST OF EXPERIMENTS

1. Develop Simple java applications using classes & objects .
2. Develop a java application using packages.
3. Develop a java application using Inheritance.
4. Write a Java Program to create an abstract class and demonstrate polymorphism.
5. Design a java program to demonstrate multiple inheritance using interface.
6. Write a program to perform string operations using String and StringBuffer classes.
7. Implement exception handling and creation of user defined exception.
8. Write a Java program to perform file operations.
9. Write a java program that implements multi0threading.
10. Develop a java applications to demonstrate the features of collection frameworks.
11. Develop applications using JavaFX controls, layouts and menus.
12. Develop a simple student database management system using event0driven and concurrent programming paradigms of Java. Use JDBC to connect a back0end database.

**TOTAL: 60 PERIODS**

## COURSE OUTCOMES

**On the successful completion of the course, the students will be able to**

**CO1:** Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

**CO2:** Develop and implement Java Programs with String and I/O Streams.

**CO3:** Develop and implement Java programs with exception handling and multithreading.

**CO4:** Design applications using generic and collection frameworks.

**CO5:** Ability to solve real world problems using JavaFX and JDBC.

## CB 3401      ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

L	T	P	C
3	0	0	3

## COURSE OBJECTIVES:

The main objectives of this course are to:

- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks

## UNIT I      PROBLEM SOLVING

**9**

Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP)

## UNIT II      KNOWLEDGE REPRESENTATION AND LOGICAL REASONING

**9**

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics –knowledge

representation and engineering – inferences in first-order logic – forward chaining –backward chaining – resolution.

### **UNIT III      SUPERVISED LEARNING      9**

Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, – Support vector machine, Decision Tree, Random forests

### **UNIT IV      NEURAL NETWORKS AND REINFORCEMENT LEARNING      9**

Biological Neuron-Artificial Neural Model-Architecture: Feedforward and Feedback- Multilayer Perceptron, Activation functions, Network training – Gradient descent optimization –Error Backpropagation, ReLU, Hyperparameter Tuning, Batch Normalization, Dropout. **Introduction to Reinforcement Learning**, Markov property, Markov chains, Markov Decision Process (MDP), State and action value functions, Bellman equations.Hidden Markov Model

### **UNIT V      ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING      9**

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN and Expectation maximization.

**TOTAL:45 PERIODS**

#### **COURSE OUTCOMES:**

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

CO1: Use appropriate Search algorithms for problem solving.

CO2: Perform Logical Reasoning

CO3: Build Supervised learning models.

CO4: Build neural network models and understand Reinforcement learning.

CO5: Build ensembling and Unsupervised models.

**TEXT BOOKS:**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

**REFERENCES:**

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013  
(<http://nptel.ac.in/>)
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
6. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
7. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014
8. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
9. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

**CO's-PO's and PSO's MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1			1		1				2	1	2	2			
CO2					1				2	1	2	2			
CO3			1				2		1		3	3			
CO4	1				1				2		3	2			
CO5	1		1		1				2		2	2			

<b>CB3402</b>	<b>DATABASE MANAGEMENT SYSTEMS AND SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To understand the need of security in Database Management systems
- To learn how to secure Database Management systems

### **UNIT I RELATIONAL DATABASES 9**

Data Models – Relational Data Models – Relational Algebra – Structured Query Language – Entity-Relationship Model – Distributed Databases – Data Fragmentation – Replication

### **UNIT II DATABASE DESIGN 9**

Mapping ER Models to Relations – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/CODD Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

### **UNIT III TRANSACTION MANAGEMENT 9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery

### **UNIT IV DATABASE SECURITY 9**

Database security – Common threats and challenges - Best practices and solutions - Data protection tools and platforms - SQL Injection Attacks – The Injection Technique – SQLi Attack Avenues and Types

### **UNIT V ACCESS CONTROL AND ENCRYPTION 9**

Database Access Control – Types - Role-based access control - SQL based access definition – Cascading Authorizations — Database Inference problem – Types of inference attacks - storage encryption

**TOTAL:45 PERIODS**

### **COURSE OUTCOMES:**

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

**CO1:** Model an application's data requirements using conceptual modelling and design database Schemas also formulate solutions to a broad range of query problems using relational algebra/SQL.

**CO2:** Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

**CO3:** Run transactions and estimate the procedures for controlling the consequences of concurrent data access.

**CO4:** Understand the need of security, best practices and solutions in database management systems

**CO5:** Understand access control mechanisms and handle security issues in database management systems

### **TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2021.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.
3. William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Fourth Edition, Pearson, 2019.

**REFERENCES:**

1. C.J. Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2014.
3. Narain Gehani and Melliya Annamalai, "The Database Book: Principles and Practice Using the Oracle Database System", Universities Press, 2012

**CO's-PO's and PSO's MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	2	1	1	-	1	-	2	-	2	2			
CO2	1	2	2	1	1	-	1	-	2	-	3	2			
CO3	2	1	2	1	2	-	2	-	1	-	3	3			
CO4	2	2	3	2	1	-	2	-	2	-	3	2			
CO5	2	2	3	2	2	-	1	-	2	2	3	3			

**CB3403****OPERATING SYSTEMS AND SECURITY (Lab Integrated)****L T P C****3 0 2 4****COURSE OBJECTIVES:**

- To understand the basic concepts of Operating Systems.
- To explore the process management concepts including scheduling, synchronization, threads and deadlock.
- To understand the memory, file and I/O management activities of OS.
- To understand the requirements of a trust model.
- To learn how security is implemented in various operating systems.

**UNIT I OPERATING SYSTEM OVERVIEW****9**

Computer-System Organization – Architecture – Operating-System Operations – Resource Management – Security and Protection – Distributed Systems – Kernel Data Structures – Operating-System Services – System Calls – System Services – Why Applications Are Operating- System Specific – Operating-System Design and Implementation - Operating-System Structure – Building and Booting an Operating System .

**UNIT II PROCESS MANAGEMENT****9**

Process Concept – Process Scheduling – Operation on Processes, Inter-process Communication – Threads – Overview – Multithreading models – Threading issues; CPU Scheduling – Scheduling criteria, Scheduling algorithms; Process Synchronization – critical-section problem, Synchronization hardware, Mutex locks,

Semaphores, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Detection, Recovery.

### **UNIT III MEMORY MANAGEMENT AND FILE SYSTEMS**

**9**

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation – Virtual Memory – Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory. Mass Storage system - HDD Scheduling - File concept, Access methods, Directory Structure, Sharing and Protection; File System Structure, Directory implementation, Allocation Methods, Free Space Management

### **UNIT IV SECURE SYSTEMS AND VERIFIABLE SECURITY GOALS**

**9**

Security Goals – Trust and Threat Model – Access Control Fundamentals – Protection System – Reference Monitor – Secure Operating System Definition – Assessment Criteria – Information Flow – Information Flow Secrecy Models – Denning's Lattice Model – Bell LaPadula Model – Information Flow Integrity Models – Biba Integrity Model – Low-Water Mark Integrity – Clark- Wilson Integrity

### **UNIT V WINDOWS vs LINUX SECURITY**

**9**

Introduction to Operating System Security, Access Control Models, Unix-Authentication and Authorization, Operating System Security Mechanisms, Malware and Threat Analysis, Secure Software Development, Network Security and OS, File System Security

**TOTAL PERIODS: 45**

#### **LIST OF EXPERIMENTS:**

- 1) a) Basics of UNIX commands and shell programs Understand and practice Linux permissions, special permissions and authentication (various options of chmod, setuid, setgid)
- b) Simple Shell Programs
2. Write programs using the following system calls of UNIX operating system
  - a. fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write C programs to implement the various CPU Scheduling Algorithms
4. Implementation of Semaphores
5. Implementation of Shared memory
6. Bankers Algorithm for Deadlock Detection & Avoidance
7. Implementation of the following Memory Allocation Methods for fixed partition
  - a) First Fit b) Worst Fit c) Best Fit
8. Implementation of the following Page Replacement Algorithms
  - a) FIFO b) LRU c) LFU
9. Program to demonstrate the working of Bell LaPadula Model and Biba Integrity Model
10. Setting up access control lists of files and directories and testing the lists in Linux
11. Learn to enable and disable address space layout randomization

**TOTAL 30 PERIODS**

#### **LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**HARDWARE:** 30 terminals

**SOFTWARE:** C / C++ / Java

#### **COURSE OUTCOMES:**

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

[illegible]



**COURSE OBJECTIVES:**

- Learn to analyze the security of in-built cryptosystems.
- Know the fundamental mathematical concepts related to security.
- Develop cryptographic algorithms for information security.
- Comprehend the various types of data integrity and authentication schemes
- Understand cybercrimes and cyber security.

**UNIT I INTRODUCTION TO SECURITY:****9**

Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services and Mechanisms – A Model for Network Security – Classical encryption techniques: Substitution techniques, Transposition techniques, Steganography – Foundations of modern cryptography: Perfect security – Information Theory – Product Cryptosystem – Cryptanalysis.

**UNIT II SYMMETRIC CIPHERS****9**

Number theory – Algebraic Structures – Modular Arithmetic – Euclid's algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields symmetric key ciphers: sdes – Block Ciphers – DES, Strength of DES– Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

**UNIT III ASYMMETRIC CRYPTOGRAPHY****9**

Mathematics of asymmetric key cryptography: primes – primality testing – factorization – euler's totient function, fermat's and euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm -Asymmetric key ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve arithmetic – Elliptic curve cryptography.

**UNIT IV AUTHENTICATION ALGORITHMS****9**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function: HMAC, CMAC – SHA – Digital signature and authentication protocols – DSS – Schnorr Digital Signature Scheme – ElGamal cryptosystem – Entity Authentication: Biometrics, Passwords, Challenge Response protocols – Authentication applications – Kerberos Mutual trust: Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates-PGP

**UNIT V CYBER CRIME MANAGEMENT****9**

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security- Dealing with Disaster –Emerging Technologies- the Law-

### **COURSE OUTCOMES:**

**CO1:** Understand the fundamentals of networks security, security architecture, threats and vulnerabilities

**CO2:** Apply the different cryptographic operations of symmetric cryptographic algorithms

**CO3:** Apply the different cryptographic operations of public key cryptography

**CO4:** Apply the various Authentication schemes to simulate different applications.

**CO5:** Understand various cyber crimes and cyber security.

**TOTAL: 45 Periods**

### **TEXT BOOKS:**

1. William Stallings, "Cryptography and Network Security – Principles and Practice", Seventh Edition, Pearson Education, 2017.
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber crimes, Computer Forensics and Legal Perspectives", First Edition, Wiley India, 2011.

### **REFERENCES :**

1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

### **CO's , PO's and PSO's Mapping:**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO1</b>	3	2	1	2	2	-	-	-	1	-	-	1	2	2	-
<b>CO2</b>	3	3	3	3	3	-	-	-	2	-	-	1	3	3	-
<b>CO3</b>	3	3	3	3	3	-	-	-	2	-	-	1	3	3	-
<b>CO4</b>	3	3	3	3	3	-	-	-	2	-	-	1	3	3	-
<b>CO5</b>	3	2	3	2	3	-	-	-	3	-	-	2	3	3	-

**COURSE OBJECTIVES:**

- Learn different cipher techniques.
- Implement the algorithms DES, AES, RSA and Diffie-Hellman.
- Implement hashing techniques such as SHA-1, MD-5.
- Develop a digital signature scheme.

**PRACTICAL EXERCISES:**

1. To implement the following cipher techniques to perform encryption and decryption
  - i. Caesar Cipher
  - ii. Playfair Cipher
  - iii. Hill Cipher
2. To implement the following transposition techniques
  - (i) Rail fence technique –Row major transformation
  - (ii) Rail fence technique - Column major transformation
3. To implement DES algorithm
4. To implement AES algorithm
5. To implement RSA Encryption algorithm
6. To implement the Diffie-Hellman Key Exchange mechanism. Consider one of the parties as Alice and the other party as bob.
7. To calculate the message digest of a text using the SHA-1 algorithm.
8. To calculate the message digest of a text using the MD-5 algorithm.
9. To implement digital signature standard

**TOTAL: 30 PERIODS****LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:****SOFTWARE:** C / C++ / Java or equivalent compiler**HARDWARE:** Standalone desktops – 30 Nos. (or) Server supporting 30 terminals or more.**COURSE OUTCOMES:****CO1:** Develop a code for classical encryption techniques.**CO2:** Build a symmetric and asymmetric algorithm.**CO3:** Construct a code for various Authentication schemes.**CO4:** Apply the principles of digital signature**CO's , PO's and PSO's Mapping:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
<b>CO1</b>	3	3	3	3	3	-	-	-	3	-	-	1	3	3	-
<b>CO2</b>	3	3	3	3	3	-	-	-	3	-	-	1	3	3	-
<b>CO3</b>	3	3	3	3	3	-	-	-	3	-	-	1	3	3	-
<b>CO4</b>	3	3	3	3	3	-	-	-	3	-	-	1	3	3	-
<b>CO5</b>	3	3	3	3	3	-	-	-	3	-	-	1	3	3	-

<b>CB3406</b>	<b>DATABASE MANAGEMENT SYSTEMS AND SECURITY LABORATORY</b>				<b>L T P C</b>
					<b>0 0 3 1.5</b>

### **COURSE OBJECTIVES:**

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand attacks on databases and to learn to defend against the attacks on databases.
- To learn to store and retrieve encrypted data in databases

### **LIST OF EXPERIMENTS**

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in database table.
9. Use SQLi to authenticate as administrator, to get unauthorized access over sensitive data, to inject malicious statements into form field.
10. Write programs that will defend against the SQLi attacks given in the previous exercise.
11. Write queries to insert encrypted data into the database and to retrieve the data using decryption.

**TOTAL:45 PERIODS**

### **COURSE OUTCOMES:**

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

- CO1:** Create databases with different types of key constraints.  
**CO2:** Write simple and complex SQL queries using DML and DCL commands.  
**CO3:** Realize database design using 3NF and BCNF.  
**CO4:** Use advanced features such as stored procedures and triggers.  
**CO5:** Secure databases and mitigate attacks on databases.

<b>CB 3407</b>	<b>ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY</b>				<b>L T P C</b>
					<b>0 0 3 1.5</b>

### **COURSE OBJECTIVES:**

The main objectives of this course are to:

- Illustrate search algorithms
- Illustrate techniques for reasoning under uncertainty
- Demonstrate building Machine Learning and supervised learning algorithms
- Demonstrate building ensemble and unsupervised learning algorithms
- Illustrate the basics of deep learning using neural networks

1. Implement Uninformed search algorithms (BFS, DFS)
2. Implement Informed search algorithm (A\*)
3. Develop a small KB using Prolog and answer simple queries
4. Inference through Prolog/Python.
5. Build Regression models
6. Build Decision trees and Random forests
7. Build SVM models
8. Build Neural Network models
9. Implement Hidden Markov Model
10. Implement Ensembling techniques
11. Implement Clustering algorithms
12. Implement Expectation Maximization algorithm

## HARDWARE:

- SOFTWARE:**

- COURSE OUTCOMES:**

### **CO1: Design and implement search strategies**

### C03: Implement logical reasoning and supervised learning models

## CO4: Implement ensemble and unsupervised models

**CO5:** Implement neural network models and Reinforcement learning algorithms.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1			1		1				2	1	2	2			
CO2					1				2	1	2	2			
CO3			1				2		1		3	3			
CO4	1				1				2		3	2			
CO5	1		1		1				2		2	2			

**COURSE OBJECTIVES:**

- To introduce the fundamentals of the physical layer, including network types, topologies, and transmission media.
- To understand the data link layer, focusing on error control, flow control, and protocols such as HDLC and Ethernet.
- To explore network layer concepts, including packet switching, IP protocols, and various routing mechanisms.
- To gain knowledge of transport layer protocols, focusing on flow control, congestion control, and Quality of Service.

- To familiarize with application layer protocols and their role in communication over networks, including HTTP, FTP, and email protocols.

<b>UNIT I</b>	<b>BUILDING NETWORKS AND APPLICATION LAYER</b>	<b>9</b>
Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP.		
<b>UNIT II</b>	<b>TRANSPORT LAYER</b>	<b>9</b>
Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service.		
<b>UNIT III</b>	<b>NETWORK LAYER &amp; ROUTING</b>	<b>9</b>
Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP-Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP		
<b>UNIT IV</b>	<b>DATA LINK AND PHYSICAL LAYERS</b>	<b>9</b>
Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.		
<b>UNIT V</b>	<b>NETWORK SECURITY, INTRUSION DETECTION, AND PREVENTION</b>	<b>9</b>
Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams.		

**45 PERIODS**

**30 PERIODS**

### **LIST OF EXPERIMENTS**

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like: a) Echo client and echo server b) Chat.
4. Simulation of DNS using UDP sockets.
5. Use a tool like Wireshark to capture packets and examine the packets.
6. Write a code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC).

**TOTAL:75 PERIODS**

### **COURSE OUTCOMES:**

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

- Understand and explain the principles of network architecture, including the OSI and TCP/IP models, and the functionality of various network types, protocols, and transmission media. (BLT-2)
- Analyze and evaluate the functionality of the transport layer protocols, including TCP, UDP, and SCTP, and understand their role in managing data flow, congestion, and ensuring Quality of Service. (BLT-3)
- Demonstrate knowledge of network layer protocols, including IP addressing, subnetting, and packet switching, and apply these concepts to design efficient IP-based networks. (BLT-3)
- Compare and contrast different routing protocols, including unicast and multicast routing, and assess their effectiveness in different networking scenarios. (BLT-4)

- Implement and simulate data link layer protocols and physical layer concepts, such as Ethernet, VLAN, wireless LAN, framing, flow control, and error control, to analyze network performance. (BLT-3).

#### TEXT BOOKS:

- James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
- Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022.
- Rob Wilson, Michael T. Simpson, and Nicholas Antill, Hands-On Ethical Hacking and Network Defense, 4th Edition, Course Technology, Cengage Learning, 2022.

#### REFERENCES:

- Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
- William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
- Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
- Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012.

#### LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals

SOFTWARE:

CO's-PO's and PSO's MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2
CO1	3	2	1		2			1				3	2
CO2	2	3	2	2	2							3	2
CO3	3	3	2	2	2							3	2
CO4	3	3	2	2	2		1					3	2
CO5	3	2	2	2	2		1	1				3	2

CS3502	DISTRIBUTED AND CLOUD COMPUTING (Lab Integrated)	L	T	P	C
		3	0	2	4

#### COURSE OBJECTIVES:

- To introduce the computation and communication models of distributed systems
- To explore cloud service models (IaaS, PaaS, SaaS) and deployment models (Public, Private, Hybrid).
- To understand virtualization concepts, types, and hypervisor-based implementations effectively.
- To provide expertise in virtualization, containers, and Docker technologies.
- To analyze security, scalability, and reliability challenges in cloud computing.

UNIT I	INTRODUCTION	9
Introduction: Definition-Relation to Computer System Components – Motivation – Message -Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A		

Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System. Case Study: Distributed Computing in E-Commerce Platforms – Analysis of Message-Passing, Synchronization, Global State, and Design Challenges.		
<b>UNIT II</b>	<b>CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE</b>	<b>9</b>
Introduction-Definition, characteristics, and evolution of cloud computing Cloud ;Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges Case Study : Practical issues related to Cloud Services.		
<b>UNIT III</b>	<b>VIRTUALIZATION BASICS</b>	<b>9</b>
Virtualization: Concepts, types, and benefits - Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.		
<b>UNIT IV</b>	<b>VIRTUALIZATION INFRASTRUCTURE AND DOCKER</b>	<b>9</b>
Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.		
<b>UNIT V</b>	<b>CLOUD SECURITY</b>	<b>9</b>
Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) – IAM Challenges – IAM Architecture and Practice.		
<b>45 PERIODS</b>		
<b>LIST OF EXPERIMENTS</b>		
<b>1. Virtualization</b>		
a. Find procedure to run the virtual machine of different configuration using virt-manager.		
b. Virtualize a machine and check how many virtual machine can be utilized at a particular time.		
c. Create a VM clone and attach virtual block to the cloned virtual machine and check whether it holds the data even after the release of the virtual machine.		
<b>2. Public Cloud</b>		
a. Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix/GCC and launch it.		
b. Test how a SaaS application scales in response to demand.		
c. Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.		
<b>3. Private Cloud</b>		
a. Setup a Private Cloud by performing the procedure using a Single node Openstack/Opennebula implementation.		
b. Perform Creation, Management and Termination of a CentOS instance in Openstack/Opennebula.		
c. Show the virtual machine migration based on certain conditions from one node to the other.		
<b>30 PERIODS</b>		
<b>TOTAL:75 PERIODS</b>		
<b>COURSE OUTCOMES:</b>		
At the end of the course, the students should be able to:		
1. Summarize the foundations of distributed systems (BTL-2)		
2. Apply knowledge to design, classify, and solve cloud computing challenges. (BTL-3)		
3. Examine the effects of virtualization on resource allocation and system efficiency. (BTL-3)		



4. Analyze virtualization types, evaluate structures, and optimize resource utilization strategies. (BTL-4)
5. Outline secure storage solutions and IAM architectures for cloud environments. (BTL-4).

**TEXT BOOKS:**

1. Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, John Wiley, 2011.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
3. Dac-Nhuong Le, Raghvendra Kumar, et al. “Cloud Computing and Virtualization, Wiley, 2018.

**REFERENCES:**

1. George Coulouris, Jean Dollimore, Time Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
2. Douglas E. Comer, “The Cloud Computing Book: The Future of Computing Explained”. CRC Press. 2012.
3. Arshdeep Bagga, Vijay Madiseti, “Cloud Computing: A Hands-On Approach”, Universities Press, 2014.
4. Liu M L, “Distributed Computing: Principles and Applications”, Pearson Education, 2004.
5. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, 2003.
6. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, “Cloud Computing: Concepts, Technology & Architecture” Prentice Hall, 2013.
7. John W. Rittinghouse, James F. Ransome, “Cloud Computing: Implementation “Management and Security”, CRC Press, 2016.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

HARDWARE: 30 terminals

SOFTWARE: VM Ware, Windows OS, VM Workstation, CentOS, Open Nebula, C,Java

CO's-PO's and PSO's MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	-		-	-	-	1	-	2	2	2
CO2	2	3	3	-	1	-	-	-	1	2	2	2	2
CO3	2	3	3	-	2	-	-	-	2	2	2	2	1
CO4	2	2	2	-	2	-	-	-	1	2	2	2	2
CO5	2	2	2	-	2	-	-	-	1	2	2	2	2

CB3502	SECURE SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVES:**

- Know the importance and need for software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security

<b>UNIT I</b>	<b>NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS</b>	<b>9</b>
Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory- Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks.		
<b>UNIT II</b>	<b>SECURE SOFTWARE DESIGN</b>	<b>9</b>
Requirements Engineering for secure software - SQUARE process Model - Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles		
<b>UNIT III</b>	<b>SECURITY RISK MANAGEMENT</b>	<b>9</b>
Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management, – Using Components with known vulnerabilities – Insufficient logging and monitoring.		
<b>UNIT IV</b>	<b>SECURITY TESTING</b>	<b>9</b>
Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection		
<b>UNIT V</b>	<b>SECURE PROJECT MANAGEMENT</b>	<b>9</b>
Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice, Software Quality Assurance Plan - Formal approaches to SQA.		

**45 PERIODS**  
**30 PERIODS**

#### **COURSE OUTCOMES:**

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

CO1: Identify various vulnerabilities related to memory attacks.

CO2: Apply security principles in software development.

CO3: Evaluate the extent of risks.

CO4: Involve selection of testing techniques related to software security in the testing phase of software development.

CO5: Use tools for securing software

#### **TEXT BOOKS:**

1. Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”, Addison-Wesley Professional, 2005
2. Jason Grembi, “Developing Secure Software” Edition: 1st Edition, 2009, Thomson Press (India) Ltd

#### **REFERENCES:**

1. Jon Erickson, “Hacking: The Art of Exploitation”, 2nd Edition, No Starch Press, 2008.
2. Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012
3. Bryan Sullivan and Vincent Liu, “Web Application Security, A Beginner's Guide”, Kindle Edition, McGraw Hill, 2012
4. Lee Allen, “Advanced Penetration Testing for Highly-Secured Environments: The Ultimate Security Guide (Open Source: Community Experience Distilled)”, Kindle Edition, Packt Publishing, 2012

#### **LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

HARDWARE: 30 terminals

CO's-PO's and PSO's MAPPING

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2	3	2	-	-	2	1	2	2	2	2
CO2	2	2	2	3	3	-	-	2	1	2	2	1	2
CO3	1	2	2	2	1	-	-	1	1	2	1	2	2
CO4	2	3	2	2	2	-	-	2	1	2	2	2	2
CO5	2	1	2	2	3	-	-	2	1	1	2	2	1

CS3503	THEORY OF COMPUTATION	L T P	C
		3 0 0	3
<b>Course Objectives :</b> <ul style="list-style-type: none"> <li>• To understand the language hierarchy</li> <li>• To construct automata for any given pattern and find its equivalent regular expressions.</li> <li>• To identify the real time applications on automata theory.</li> <li>• To design a context free grammar for any given language.</li> <li>• To understand Turing Machine undecidable problems and NP class problems and their capability.</li> </ul>			
<b>UNIT I AUTOMATA FUNDAMENTALS</b>			<b>9</b>
Proof Techniques in Mathematics- Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Equivalence of NFA and DFA – Finite Automata with Epsilon Transitions – Equivalence of NFA with epsilon transitions and NFA without Epsilon Transitions.			
<b>UNIT II REGULAR EXPRESSION AND REGULAR GRAMMAR</b>			<b>9</b>
Regular Languages – Regular Expressions – FA and Regular Expressions – Pattern matching and regular expressions-Arden's Theorem –Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata			
<b>UNIT III CONTEXT FREE GRAMMAR AND CONTEXT FREE LANGUAGE</b>			<b>9</b>
CFG – Parse Trees – Ambiguity in Grammars and Languages-Cocke-Younger-Kasami (CYK Algorithm)– Normal Forms for CFG- Chomsky Normal Form – Griebach Normal Forms-Pumping Lemma for CFL – Closure Properties of CFL – Conversion of normal forms to Regular Expression.			
<b>UNIT IV PUSH DOWN AUTOMATA AND TURING MACHINE</b>			<b>9</b>
Definition of the Pushdown Automata – Instantaneous Descriptions – Context Free languages – Equivalence of Pushdown Automata and CFG – Turing Machines – Programming Techniques for TM.			
<b>UNIT V UNDECIDABILITY</b>			<b>9</b>
Language not recursively enumerable – Undecidable Problem with RE – RICE Theorem – Undecidable Problems about TM – Recursive and recursively enumerable languages- Post's Correspondence Problem –The Class P and NP.			
<b>TOTAL</b>			<b>45</b>
			<b>Periods</b>
<b>Course Outcomes:</b>			
<b>On the successful completion of the course .the student will be able to</b>			
<b>CO1. Apply automata for any pattern (BTL03)</b>			

- CO2.** Analyse regular expression for any pattern (BTL04)  
**CO3.** Demonstrate context free grammar for any grammar. (BTL03)  
**CO4.** Solve computation solution to build Turing machine (BTL04)  
**CO5.** Interpret whether a problem is decidable or not (BTL02)

**TEXTBOOKS**

1. J.E. Hopcroft, R. Motwani, and J.D. Ullman, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2003.

**REFERENCE BOOKS**

1. H.R. Lewis and C.H. Papadimitriou, Elements of the Theory of Computation, Second Edition, PHI, 2003.  
 2. J. Martin, Introduction to Languages and the Theory of Computation, Third Edition, TMH, 2003.  
 3. Micheal Sipser, Introduction of the Theory and Computation, Thomson Brokecole, 1997.  
 4. Laurel Brodkorb, The Entscheidungs and Alan Turing, 2019.  
 5. Deepak 'D'Souza—Modern Applications of Automata Theory, 2021.

**CO's PO's and PSO's MAPPING**

	<b>PO 1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	2	2	3	0	0	0	0	0	1	0	2	2	2
<b>CO2</b>	2	3	3	0	1	0	0	0	1	2	2	2	2
<b>CO3</b>	2	3	3	0	2	0	0	0	2	2	2	2	1
<b>CO4</b>	2	2	2	0	2	0	0	0	1	2	2	2	2
<b>CO5</b>	2	2	2	0	2	0	0	0	1	2	2	2	2