S.A.ENGINEERING COLLEGE, CHENNAI -600 077
(An Autonomous Institution, Affiliated to Anna University)
REGULATION 2024
B.TECH INFORMATION TECHNOLOGY
CHOICE BASED CREDIT SYSTEM

VISION OF THE DEPARTMENT

The Department's vision is clearly defined and it is in line with the college's vision. The vision of the department is

- To aspire excellence in providing education in Information Technology and
  research through innovation, ethical practices, and sustainable technological solutions to meet industrial and societal needs.

MISSION OF THE DEPARTMENT

The mission of the department is concise and supports the College's mission. The mission of the department is,

- **Education**

  To impart quality education and promote active learning in Information Technology by nurturing analytical, critical, and innovative thinking to prepare students for global challenges.

- **Research**

  To encourage cutting-edge research and foster collaboration with industry partners, leveraging cognitive skills to develop innovative and impactful solutions in the field of Information Technology.

- **Sustainable Solutions**

  To uphold ethical standards while designing multi-disciplinary, sustainable technological solutions that address real-world problems.

- **Industry and Society**

  To bring synergy between academia and Industry through curriculum with state of art technologies which meets industry and societal needs.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. Demonstrate core competence in basic engineering and mathematics to design, formulate, analyze, and solve hardware/software engineering problems.

II. Develop insights in foundational areas of Information Technology and related engineering to address real-world problems using digital and cognitive technologies.

III. Collaborate with industry, academic and research institutions for state-of-the- art product development and research.

IV. Inculcate a high degree of professionalism, effective communication skills and team spirit to work on multidisciplinary projects in diverse environments.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

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

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

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

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

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

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

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

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

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

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

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

Knowledge and Attitude Profile (WK)

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Ability to apply programming principles and practices for the design of software solutions in an internet-enabled world of business and social activities.

PSO2: Ability to identify the resources to build and manage the IT infrastructure using the current technologies in order to solve real world problems with an understanding of the tradeoffs involved in the design choices.

Mapping of PEO with PO & PSO:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES & PROGRAMME SPECIFIC OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO I	✓	✓	✓	✓	✓							✓		✓
PEO II	✓	✓	✓	✓	✓							✓	✓	
PEO III						✓	✓	✓	✓	✓	✓	✓	✓	✓
PEO IV		✓				✓	✓	✓	✓	✓	✓	✓		✓

R2024 - CURRICULUM FOR SEMESTER I TO VIII

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
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
6.	TA3101	தமிழர் மரபு /Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
7.	GE3201	Engineering Practices Laboratory	ESC	0	0	4	4	2
8.	CS3102	Programming for problem solving using C Laboratory	ESC	0	0	4	4	2
9.	BS3101	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
			TOTAL	**16**	**1**	**12**	**29**	**23**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
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.	IT3201	Information Technology Essentials (Lab Integrated)	ESC	3	0	2	5	4
5.	CS3201	Programming in Python	ESC	3	0	0	3	3
6.	TA3201	தமிழரும் தொழில்நுட்பமும் /Tamils and Technology	HSMC	1	0	0	1	1
7.	ME3101	Engineering Graphics	ESC	2	0	2	4	3
PRACTICALS								
8.	CS3203	Programming in Python Laboratory	ESC	0	0	4	4	2
MANDATORY COURSE								
9.	CY3201	Environmental science and sustainability	MC	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	CREDITS
				L	T	P		
THEORY								
1.	MA3307	Probability, Statistics and Queuing Theory	BSC	3	1	0	4	4
2.	IT3301	Computer Organization and Architecture	PCC	3	0	0	3	3
3.	IT3302	Software Engineering Essentials	PCC	3	0	0	3	3
4.	IT3303	Data Structures and Algorithms	PCC	3	0	0	3	3
5.	IT3304	Object Oriented Programming	PCC	3	0	0	3	3
PRACTICALS								
6.	IT3305	Data Structures and Algorithms Laboratory	PCC	0	0	3	3	1.5
7.	IT3306	Object Oriented Programming Laboratory	PCC	0	0	3	3	1.5
EMPLOYABILITY ENHANCEMENT COURSES								
8	HS3303	English Language Enhancement and Business Communication Laboratory	HSMC	0	0	3	3	1.5
9.	IT33PT	Aptitude Skills - I	EEC	0	0	3	3	0
10	IT33VAC	Value Added Course-I	EEC	0	0	3	3	0
		TOTAL		**15**	**1**	**15**	**31**	**20.5**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3403	Optimization Techniques	BSC	3	1	0	4	4
2.	IT3401	Object Oriented Analysis and Design	PCC	3	0	0	3	3
3.	IT3402	Database ManagementSystems	PCC	3	0	0	3	3
4.	IT3403	Principles of Operating Systems (Lab Integrated)	PCC	3	0	2	5	4
5.	IT3404	Algorithm Design Techniques (Lab Integrated)	PCC	3	0	2	5	4
6.	HS3401	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	HSMC	2	1	0	3	3
PRACTICALS								
7.	IT3405	Database ManagementSystems Laboratory	PCC	0	0	3	3	1.5
EMPLOYABILITY ENHANCEMENT COURSES								
9.	IT34PT	Aptitude Skills - II	EEC	0	0	3	3	0
10.	IT34VAC	Value Added Course-II	EEC	0	0	3	3	0
		TOTAL		**17**	**2**	**13**	**32**	**22.5**

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	IT3501	Computer Communication (Lab Integrated)	PCC	3	0	2	5	4
2.	IT3502	Internet Technology and Web Services	PCC	3	0	0	3	3
3.	IT3503	Computational Intelligence (Lab Integrated)	PCC	3	0	2	5	4
4.	-	Open Elective I	OEC	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
PRACTICALS								
7.	IT3504	Internet Technology and Web Services Laboratory	PCC	0	0	3	3	1.5
EMPLOYABILITY ENHANCEMENT COURSES								
8.	HS3501	Professional and Career Development Laboratory	HSMC	0	0	3	3	1.5
9.	IT35PT	Advanced Coding Skills - I	EEC	0	0	3	3	0
10.	IT35VAC	Value Added Course-III	EEC	0	0	3	3	0
			TOTAL	**18**	**0**	**16**	**34**	**23**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	IT3601	Cloud and Big Data Analytics (Lab Integrated)	PCC	3	0	2	5	4
2.	IT3602	Mobile Architecture and Development (Lab Integrated)	PCC	3	0	2	5	4
3.	IT3603	Full Stack Web Development (Lab Integrated)	PCC	3	0	2	5	4
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.	IT36SLC	Self Learning Course (MOOC Courses)	EEC	0	0	0	0	1*
8.	IT36PT	Advanced Coding Skills - II	EEC	0	0	3	3	0
9.	IT36VAC	Value Added Course-IV	EEC	0	0	3	3	0
			TOTAL	**18**	**-**	**12**	**30**	**21**

SEMESTER VII

S. NO.	Course Code	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Principles of Ethics	HSC	3	0	0	3	3
2.	IT3701	Machine Learning Techniques(Lab Integrated)	PCC	3	0	2	5	4
3.	IT3702	Cryptography and Network Security(Lab Integrated)	PCC	3	0	2	5	4
4.		Professional Elective V	PEC	3	0	0	3	3
5.		Professional Elective VI	PEC	3	0	0	3	3
PRACTICALS								
6.	IT3703	Project Work I	PCC	0	0	4	4	2
MANDATORY COURSES								
7.	MC3701	Indian Constitution	MC	2	0	0	2	0
EMPLOYABILITY ENHANCEMENT COURSES								
8.	IT37PT	Advanced Coding Skills - III	EEC	0	0	3	3	0
9.	IT37VAC	Value Added Course-V	EEC	0	0	3	3	0
10.	IT37INT	Summer Internship	EEC	0	0	0	0	2
			TOTAL	**17**	**0**	**14**	**31**	**21**

* The students will undergo 4 weeks Industrial training / Internship during previous vacation.

SEMESTER VIII /VII*

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
EMPLOYABILITY ENHANCEMENT COURSES								
1.	IT3801	Project Work	EEC	0	0	16	16	8
			TOTAL	**0**	**0**	**16**	**16**	**8**

TOTAL CREDITS: 163

SL. NO	Subject Area	Credits per semester								Credits total
		I	II	III	IV	V	VI	VII	VIII	
1.	HSMC	4	4	1.5	3	1.5		3		17
2.	BSC	12	7	4	4					27
3.	ESC	7	8							15
4.	PCC		4	15	16	12.5	12	10		68
5.	PEC					6	6	6		18
6.	OEC					3	3			6
7.	EEC					1	2	8		13
8.	MC		1				0			1
	TOTAL	23	24	20.5	22.5	23	21	21	8	163

Subject code	Subject Name	Category	L	T	P	C
HS3101	**Professional English - I**	**HSC**	**3**	**0**	**0**	**3**

Course Objectives
• To improve the communicative competence of learners
• To learn to use basic grammatical structures in suitable contexts
• To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
• To help learners use language effectively in professional contexts
• To develop learners' ability to read and write complex texts, summaries, articles, blogs, Definitions, essays and user manuals.

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: Why/ 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 Hours: 45	

Text Book(s):
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.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K N. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

Reference Book(s)/ Web Links:
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.	Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
6.	A Course Book On Technical English By Lakshminarayanan , Scitech Publications (India) Pvt. Ltd.

Course Outcomes

CO1- Describe the memory of the previously learnt grammatical concepts and apply them in technical contexts.

CO2- Interpret the professional proficiency by preparing the formal correspondence with global standards.

CO3- Explain information and interrelate the technical and general texts.

CO4- Use verbal and technical information concisely with coherence and cohesion.

CO5- Show appropriate statements representing the global situations.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	1	1	2	3	2	1	-	-
CO2	-	-	-	-	-	2	1	3	3	2	1	-	-
CO3	-	-	-	-	-	1	1	1	3	2	2	-	-
CO4	-	-	-	-	-	2	1	3	3	2	1	-	-
CO5	-	-	-	-	-	2	1	2	3	2	2	-	-
Average	-	-	-	-	-	1.60	1.00	2.20	3.00	2.00	1.40	-	-

Subject code	Subject Name	Category	L	T	P	C
MA3101	**Matrices and Calculus**	**BSC**	**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

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.

UNIT II	DIFFERENTIAL CALCULUS	12

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules Maxima and Minima of functions of one variable..

UNIT III	DIFFERENTIAL EQUATIONS	12

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.

UNIT IV	MULTIVARIABLE CALCULUS	12

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.

UNIT V	MULTIPLE INTEGRALS	12

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 Hours: 60

Text Book(s):

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,

Reference Book(s)/ Web Links:

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.ThomasJr.,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.

Course Outcomes

CO1- Describe the basic concepts of differentiation rules to find the maxima and minima for function of one variable.

CO2- Apply the knowledge of basic application problems involved in first order differential equation.

CO3- Determine the solution of second order linear differential equations with constant coefficients.

CO4- Show the concept of ordinary derivatives into partial derivatives and apply them to find extreme values of the functions of two variables and series approximation of the function of two variables.

CO5- Calculate the double and Triple integration techniques over a region in two dimensional and three-dimensional geometry.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-
Average	3.00	3.00	2.00	-	-	-	-	-	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
PH3101	**Engineering Physics**	**BSC**	**3**	**0**	**0**	**3**

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

UNIT I	CRYSTAL PHYSICS	9
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.		

UNIT II	PROPERTIES OF MATTER AND THERMAL PHYSICS	9
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.		

UNIT III	ULTRASONICS AND NDT	9
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		

UNIT IV	LASER AND FIBRE OPTICS	9
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.		

UNIT V	BASIC QUANTUM PHYSICS	9
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 Hours: 45

Text Book(s):
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.

Reference Book(s)/ Web Links:
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

Course Outcomes

CO1- Explain the basics of properties of matter and its applications

CO2- Describe the concepts of waves and optical devices and their applications in Laser and fiber optics

CO3- Use the properties of thermal materials and its applications

CO4- Apply the advanced physics concepts of quantum theory and its application in one dimensional box

CO5- Apply the different types of crystals structures and different crystal growth techniques.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-
Average	**3.00**	**2.00**	-	-	-	-	-	-	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
CY3101	**Chemistry for Engineers**	**BSC**	**3**	**0**	**0**	**3**

Course Objectives

- To make the students conversant with hardness, boiler feed water requirements, related problems and water treatment techniques
- To develop an understanding of different advanced polymeric materials.
- To impart knowledge about the nanomaterial synthesis, properties and applications
- It enables the students to gain information about Electrochemical reaction, corrosion and its prevention.
- To make the students familiar with the different types of Engineering materials.

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	NANO CHEMISTRY	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 Hours: 45

Text Book(s):

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

Reference Book(s)/ Web Links:

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.

Course Outcomes

CO1- Explain the hardness of water, related problems and its treatment.

CO2- Apply phase rule to construct phase diagram and predict the low melting alloys.

CO3- Illustrate conventional and non-conventional energy sources and basics of electrochemistry, Types of batteries, their reactions and the importance.

CO4- Demonstrate the use of fuels in real-world applications by analyzing their calorific values.

CO5- Analyze the basics, types, preparation methods and recent trends in nanomaterial.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	RIY	1	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	2	-	-	-	-	-	-	-	-	-	-
Average	2.00	1.20	1.20	-	-	-	-	-	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
CS3101	**Programming for problem solving using C**	**ESC**	**3**	**0**	**0**	**3**

Course Objectives

To develop C Programs with
- Basic programming constructs.
- Arrays and strings.
- Functions and pointers.
- Applications in C using structures.
- Input/output and file handling in C.

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.	
UNIT III	FUNCTIONS AND POINTERS	9
	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.	
UNIT IV	STRUCTURES	9
	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.	
UNIT V	FILE PROCESSING AND GRAPHICS PROGRAMMING	9
	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 Hours: 45

Text Book(s):
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

Reference Book(s)/ Web Links:
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,OxfordUniversityPress,2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India)Pvt.Ltd.,PearsonEducationinSouthAsia,2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996. C", ,McGraw-HillEducation,1996.

COURSE OUTCOMES:
At the end of the course, students would:
- Interpret the basic syntax and semantics of the programming language constructs.
- Examine derived data types like arrays in solving problems.
- Illustrate problem decomposition and reconstruction through multiple user-defined function methods.
- Examine user-defined data types like structures and unions and its applications to solve problems.

Apply file handling techniques to develop programs using sequential and random-access processing

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	3	2
CO2	3	1	1	1	-	-	-	-	-	-	-	3	3
CO3	3	2	2	2	-	-	-	-	-	-	-	3	2
CO4	3	2	2	2	-	-	-	-	-	-	-	3	2
CO5	2	1	1	1	-	-	-	-	-	-	-	3	3
Average	2.80	1.60	1.60	1.50	-	-	-	-	-	-	-	3.00	2.40

Subject code	Subject Name	Category	L	T	P	C
BS3101	PHYSICS AND CHEMISTRY LABORATORY	BSC	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. • 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.

Total Hours: 60

TEXTBOOKS
1. J.D. Wilson& C.A. Hernandez Hall "Physics Laboratory Experiments", Houghton Mifflin Company, New York, 2010.

2. M.N. Srinivasan, S. Balasubramanian &R. Ranganathan, "Practical Physics", S. Chand & Sons educational publications, New Delhi, 2011.	
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.	
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" ,2nd Edition,D.D.Publications (2010)	

COURSE OUTCOMES:

- Describe fundamental concepts of mechanical properties analysis
- Explain the fundamental principles of acoustic properties, and learn about semiconductor properties
- Summarize the fundamental principles of optical properties analysis.
- Apply hands-on knowledge in the quantitative chemical analysis of water.
- Solve the basics of instrumental analysis-conductivity meter, and potentiometer

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	1	-	-	-	-	-	-	-	-	-
CO2	2	1	1	1	-	-	-	-	-	-	-	-	-
CO3	2	1	1	1	-	-	-	-	-	-	-	-	-
CO4	2	2	1	1	-	-	-	-	-	-	-	-	-
CO5	2	1	1	1	-	-	-	-	-	-	-	-	-
Average	2.00	1.20	1.00	1.00	-	-	-	-	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
CS3102	**Programming for problem solving using C Laboratory**	**ESC**	**0**	**0**	**4**	**2**

LIST OF EXPERIMENTS

1. Input and Output statements.
2. Control state ments – 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 Hours: 60**

COURSE OUTCOMES:

At the end of the course, students would:
- Interpret the basic syntax and semantics of the programming language constructs.
- Examine derived data types like arrays in solving problems.
- Illustrate problem decomposition and reconstruction through multiple user-defined function methods.
- Examine user-defined data types like structures and unions and its applications to solve problems.
- Apply file handling techniques to develop programs using sequential and random-access processing

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CS1203A.1	2	-	-	2	-	-	-	-	-	-	-	2	-
CS1203A.2	2	-	-	2	2	-	-	-	-	-	-	2	2
CS1203A.3	2	-	-	-	3	-	-	-	-	-	-	-	3
CS1203A.4	-	-	-	-	3	-	-	-	-	-	-	-	3
CS1203A.5	-	-	-	-	-	-	-	-	-	-	-	-	-
AVERAGE	2.00	-	-	2.00	2.67	-	-	-	-	-	-	2.00	2.67

Subject code	Subject Name	Category	L	T	P	C
TA3101	தமிழர் மரபு /Heritage of Tamils	**HSC**	1	0	0	1

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, ஒயிலாட்டம், 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 பிறபகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு 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. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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.

Subject code	Subject Name	Category	L	T	P	C
GE3201	**Engineering Practices Laboratory**	**ESC**	**0**	**0**	**4**	**2**

Course Objectives
The main learning objective of this course is to provide hands on training to the students in:
• 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)
PART I   CIVIL ENGINEERING PRACTICES   15

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

PART IV   ELECTRONIC ENGINEERING PRACTICES   15

SOLDERING WORK:
a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
a) Study an elements of smart phone.
b) Assembly and dismantle of LED TV.
c) Assembly and dismantle of computer/ laptop

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Describe the basic principle of welding
- Explain the basic principle of Sheet Metal Work
- Discuss the basic principle of joints
- Summarize the basic principle of Machine assembly practice
- Apply the basic principle of Drilling

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	1	2	-	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-	-
Average	2.75	2.75	2.00	2.33	-	-	-	-	-	-	-	-	-

SEMESTER II

Subject code	Subject Name	Category	L	T	P	C
HS3201	**Professional English - II**	**HSC**	3	0	0	3

Course Objectives
- To engage learners in meaningful language activities to improve their LSRW skills   - To enhance learners' awareness of general rules of writing for specific audiences   - To help learners understand the purpose, audience, contexts of different types of writing   - To develop analytical thinking skills for problem solving in communicative contexts   - To demonstrate an understanding of job applications and interviews for internship and placements

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	REPORTINGOFEVENTSANDRESEACH	9

Listening – Listening Comprehension based on news report and domentaries – Precis writing, Summarising **Speaking** – Interviewing, Presenting an oral report, Mini presentations on select topics **Reading** – Research Articles **W riting** – Transcoding, Accident Report, Survey Report **Grammar** – Reported Speech, Modals Vocabulary – Conjunctions - use of prepositions.

UNIT V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	9

Listening – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance); **Speaking** – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids; **Reading** – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing –Job/Internship application – Cover letter & Resume; **Grammar** – Relative Clauses Vocabulary – Idioms

Total Hours: 45

Text Book(s):
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 Joevani, Department of English, Anna University.

Reference Book(s)/ Web Links:
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.

COURSE OUTCOMES:

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

*   Identify technical and general texts using appropriate diction.
*   Recall various styles of drafts in formal and informal contents.
*   Use the verbal and technical skills in the given technical contexts.
*   Apply meaningful utterances to present intense technical knowledge.
*   Interpret key ideas by reviewing lexicon across the language in syntactical contexts

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	2	1	-	2	3	-	1	-	-
CO2	-	-	-	-	2	1	-	2	3	-	2	-	-
CO3	-	-	-	-	2	2	-	2	3	-	2	-	-
CO4	-	-	-	-	2	1	-	2	3	-	1	-	-
CO5	-	-	-	-	3	1	-	2	3	-	1	-	-
Average	-	-	-	-	2.20	1.20	-	2.00	3.00	-	1.40	-	-

Subject code	Subject Name	Category	L	T	P	C
MA3202	**Discrete Mathematics**	BSC	3	1	0	4

Course Objectives
- To extend student's logical and mathematical maturity and ability to deal with abstraction.   - To establish a solid foundation in set theory, lattices, and Boolean algebra.   - To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.   - To understand the basic concepts of combinatorics and graph theory.   - To familiarize the applications of algebraic structures.

UNIT I	LOGIC AND PROOFS	12
Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference – Normal form - Introduction to proofs – Proof methods and strategy.		

UNIT II	SET THEORY	12
Basic concepts – Algebra of sets – Types of relations and their properties – Relational matrix and the graph of a relation – Partial ordering – Poset – Hasse diagram – Lattices and their properties – Sub lattices – Boolean algebra – Homomorphism.		

UNIT III	COMBINATORICS	12
Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications		

UNIT IV	GRAPHS	12
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.		

UNIT V	ALGEBRAIC STRUCTURES	12
	Algebraic systems – Definitions-Examples-Properties-Semi groups and monoids – Homomorphism's- Groups – Subgroups – Normal subgroup and cosets – Lagrange's theorem – Codes and group codes – Basic notions of error correction-Error recovery in group codes	

Total Hours: 45

Text Book(s):

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.

Reference Book(s)/ Web Links:

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.

COURSE OUTCOMES:

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

- Explain the concept of divergence and curl to Calculate the line, surface and volume integrals using vector integration.
- Solve the problems under analytic functions and construction of analytic function using C-R equation.
- Classify the singularities and pole, find residues and evaluate complex integrals using residue theorem.
- Outline the concepts of Laplace Transforms and its properties and to solve the differential equations.
- Analyze the properties of Z-transform and solve the difference equation.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	-
Avg	3.00	2.80	2.00	-	-	-	-	-	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
PH3201	**Physics for Information Science**	BSC	3	0	0	3

Course Objectives
• Understand the transport properties of conducting materials and their modelling using classical and quantum theories.
• Acquire knowledge on basics of semiconductor physics and its application in various devices.
• Understand the origin of magnetism and data storage principles.
• Study the fundamentals of optical materials and their applications to display devices.

- Understand the basics of basics of quantum structures and their applications and basics of quantum computing. .

UNIT I	ELECTRICAL PROPERTIES OF MATERIALS	9
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.		
UNIT II	SEMICONDUCTOR PHYSICS	9
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.		
UNIT III	MAGNETIC MATERIALS AND DATA STORAGE PRINCIPLES	9
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.		
UNIT IV	OPTICAL MATERIALS AND DISPLAYDEVICES	9
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.		
UNIT V	NANODEVICES AND QUANTUM COMPUTING	9
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.		
	Total Hours: 45	

Text Book(s):
1. Adaptation by Balasubramanian, R, Callister's Material Science and Engineering, Wiley India Pvt .Ltd., 2ndEdition, 2014.
2. Kasap,S.O., Principles of Electronic Materials and Devices, (Special Indian Edition) McGrawHill Education, 3rd Edition, 2017.
3. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.
4. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.

Reference Book(s)/ Web Links:	
1.	Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Pearson, 2ndEdition, 2017.
2.	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) PrivateLimited, 2018.
6.	https://www.youtube.com/watch?v=M4tmxU8oDQs&list=PLDljpOBMA5mQTdbaRrtwF32xdjyhq2GB7

7.	https://www.youtube.com/watch?v=JA3sCmrv11M&list=PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2
8.	https://www.youtube.com/watch?v=QQZ6EGf0Ju8
9.	https://www.youtube.com/watch?v=N01BYteinzE&list=PLbMVogVj5nJSvhvgcBfT3e6HFFuhq2xqz
10.	https://www.youtube.com/watch?v=7Dz7E4XGv5I&list=PLLy_2iUCG87AUZ9mkKZT7fu3HFispgKve

COURSE OUTCOMES:

At the end of the course, students would:

- Describe the fundamental principles of conducting materials and analyze their behavior under varying temperature conditions.
- Explain knowledge on semiconductor physics, including carrier concentration, and apply it to the design and analysis of semiconductor devices.
- Apply the properties of magnetic and superconducting materials, and apply their concepts in practical engineering systems
- Examine knowledge on polarization mechanisms in dielectric materials and its applications
- Analyze the properties and applications of advanced nano materials and biomaterials for various engineering applications.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-
Average	**3.00**	**2.00**	-	-	-	-	-	-	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
CS3201	**Programming in Python**	ESC	**3**	**0**	**0**	**3**

Course Objectives
• To know the basics of python Programming
• To read and write simple Python programs.
• To develop Python programs with conditionals and loops.
• To define Python functions and call them.
• To use Python data structures –- lists, tuples, dictionaries.

UNIT I	INTRODUCTION TO PYTHON PROGRAMMING	9
Introduction to Python, Program Verses Script, Compiler Verses Interpreter, Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators andits 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.		
UNIT II	CONTROL STRUCTURES AND FUNCTIONS	9
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

UNIT III	LISTS, TUPLES, DICTIONARIES AND SET	9

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.

UNIT IV	FILES AND EXCEPTION	9

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

UNIT V	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING USING PYTHON	9

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 ina bank account

Total Hours: 45

Text Book(s):
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 Shroff/ 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.

Reference Book(s)/ Web Links:
1. Charles Dierbach, "Introduction to Computer Science using Python: A ComputationalProblem- 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.

Course Outcomes
CO1- Discuss the basics of algorithmic problem solving.
CO2- Illustrate Python programs with data expressions and statements.
CO3- Apply control flow and python functions for problem solving.
CO4- Apply data structures such as lists, tuples, and dictionaries in Python for problem solving.
CO5- Examine file concepts to read and write data from/to files.

CO -	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2

PO, PSO													
CO1	3	3	-	-	-	-	-	-	-	-	1	3	1
CO2	-	2	1	2	-	-	-	-	-	-	1	3	1
CO3	1	1	-	2	-	-	-	-	-	-	1	3	1
CO4	-	3	-	-	3	-	-	-	-	-	1	2	1
CO5	3	3	-	-	-	-	-	-	-	-	1	2	1
Average	2.33	2.40	1.00	2.00	3.00	-	-	-	-	-	1.00	2.60	1.00

Subject code	Subject Name	Category	L	T	P	C
CS3203	**Programming in Python Laboratory**	**ESC**	**0**	**0**	**4**	**2**

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:
At the end of the course the student should be able to
- Interpret the behavior of programs that use decision-making and iteration.
- Demonstrate the functions to solve mathematical problems
- Use strings for structuring Python programs.
- Illustrate compound data using Python lists, tuples, and dictionaries.
- Demonstrate file concepts to write programs to read and write datas.

Subject code	Subject Name		Category	L	T	P	C
TA3201	Tamils and Technology/ தமிழரும் தொழில்நுட்பமும்		HSC	1	0	0	1

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	-	-	-	3	1
CO2	2	3	1	2	-	-	-	-	-	-	-	3	1
CO3	2	3	1	-	2	-	-	-	-	-	-	3	1
CO4	2	3	1	-	3	-	-	-	-	-	-	2	1
CO5	2	2	1	-	-	-	-	-	-	-	2	2	1
Average	2.20	2.80	1.00	2.00	2.50	-	-	-	-	-	2.00	2.60	1.00

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்

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

அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்

சங்க காலத்தில் கட்டுமான பொருட்களும் நடு கல்லும் சிலப்பதிகாரத்தில் மேடை - வடிவமைப்பு பற்றிய விவரங்கள், மாமல்லபுரச் சிற்பங்களும் கோவில்களும் சோழர் - நாயக்கர் கால - காலத்துப் பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் பிரிட்டிஷ் காலத்தில் சென்னையில் - செட்டிநாட்டு வீடுகள்இந்தோ சாரோசெனிக் கட்டிடக்கலை.

அலகு 3 உற்பத்தி தொழில்நுட்பம்

கப்பல் கட்டும் கலை இரும்பு உருக்குதல் - இரும்புத் தொழிற்சாலை - உலோகவியல் -, எஃகு மணி - நாணயங்கள் அச்சடித்தல் - செம்பு மற்றும் தங்க நாணயங்கள் - உருவாக்கம் தொழிற்சாலைகள் கல் மணிகள், கண்ணாடி மணிகள் சுடுமண் - சங்கு மணிகள் - 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 (விகடன்பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilizationon 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) (Publishedby: 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.

Subject code	Subject Name	Category	L	T	P	C
ME3101	**Engineering Graphics**	ESC	2	0	2	3

Course Objectives
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
• To expose them to existing national standards related to technical drawings

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.		
UNIT II	**PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES**	**12**
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.		
UNIT III	**PROJECTION OF SOLIDS**	**12**
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.		

UNIT IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	12

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.

UNIT V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	12

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 Hours: 60

Text Book(s):
1. 1 NatrajanK.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.

Reference Book(s)/ Web Links:
1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th 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, 2nd Edition,2009.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

COURSE OUTCOMES:

At the end of this course, the student will be able to
- Understand existing national standards of engineering drawing and visualization concepts
- Understand the projection of Points, Lines and Plane surfaces.
- Understand the projection of Solids.
- Understand the section of solids.
- Understand the development of surfaces

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	1	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	1	-	-	-	-	-
Average	2.20	2.40	-	-	-	-	-	1.00	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
CY3201	**Environmental Science and Sustainability**	**MC**	**1**	**0**	**0**	**1**

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.

UNIT I	**ENVIRONMENT AND BIODIVERSITY**	**6**

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.

UNIT II	**ENVIRONMENTAL POLLUTION**	**6**

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 .

UNIT III	**RENEWABLE SOURCES OF ENERGY**	**6**

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.

UNIT IV	**SUSTAINABILITY AND MANAGEMENT**	**6**

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

UNIT V	**SUSTAINABILITY PRACTICES**	**6**

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.

	Total Hours: 30

Text Books:

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.

Reference Book(s)/ Web Links:

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

COURSE OUTCOMES:

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

- Infer the functions of eco systems and appreciate the bio diversity.
- Explain the measures to control environmental pollution.
- Illustrate the usage as well as the effects of over exploitation of natural resources.
- Analyze the technological, economic and political solutions to environmental problems with various Environmental Protection Act in mind.
- Outline the interrelationship between population explosion and the environment also role of IT in environment and human health.

CO - PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	-	-	-	1	2	-	-	-	-	-	-
CO2	2	1	-	1	-	1	3	-	-	-	-	-	-
CO3	1	1	-	-	-	1	2	-	-	-	-	-	-
CO4	2	1	-	1	-	1	3	1	-	-	-	-	-
CO5	2	1	-	1	-	1	2	-	-	-	-	-	-
Average	1.60	1.00	-	1.00	-	1.00	2.40	1.00	-	-	-	-	-

Subject code	Subject Name	Category	L	T	P	C
MA3307	**Probability, Statistics and Queueing Theory**	**BSC**	**3**	**1**	**0**	**4**

Course Objectives

- To understand the concept the different types probability distributions and their properties.
- To understand the basic concepts two dimensional random variables applicable to engineering which can describe real life phenomenon.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To Perform Analysis of variance in the design of experiments.
- To understand the concept of queuing models and apply in engineering.

UNIT I	**RANDOM VARIABLES**	**9+3**
Random variables-Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.	
UNIT II	**TWO DIMENSIONAL RANDOM VARIABLES**	**9+3**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).	
UNIT III	**TESTING OF HYPOTHESIS**	**9+3**
Sampling distributions - Tests for single mean, proportion and difference of means(Large and small samples) - Tests for single variance and equality of variance - Chi square test for goodness of fit - independence of attributes	
UNIT IV	**DESIGN OF EXPERIMENTS**	**9+3**
One way and Two-way classifications - Completely randomized design – Randomized block design – Latin square design.	
UNIT V	**QUEUEING MODELS**	**9+3**
Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms – Queues with impatient customers.	

Total Hours: 60

Text Book(s):
1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier,1st Indian Reprint,2007
2. Johnson, R.A., Miller, I and Freund J., " Probability and Statistics for Engineers", Pearson Education,Asia, 8th Edition, 2015.
3. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014

Reference Book(s)/ Web Links:
1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, NewDelhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.

4. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007

5. Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.

6. Trivedi, K.S., "Probability and Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.

Subject code	Subject Name	Category	L	T	P	C
IT3301	**Computer Organization and Architecture**	**PCC**	**3**	**0**	**0**	**3**

Course Objectives

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand parallelism and multi-core processors.

UNIT I	BASIC COMPUTER ORGANIZATION AND DESIGN	9

Overview- Eight great Ideas in Computer architecture-components of computer system-Instructions – Operations and Operands – Representing Instructions – Arithmetic & Logical operations – control operations – Performance - Addressing modes – RISC and CISC Architectures.

UNIT II	COMPUTER ARITHMETIC OPERATIONS	9

Data Representation, Architecture of Hardware implementation of arithmetic unit for common arithmetic operations: addition, subtraction, multiplication, division(Fixed point and floating point)- Sub-word Parallelism.

UNIT III	PROCESSING AND CONTROL UNIT	9

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU–An Overview of Pipelining – Pipeline Hazards – Handling Data hazards &Control Hazards-Exceptions.

UNIT IV	PARALLEL PROCESSING	9

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Symmetric Multiprocessor Organization- -Hardware multithreading – Homogeneous and Heterogeneous Multi-core Architectures – Introduction to Graphics Processing Units(GPU)- Case study: NVIDIA GPU.

UNIT V	MEMORY SYSTEM & INPUT/ OUTPUT ORGANIZATION	9

Exploiting Memory Hierarchy-Memory Technologies-Basics of caches-Measuring and improving Cache Performance-Virtual Memory - Accessing I/O devices - Programmed I/O-Interrupt Driven I/O-Direct Memory Access-I/O Processors- Standard I/O Interfaces - SCSI - Universal Serial Bus(USB).

Total Hours: 45

Text Book(s):

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, Fifth Edition, Tata McGraw Hill, 2012.
2. M. M. Mano, Computer System Architecture, 3rd ed., Prentice Hall of India, NewDelhi, 2017.
3. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 6th Edition, Elsevier / Morgan 2021

Reference Book(s)/ Web Links:
1. John P. Hayes, Computer Architecture and Organization,.3rd Edition. McGraw Hill Education, 2017
2. William Stallings, Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson Education, 2017
3. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

Subject code	Subject Name	Category	L	T	P	C
IT3302	**Software Engineering Essentials**	**PCC**	**3**	**0**	**0**	**3**

Course Objectives
- To understand Software Engineering Lifecycle Models.
- To perform software requirements analysis, documentation, verification and validation.
- To understand the software design architecture, principles and design patterns.
- To understand different types of software testing and maintenance approaches.
- To gain knowledge on software project estimation, scheduling, and risk management.

UNIT I	SOFTWARE PROCESS AND AGILE DEVELOPMENT	9

Introduction to Software Engineering, Software Process, Software Development Life Cycle Model - Perspective and Specialized Process Models – Introduction to Agility - Agile process - Extreme Programming - XP Process - Case Study.

UNIT II	REQUIREMENT ENGINEERING AND SYSTEM MODELLING	9

Requirement Engineering: Functional and non-functional requirements - The software requirements document - Requirements specification - Requirements engineering processes - Requirements elicitation and analysis - Requirements validation - Requirements management. System Modeling- Context models- Interaction Models- Structural Models- Behavioral Models- Model Driven Engineering.

UNIT III	SOFTWARE DESIGN	9

Design engineering: Design Process - Design Concepts - Design Model: Architectural Design-Software Architecture, Architectural Genres, Architectural Styles, Architectural Mapping using Data Flow, Interface Design: The Golden Rules, User Interface Analysis and Design, Component-Level Design: Designing Class-Based components, Component Level Design for WebApps, Pattern Based Design: Design Patterns, Pattern Based Software Design, Architectural Patterns and WebApp Design Patterns.

UNIT IV	SOFTWARE TESTING AND DEBUGGING	9

Software testing strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software, Object-Oriented Software and WebApps, Validation Testing, White- Box Testing, Basis Path Testing, Black-Box Testing, System Testing, Control Structure Testing. **Debugging**: Debugging process and Strategies, Correcting the errors.

UNIT V	PROJECT ESTIMATION AND RISK MANAGEMENT	9

Project Estimation: Software Project Estimation – Software Size - Problem Based Estimation- LOC Based Estimation - FP Based Estimation - COCOMO I & II Model - **Risk Management**: Risk Identification - Risk Projection - Risk Refinement - Risk Mitigation - Monitoring and Maintenance.

Total Hours: 45

Text Book(s):
1. Roger S. Pressman, Bruce R. Maxim, "Software Engineering- A Practitioner's Approach", 9th Edition, Mc Graw- Hill International Edition, 2023.
2. lan Sommerville, "Software Engineering", 10th Edition, Pearson Education, 2021.

Reference Book(s)/ Web Links:
1. Frank Tsui, Orlando Karam, and Barbara Bernal, "Essentials of Software Engineering", 5th Edition, Jones & Bartlett Learning, 2022.
2. Ian Sommerville, "Engineering Software Products: An Introduction to Modern Software Engineering", 2nd Edition, Pearson Education, 2022**.**
3. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI Learning Pvt. Ltd, 2018.

Subject code	Subject Name	Category	L	T	P	C
IT3303	**Data Structures and Algorithms**	**PCC**	**3**	**0**	**0**	**3**

Course Objectives
• Understand the basic terminologies of algorithm and data organization
• Understand the concepts of ADTs
• Learn linear data structures – lists, stacks, and queues
• Understand sorting, searching and hashing algorithms
• Learn dynamic data structures - Tree and Graph

UNIT I	BASIC TERMINOLOGIES AND INTRODUCTION TO ALGORITHM	9

Algorithm Specification - Recursion - Performance Analysis - Asymptotic Notation - The Big-O - Omega and Theta Notation - Notion of efficiency of algorithms - running time and memory consumption. Notions of best, worst and average case complexity.

UNIT II	LINEAR DATA STRUCTURES	9

Array - Stack – Operations - Evaluating Arithmetic Expressions - Conversion of Infix to Postix Expression - Queue – Circular Queue - Operations - Linked List and its Types - Applications of Linear Data Structures.

UNIT III	NON LINEAR DATA STRUCTURES	9

Introduction to Tree ADT – Implementations of trees- Binary Tree ADT -Tree traversals - Expression trees — Binary search tree ADT –Threaded Binary Trees- AVL Trees - B-Tree – B+ Tree- Heap-Priority Queue.

UNIT IV	GRAPHS AND HASHING	9

Graph and their representations-Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS)-Topological Sort- Hashing- Hash Functions – Collision in hashing-Separate Chaining – Open Addressing-Rehashing-Applications of Hashing.

UNIT V	SEARCHING AND SORTING	9

Searching- Linear Search – Binary Search. Sorting – Bubble Sort – Selection Sort – Insertion Sort – Quick Sort-Merge Sort-Shell Sort – Radix Sort-Heap Sort.

Total Hours: 45

Text Book(s):
1. E. Horowitz, S. Sahni,S. A-Freed, "Fundamentals of Data Structures", Universities Press, Second Edition, 2008.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2002..
3. A.V.Aho, J. E.Hopperoft, J. D.UIlman, "Data Structures and Algorithms", Pearson Education, 1983.

Reference Book(s)/ Web Links:
1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, the MIT Press.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st Edition, Pat Morin, UBC Press.

Subject code	Subject Name	Category	L	T	P	C
IT3304	**Object Oriented Programming**	**PCC**	**3**	**0**	**0**	**3**

Course Objectives
• 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.

UNIT I	**INTRODUCTION TO OOP AND JAVA FUNDAMENTALS**	**9**

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.

UNIT II	**INHERITANCE, INTERFACES AND I/O**	**9**

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.

UNIT III	**EXCEPTION HANDLING MULTITHREADING**	**9**

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.

UNIT IV	**GENERICS AND COLLECTION FRAMEWORK**	**9**

Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations- 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.

UNIT V	**JAVAFX EVENT HANDLING AND JDBC**	**9**

JAVAFX 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.

Total Hours: 45

Text Book(s):
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.

Reference Book(s)/ Web Links:
1. Allen B.Downey & Chris Mayfield-Think Java, 2nd Edition, Oreilly, 2023.   2. MarcLoy,Patrick Niemeyer & Daniel LeuckLearning Java: An Introduction To Real-world Programming With Java, Sixth Edition Grayscale Indian Edition, 6th edition , Oreilly.   3. Kathy sierra, Bert Bates & Trisha Gee, - Head First Java: A Brain-Friendly Guide Third edition , Shroff Publishers ,June 2022.

Subject code	Subject Name	Category	L	T	P	C
IT3305	**Data Structures and Algorithms Laboratory**	**PCC**	**0**	**0**	**3**	**1.5**

Course Objectives
• Design and implement linear and non-linear data structures
• Develop & implement binary search trees with all operations
• Write functions to implement graph traversal algorithms
• Familiarize in sorting and searching algorithm
• Appropriately use the linear / non-linear data structure operations for a given problem

LIST OF EXPERIMENTS:

1. Array implementation of List ADT
2. Implement the following data structures
i. Singly Linked List
ii. Doubly Linked List
3. Array implementation of Stack and Queue ADTs
4. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
5. Implementation of Binary Search Trees
6. Implementation of AVL Trees
7. Programs for implementation of graph traversals
 (i) BFS and (ii) DFS
8. Implementation of searching algorithms
9. Implementation of Insertion Sort, Merge Sort, Quick Sort and Heap Sort algorithms
10.Implementation of Open Addressing (Linear Probing and Quadratic Probing)

                                                    TOTAL: 45 PERIODS

Subject code	Subject Name	Category	L	T	P	C
IT3306	**Object Oriented Programming Laboratory**	**PCC**	**0**	**0**	**3**	**1.5**

Course Objectives
• To build software development skills using java programming for real-world 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 demnonstrate polymorphism.
5. Design a java program to demonstarte multiple inheritance using interface.
6. Write a program to perform string operations using String and StringBuffer classs.
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 multi-threading.
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 event-driven and concurrent programming paradigms of Java. Use JDBC to connect a back-end database.

TOTAL: 45 PERIODS

Subject code	Subject Name	Category	L	T	P	C
HS3303	English Language Enhancement and Business Communication Laboratory	HSMC	0	0	3	1.5

Course Objectives

- Enhance the ability of the students to converse in simple and short sentences.
- Improve the fluency in spoken English by refining language skills.
- Expose students to address various scenarios in the domain of LSRW skills.
- Help the students to learn, practice and apply English language at different pace.

UNIT I		9

Listening – Listen to business terminologies and use them
Speaking – People, Relationships and interpersonal skills
Reading – Word Search
Writing – Stream of Consciousness

UNIT II		9

Listening – Listen and narrate a story
Speaking – Imitation, SWOT analysis, Engineering ethics, rights and responsibilities
Reading – Echo reading, professionalism in workplace
Writing – Free style writing, Construction of Paragraphs & essays

UNIT III		9

Listening – Listen and act
Speaking – Speaking skills, methods of speech, Role Play, Team and group, conflict management
Reading – Inference, cultural and global diversities
Writing – Report writing, using social media

UNIT IV		9

Listening – Listen, respond and motivate
Speaking – Picture yourself to different scenarios
Reading – Read and comprehend
Writing – Clubbing Keywords, Letter & mail correspondence, Job Application and Resume

UNIT V		9

Listening – Listen and perform, traits of a leader, winning formula
Speaking – Variation, Varieties in speeches, women empowerment, Human values, corporate culture& etiquette
Reading – Visual reading
Writing – E-Writing and email-communication

Total Hours: 45

Reference Book(s)/ Web Links:

1. English and Soft Skills. SP Dhanavel. Orient Blackswan 1, 124, 2011. 20, 2011. English Language Teaching in India: The Shifting Paradigms.

2. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011.

3. Davis, Jason and Rhonda LIss.Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006

4. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012

5. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004

Course Outcomes
CO1- Receive sound, understand the message, evaluate it, and respond promptly.
CO2- Demonstrate professional responsibilities and coherent expression of ideas using SWOT analysis.
CO3- Communicates excellent speaking and writing skills expressing team spirit drawing inferences from cultural and global diversities using social media.
CO4- Identifies pictorial information and inscribe one's candidature through mail and letter communication.
CO5- Showcase leadership traits fitting the corporate culture keeping in mind the gender equality.

MA3403   **OPTIMIZATION TECHNIQUES**   **L   T   P   C**
                                                3   1   0   4

COURSE OBJECTIVES:

- Introduce the fundamental concepts, assumptions, and formulations of Linear Programming Problems (LPP) and solution techniques.
- Develop the ability to apply extensions of LPP to solve transportation, assignment, and traveling salesman problems.
- Familiarize students with project scheduling techniques such as CPM and PERT for effective project management.
- Equip students with knowledge of inventory control models and replacement strategies for optimal decision-making in operations.
- Introduce the principles of Game Theory for analyzing competitive situations and deriving optimal strategies.

UNIT I   LINEAR PROGRAMMING

Introduction to Operations Research – Assumptions of Linear Programming Problems - Formulations of linear programming problem – Graphical method. Solutions to LPP using simplex algorithm – Two phase method – Big M method   **9+3**

UNIT II   LINEAR PROGRAMMING EXTENSIONS

Transportation problems: Northwest corner rule , Least cost method , Vogel's approximation method - stepping stone method - MODI method – Unbalanced transportation – Assignment problem – Hungarian algorithm – Travelling salesman problem.   **9+3**

UNIT III   PROJECT SCHEDULING

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM.   **9+3**

UNIT IV   INVENTORY AND REPLACEMENT MODELS

Inventory Models – EOQ and EBQ Models (With and without shortages)- Quantity Discount Models.-Replacement Models-Individual replacement Models (With and without time value of money) – Group Replacement Models.   **9+3**

UNIT V   GAME THEORY

Competitive game - Rectangular game- saddle point- minimax (maximin) method of optimal strategies- value of the game. -Dominance principle- Rectangular games without saddle point – mixed strategy for 2 X 2 games-Graphical methods.   **9+3**

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On the successful completion of the course, students will be able to
CO1: Formulate and solve linear programming problems using simplex, two-phase, and Big M methods.
CO2: Apply transportation and assignment models to real-world allocation and scheduling problems.

CO3: Construct and analyze project networks, determine critical paths, and evaluate project costs using CPM and PERT.

CO4: Evaluate and select appropriate inventory policies and replacement models for cost minimization.

CO5: Analyze and solve competitive games using saddle point, dominance principle, and mixed strategy approaches.

TEXTBOOKS

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.

REFERNCES

1. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.

2. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.

3. Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill, 2017.

4. Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim, Essentials of Linear Programming, Vikas Publishing House Pvt.Ltd. New Delhi, 1994.

5. Ravindran A., Philip D.T., and Solberg J.J., Operations Research, John Wiley, 2nd Edition, 2007.

6. Kanti Swarup, P.K.Gupta, and Man Mohan, Operations Research, Sultan Chand & Sons Publications.

CO'S-PO'S & PSO'S MAPPING														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	Average
MA3403.1	3	3	2	1	-	-	-	-	-	-	1	-	-	2.00
MA3403.2	3	3	2	1	-	-	-	-	-	-	1	-	-	2.00
MA3403.3	3	3	2	1	-	-	-	-	-	-	1	-	-	2.00
MA3403.4	3	3	2	1	-	-	-	-	-	-	1	-	-	2.00
MA3403.5	3	3	2	1	-	-	-	-	-	-	1	-	-	2.00
Average	3	3	2	1	-	-	-	-	-	-	1	-	-	2.00

1- Low, 2-Medium, 3-High, '-' – No correction

COURSE COORDINATOR   **HOD**

Subject code	Subject Name	Category	L	T	P	C
IT3401	**OBJECT ORIENTED ANALYSIS AND DESIGN**	**PCC**	**3**	**0**	**0**	**3**

Course Objectives

- To capture the requirements specifications of an intended software system
- To design software with static and dynamic UML diagrams
- To map the design properly to code
- To improve the software design with design patterns
- To test the software against its requirements specifications

UNIT I	INTRODUCTION	9
Introduction to OOAD with OO Basics - Unified Process – UML diagrams, Use Cases – Case study – the Next Gen Point of Sale (POS) system, Inception Use case Modelling, use case modeling - Relating Use cases – include, extend and generalization.		
UNIT II	**STATIC MODELLING**	**9**
Class Diagram - Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes - Domain Modeling using class diagrams - Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition		
UNIT III	**DYNAMIC MODELLING**	**9**
Dynamic Diagrams - UML interaction diagrams - System sequence diagram – Collaboration diagram - Communication diagram - State machine diagram and Modelling – State Diagram - Activity diagram, Implementation Diagram - UML package diagram - Component and Deployment Diagrams		
UNIT IV	**DESIGN PATTERNS**	**9**
GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller. Design Patterns – Creational – Factory method – Structural – Bridge – Adapter – Behavioral– Strategy – Observer, Applying Gang of Four design patterns – Mapping design to code		
UNIT V	**TESTING**	**9**
Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans, Revisiting and consolidating all salient points and key insights based on the team projects.		
	Total Hours: 45	

Text Book(s):
1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", 3rd. Edition, Pearson Education, 2005. 2. Carol Britton, Jill Doake, "A Student Guide to Object-oriented Development", Elsevier Butterworth-Heinemann, 2005

Reference Book(s)/ Web Links:
1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition, Addison Wesley, 2003. 2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", Pearson, 2015.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1 Identify and map basic software system requirements in UML

CO2 Express software design with UML diagrams

CO3 Design and implement software systems using OO methodology

CO4 Improve software design using design patterns

CO5 Test the software system developed against the intended requirements

Subject code	Subject Name	Category	L	T	P	C
IT3402	**DATABASE MANAGEMENT SYSTEMS**	**PCC**	**3**	**0**	**0**	**3**

Course Objectives

- To learn the fundamentals of SQL, 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 learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To have an introductory knowledge about the Distributed databases and Query Processing Techniques.

UNIT I	INTRODUCTION TO RELATIONAL DATABASES	9

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL .

UNIT II	ER MODEL AND RELATIONAL DATABASE DESIGN	9

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd's Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III	TRANSACTIONS	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 DESIGN	9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V	ADVANCED DATABASE CONCEPTS	9

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: Concepts, Retrieval Models, Queries in IR systems.

Text Book(s):

3. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.
4. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2017.

Reference Book(s)/ Web Links:

1. David Loshin,"Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL,and Graph", Morgan Kaufmann/El Sevier Publishers,2013.
2. Vlad Vlasceanu, Wendy A. Neu, Andy Oram, Sam Alapati, An Introduction to Cloud Databases, O'Reilly Media, Inc.,2019.
3. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
4. Raghu Ramakrishnan, ―Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.
5. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
6. Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design, Implementation and Management", Ninth Edition, Cengage Learning, 2011.

COURSE OUTCOMES:

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

- Model an application's data requirements using conceptual modeling and design databaseschemas based on the conceptual model and Formulate solutions to a broad range of query.
- Recognize and identify the use of normalization and functional dependencies to refine the database system.
- Demonstrate various SQL queries for the Transaction Processing & Locking using concept of concurrency control.
- Implement the indexing and hashing techniques for the organization of database records.
- Illustrate how advanced databases differ from the traditional databases and also analyze the recent advancements in databases.

Subject code	Subject Name	Category	L	T	P	C
IT3403	**Principles of Operating Systems**	PCC	3	0	2	4

Course Objectives

- To study the basic concepts and functions of operating systems.
- To learn about Processes, Threads, Scheduling algorithms
- To understand the process of synchronization and deadlock issues
- To learn and understand the Memory management systems.
- To learn I/O Management and File Systems.

UNIT I	OPERATING SYSTEMS OVERVIEW	9

Introduction – Computer System Organization – Computer System Architecture – Operations – Resource Management – Security and Protection – Virtualization – Computing Environments. Operating Systems Structures: Services – User and OS Interface – System Calls – Linkers and Loaders – Operating system Structure – Building and Booting OS.

UNIT II	PROCESS MANAGEMENT	9

Process Concepts– Process Scheduling - Operations – Inter process Communication- Shared Memory and Message Passing Systems Threads: Overview- multithreading models-issues. CPU Scheduling: – FCFS – SJF – Priority – RR – Multilevel Queue Scheduling - Multilevel Feedback Queue.

UNIT III	PROCESS SYNCHRONIZATION AND DEADLOCKS	9

Process Synchronization – Critical Section Problem – Peterson"s Solution – Hardware Synchronization – Semaphores- Monitors - Classic Problems of Synchronization, Deadlocks: Characterization-Prevention – Avoidance – Detection – Recovery.

UNIT IV	MEMORY MANAGEMENT	9

Main Memory: Background - Contiguous Memory Allocation – Paging - Structure of a page table – Segmentation - Virtual Memory – Demand Paging - Page Replacement-FIFO-LRU-Optimal - Allocation of Frames – Thrashing - Mass Storage Management-Disk scheduling.

UNIT V	FILE MANAGEMENT	9

File System -Concepts - Access Methods- Directory Structure - Protection - Discretionary Access control and Mandatory Access Control - File System structure– Directory Implementation – Allocation Methods – Free-Space Management-Virtual File System. Case studies: Linux.

Total Hours: 45

LIST OF EXPERIMENTS:

1. Basics of UNIX and LINUX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Shell Programming
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Write C program to implement Threading & Synchronization Applications
6. Implementation of the following Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit
7. Implementation of Paging Technique of Memory Management
8. Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU 9. Implementation of the various file organization techniques and the following File Allocation Strategies a) Sequential b) Indexed c) Linked

TOTAL (LAB): 30 Hours
TOTAL (L + P): 75 Hours

Text Book(s):
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

Reference Book(s)/ Web Links:
1. William Stallings, "Operating Systems – Internals and Design Principles", 9thEdition, Pearson, 2018.
2. Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems", 4th Edition, Pearson, 2016.
3. Achyut Godbole and Atul Kahate, "Operating System", 3rd Edition, Tata McGraw Hill, 2017.

4. Pavel Y., Alex I., Mark E., David A., "Windows Internal Part I - System Architecture, Processes, Memory Management and More", 7th Edition, Microsoft Press, 2017.

Subject code	Subject Name	Category	L	T	P	C
IT3404	**Algorithm Design Techniques**	**PCC**	**3**	**0**	**2**	**4**

Course Objectives
- To enable students to analyze the performance of algorithms mathematically and apply problem-solving techniques effectively
- To guide students in utilizing greedy techniques for solving optimization problems, including applications in pattern matching and palindrome identification
- To equip students with an in-depth understanding of advanced dynamic programming algorithms and their practical applications
- To facilitate learning of graph algorithms and range query optimizations, helping students implement these techniques in real-world problem-solving scenarios

UNIT I	ALGORITHM COMPLEXITY ANALYSIS	9

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

UNIT II	RECURSION AND GREEDY APPROACH	9

Recursion: Concept of recursion, base cases, and recursive problem-solving strategies. **Greedy Algorithms:** Prim's algorithm and Kruskal's Algorithm - Dijkstra's Algorithm - Fractional Knapsack problem, Huffman Trees. Industry Focus: Demonstration of built-in functions.

UNIT III	DIVIDE AND CONQUER, BACKTRACKING	9

Divide and Conquer Method-Introduction-Binary Search-Finding Min Max-Maximum Subarray Problem-Towers of Hanoi Problem-Finding the kth element-Analysis of Quick and Merge Sort. **Backtracking:** Permutation and Combination, N-Queen Problem, Knight's Tour Problem, Subset Sum, M-Coloring Problem, Hamiltonian Cycle Problem.

UNIT IV	DYNAMIC PROGRAMMING AND GRAPH	9

Dynamic Programming: Top-down and Bottom-up Approach, 0-1 Knapsack, Coin Change Problem, Subset Sum Problem, Minimum Cost Path. Longest Common Subsequence (LCS), Longest Increasing Subsequence (LIS). **Graph Algorithms:** Single Source Shortest Path Algorithm (Dijkstra's Algorithm). All-Pairs Shortest Path (Floyd Warshall Algorithm). Minimum Spanning Tree (Prim's and Kruskal's Algorithm).

UNIT V	TRACTABILITY AND SOLVABILITY	9

Lower – Bound Arguments – P, NP NP- Complete- Dominating Set Problem - NP Hard Problems – Clique Decision Problem – Node Cover Decision Problem – NP Hard Scheduling Problems –Job Shop Scheduling- Approximation Algorithm for NP Hard Problems – Travelling Salesperson Problem – Knapsack Problem.

Total Hours: 45

LIST OF EXPERIMENTS:
1. Implement time complexity analysis for recursive and non-recursive algorithms.
2. Solve the Activity Selection Problem and Fractional Knapsack using the greedy approach.
3. Design and implement algorithms using Divide and Conquer Technique.
4. Design and implement algorithms using Dynamic Programming.
5. Approximation Algorithm Projects: Assign projects where students explore and implement approximation algorithms for problems

6. Implement dynamic programming algorithms: Longest Common Subsequence (LCS), 0-1 Knapsack, and Minimum Cost Path
7. Implement graph algorithms: Dijkstra's Algorithm, Floyd-Warshall Algorithm, and Minimum Spanning Tree (MST)

TOTAL (LAB): 30 Hours
TOTAL (L + P): 75 Hours

Text Book(s):
1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", 4th Edition, The MIT Press, April 5, 2022. 2. Jon Kleinberg and Éva Tardos, "Algorithm Design", 2nd Edition, Pearson, 2022. 3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2019. 4. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", 6th Edition, Career Monk Publications, 2022.

Reference Book(s)/ Web Links:
5. Steven S. Skiena, "The Algorithm Design Manual", 3rd Edition, Springer, 2020. 6. Robert Sedgewick, Kevin Wayne, "Algorithms", 4th Edition, Addison-Wesley, 2021. 7. Aditya Bhargava, "Grokking Algorithms", 2nd Edition, Manning Publications, 2024. 8. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Java", 6th Edition, Wiley India, June 21, 2022 9. https://www.coursera.org/learn/cpsc-8400-design-and-analysis-of-algorithm 10. https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring2015/pages/syllabus/ 11. https://onlinecourses.nptel.ac.in/noc25_cs23/preview 12. https://www.codechef.com/learn/course/college-design-analysis-algorithms

Subject code	Subject Name	Category	L	T	P	C
HS3401	**Universal Human Values-II: Understanding Harmony and Ethical Human Conduct**	HSMC	2	1	0	3

Course Outcomes		
Upon successful completion of the course, the student will be able to:		BL
CO1	**Define** the terms like Natural Acceptance, Happiness and Prosperity	LI, L2
CO2	**Identify** one's self, and one's surroundings (family, society nature)	LI, L2
CO3	**Apply** what they have learnt to their own self in different day-to-day settings in real life	L3
CO4	**Relate** human values with human relationship and human society.	L4
CO5	**Justify** the need for universal human values and harmonious existence	L5

Contribution of Course Outcomes towards achievement of Program Outcomes
1- Low 2-Medium   3-High

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		2						2
CO2						2		2						2

CO3						2	2					2
CO4						2	2					2
CO5						2	2					2
Avg.						2	2					2

Syllabus		
Unit No.	**Contents**	**Mapped PO**
I	**Introduction to Value Education (6 lectures and 3 tutorials for practice** Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Lecture 2: Understanding Value Education Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education Lecture 4: Continuous Happiness and Prosperity — the Basic Human Aspirations Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity — Current Scenario	CO1 CO2

	Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance	
II	**Harmony in the Human Being (6 lectures and 3 tutorials for practice session)** Lecture 7: Understanding Human being as the Co-existence of the self and thebody. Lecture 8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body. Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body Lecture 12: Programme to ensure self-regulation and Health Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body	CO2 CO3
III	**Harmony in the Family and Society (6 lectures and 3 tutorials for practicesession)** Lecture 13: Harmony in the Family — the Basic Unit of Human Interaction Lecture 14: 'Trust' — the Foundational Value in Relationship Tutorial 7 : Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' — as the Right Evaluation Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society Lecture 18: Vision for the Universal Human Order Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal	CO2 CO4
IV	**Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)** Lecture 19: Understanding Harmony in the Nature Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels Lecture 22: The Holistic Perception of Harmony in Existence Tutorial 11: Practice Session PSll Exploring Co-existence in Existence.	CO2 CO5
V	**Implications of the Holistic Understanding — a Look at Professional Ethics (6lectures and 3 tutorials for practice session)** Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of(Ethical) Human Conduct Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture 26: Competence in Professional Ethics Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies	CO1 CO6

	Lecture 28: Strategies for Transition towards Value-based Life and Profession Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	

Learning Resources	
Text Books	
The Textbook	
1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics,2nd Revised Ed., Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1	
The Teacher's Manual	
2. R R Gaur, R Asthana, G P Bagaria, Teachers manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Ed., Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2	
Reference Books	
1. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004. 2. Mohandas Karamchand Gandhi - The Story of My Experiments with Truth	
e- Resources & other digital material	
1. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw 2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%20l-Introduction%20to%20Value%20Education.pdf 3. https://fdo-si.aicte-india.org/UHV- Harmony%20in%20the%20Human%20Being.pdf	

Subject code	Subject Name	Category	L	T	P	C
IT3405	**DATABASE MANAGEMENT SYSTEMS LABORATORY**	**PCC**	**0**	**0**	**3**	**1.5**

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 design and implementation of typical database applications. • To be familiar with the use of a front end tool for GUI based application development

LIST OF EXPERIMENTS:

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

2. Database Querying – Simple queries, Nested queries, Sub queries and Joins

3. Views, Sequences, Synonyms

4. Database Programming: Implicit and Explicit Cursors

5. Procedures and Functions

6. Triggers

7. Exception Handling

8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front End Tools.
10. Case Study using real life database applications

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 Terminals.
SOFTWARE:
Front end: VB/VC++/JAVA or Equivalent
Back end: Oracle / SQL / MySQL/PostGress / DB2 or Equivalent.

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
IT3501	**COMPUTER COMMUNICATION**	**PC**	**3**	**0**	**2**	**4**

Objectives: Broad objective of this course is to
➤Understand the concepts of computer networks and error detection-correction of data.
➤Be exposed to various addressing schemes and routing protocols.
➤Learn the Transport Layer, flow control and congestion control algorithms.
➤Be familiar with real time applications of networking devices and tools.
➤To configure different devices and trace the flow of information between nodes in the network using various tools.

UNIT-I	FUNDAMENTALS AND DATA LINK LAYER	9
Building a network – Requirements – Layering and protocols - – Internet Architecture – Network software – ApplicationProgramming Interface (sockets) - Performance - Link layer Services - Framing – Error Detection and Correction - Reliable transmission.		
UNIT-II	MEDIA ACCESS AND INTERNETWORKING	9
Media Access Protocols – ALOHA - CSMA/CA/CD –Ethernet – Wireless LANs - 802.11- Bluetooth - Switching and Forwarding - Bridges and LAN Switches – Basic Internetworking- IP Service Model – IP fragmentation - Global Addresses – ARP - DHCP – ICMP- Virtual Networks and Tunnels.		
UNIT-III	ROUTING	9
Routing – Network as Graph - Distance Vector – Link State – Global Internet –Subnetting - Classless Routing (CIDR) - BGP- IPv6 – Multicast routing - DVMRP- PIM.		
UNIT-IV	TRANSPORT LAYER	9
Overview of Transport layer – UDP – TCP - Segment Format – Connection Management – Adaptive Retransmission - TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements.		
UNIT-V	APPLICATION LAYER	9
E-Mail (SMTP, MIME, POP3, IMAP), HTTP – DNS - FTP - Telnet – web services - SNMP - MIB – RMON.		
	Contact Hours :	**45**

List of Experiments

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Captureping and traceroute 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: Echo client and echo server, Chat , File Transfer
4. Simulation of DNS using UDP sockets.
5. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms
6. Study of TCP/UDP performance using Simulation tool.
7. Simulation of Distance Vector/ Link State Routing algorithm.
8. Write a code using Raw sockets to implement packet Sniffing.

Course Outcomes:
On completion of the course, the students will be able to
CO1	Choose the required functionality at each layer for given application.
CO2	Trace the flow of information from one node to another node in the network.
CO3	Apply the knowledge of addressing scheme and various routing protocols in data communication to select optimal path.
CO4	Monitor the traffic within the network and analyze the transfer of packets.
CO5	Develop real time applications of networks using different tools.

	Text Books:
1	Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
2	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition, McGrawHill, 2017.

	Reference Book:
1	William Stallings, ―SNMP, SNMPv2, SNMPv3 and RMON 1 and 2‖, Third Edition, Pearson Edition, 2009.
2	James F. Kurose, Keith W. Ross, Computer Networking - A Top-Down Approach Featuring the Internet, Seventh Edition, Pearson Education, 2017.
3	Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th Edition, Prentice Hall publisher, 2010.
4	William Stallings, ―Data and Computer Communications‖, Eighth Edition, Pearson Education, 2011.

	Web Link
1.	Website reference: https://realpython.com/python-sockets/

COMPUTATIONAL INTELLIGENCE   (Lab Integrated)

COURSE OBJECTIVES:
The main objectives of this course are to:
• Learn the basic AI approaches
• Develop problem solving agents
• Perform logical and probabilistic reasoning

UNIT I   INTELLIGENT AGENTS   9
Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT II   PROBLEM SOLVING   9
Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments

UNIT III   GAME PLAYING AND CSP   9
Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT IV   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 V   PROBABILISTIC REASONING   9
Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Explain intelligent agent frameworks
CO2: Apply problem solving techniques
CO3: Apply game playing and CSP techniques
CO4: Perform logical reasoning
CO5: Perform probabilistic reasoning under uncertainty

TOTAL:45 PERIODS
TEXT BOOKS:
1.   Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2.   David L. Poole and Alan K. Mack worth, A. 2023. Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press.

REFERENCES
1.   Dan W. Patterson, "Introduction to AI and ES", 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.
5.   http://nptel.ac.in/

ARTIFICIAL INTELLIGENCE LABORATORY
LIST OF EXPERIMENTS:
1.   Implement basic search strategies – 8-Puzzle, 8 - Queens problem, Cryptarithmetic.
2.   Implement A* and memory bounded A* algorithms
3.   Implement Minimax algorithm for game playing (Alpha-Beta pruning)
4.   Solve constraint satisfaction problems
5.   Implement propositional model checking algorithms
6.   Implement forward chaining, backward chaining, and resolution strategies
7.   Implement Bayesian networks and perform inferences
8.   Mini-Project

IT3502	INTERNET TECHNOLOGY AND WEB SERVICES	L T P C
		3 0 0 3

OBJECTIVES:

● **To understand about client-server communication and protocols used during communication.**
● To design interactive web pages using Scripting languages.
● To learn server side programming using servlets and JSP.
● To develop web pages using XML/XSLT.
● To develop web services using recent technologies.

UNIT 1 WEB ESSENTIALS BASICS AND HTML   9
 Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide HTTP request message-response message-Web Clients Web Servers. **Markup Languages:** XHTML. An Introduction `ML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-tables-Frames-Forms-HTML 5.0.

UNIT II CSS AND CLIENT SIDE SCRIPTING   9
Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-CSS3.0. **Client-Side Programming**: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

UNIT III SERVER SIDE SCRIPTING 9

Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window. **Server-Side Programming**: Java Servlets- Architecture Overview- A Servlet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies-URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency- Databases and Java Servlets.

UNIT IV **JSP AND XML** 9

Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-ViewController Paradigm- Databases and JSP. **Representing Web Data:** XML-Documents and Vocabularies Versions and Declaration-Namespaces- DOM based XML processing Event-oriented Parsing: SAXTransforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLTDisplaying XML Documents in Browsers.

UNIT V **AJAX AND WEB SERVICES** 9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods. **Web Services:** JAXRPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL-Representing Data Types: XML Schema-Communicating Object Data: SOAP, Introduction technologies: JSON, AngularJS, React, Node.JS, JQuery, and MongoDB. **Express Framework :** Express Framework - Configuring Routes – Express JS Request – Response – GET - POST

TOTAL 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student should be able to:
● Design simple web pages using markup languages like HTML and XHTML.
● Create dynamic web pages using DHTML and java script that is easy to navigate and use.
● Program server side web pages that have to process request from client side web pages.
● Represent web data using XML and develop web pages using JSP.
● Understand various web services and new technologies used and develop Express Framework.

TEXT BOOK:
1. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2007.
2. Brown, Ethan, "Web Development with Node and Express: Leveraging the JavaScript Stack", O'Reilly Media, 2019.
3. Anthony, Accomazzo, Murray Nathaniel, Lerner Ari, "Fullstack React: The Complete Guide to React JS and Friends", Fullstack.io, 2017.
4. Brad Dayley, "Node.js, MongoDB, and AngularJS Web Development", 2nd edition, Addison Wesley, 2017.
5. Azat Mardan, "Express. js Guide: The Comprehensive Book on Express. Js", Leanpub, 2014.
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REFERENCES
1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition,Pearson Education, 2007 .
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,‖ Core Web Programming‖ Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, ―Developing Web Applications‖, Wiley, 2006
5. Dayley B., "Node.js, MongoDB, and AngularJS Web Development", Addison-Wesley Professional, 2014.
6. Vainikka J., "Full-Stack Web Development using Django REST Framework and React", 2018.

IT3501	Internet Technology and Seb Services Laboratory	**L T P C**
		0 0 3 1.5

COURSE OBJECTIVES:

- To design interactive web pages using Scripting languages.
- To learn server side programming using servlets and JSP.
- To develop web pages using XML/XSLT.

LIST OF EXPERIMENTS:

1. Create a web page with the following using HTML. i) To embed an image map in a web page. ii) To fix the hot spots. iii) Show all the related information when the hot spots are clicked
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets: To invoke servlets from HTML forms. SessionTracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
   - For conducting on-line examination.
   - For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
7. Programs using XML – Schema – XSLT/XSL
8. Programs using DOM and SAX parsers
   - Include Image Slide Show
   - Digital Clock
9. To build an AJAX Application
10. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.
11. Write a client side scripting to demonstrate AngularJS.
12. Write a client side scripting to demonstrate ReactJS.

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design simple web pages using markup languages like HTML and XHTML.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Program server side web pages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.
- Understand various web services and how these web services interact.

SOFTWARE REQUIRED:
- Dream Weaver or Equivalent, Apache Server, WAMP/XAMPP

HS3505   PROFESSIONAL AND CAREER DEVELOPMENT LABORATORY   L   T   P   C
**   0   0   3 1.5**

COURSE OBJECTIVES:
The course aims to:
- Enhance the employability skills of students
- Orient the students towards grooming as a professional
- Enable them to become employable, industry readygraduates
- Build their self-esteem and guide them in achieving success in interviews
- Aid them to fit into any professional working environment

UNIT I   9
Introduction to Employability Skills –Rapport Building - Emotional Awareness - Professional Grooming - Adaptability

UNIT II   9
Presentation Skills -Topic Selection – Organizing the Material –Significance of Presentation - Presentation Techniques – Do's and Don'ts of Presentation - Differences between Reading and Presenting – Formal Phrases for Presentation– Effective PPT Techniques - Mini Presentation

UNIT III   9
Group Discussion (GD) Strategies – Prepared GD - Importance of GDs in professional and academic settings- Understanding the topic - Time management and prioritization - Developing persuasive arguments - Active listening and responding - Conflict resolution and negotiation - Understanding Group Dynamics- Brainstorming the Topic – Questioning and Clarifying – Mock GDs

UNIT IV   9
Job Interview Tips - Etiquette– Self preparation and introduction - One-to-one interview &Panel Interview – Stress Interview management –Mock Interview in Google Meet-

UNIT V   **9**

Recognizing Differences between Group and Teamwork – Multitasking – Stress Management – Networking professionally- Leadership skills– Respecting Social Protocols- Work Ethics - Developing a Long-term Career plans – Panel Expectations.

                                             TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course Learners will be able to:
- Present oneself as an efficient candidate with adequate soft skills
- Make effective presentations
- Perform the role as a team member and individual.
- Demonstrate effective participation and engagement in group discussions. (Unit-III)
- Attend job interviews successfully and demonstrate soft skills suiting any work environment as a complete professional

RECOMMENDED SOFTWARE
- Globearena
- https://placement.freshersworld.com/
- Related Online Repositories for Soft Skill Development
- Videos from TED and YouTube

REFERENCES:

Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
1. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
2. Interact English Lab Manual for Undergraduate Students. Orient BalckSwan: Hyderabad, 2016.
3. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
4. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.
5. Singh, Prachi, Professional Communication JBC Press: Daryaganj, 2015.
6. Eric H. Glendinning, Oxford English for Careers Technology for Engineering and Applied Sciences:Student Book, Oxford University Press, Oxford, 2013.

Subject Code	Subject Name	Category	L	T	P	C
IT3601	**CLOUD AND BIG DATA ANALYTICS** **(LAB INTEGRATED)**	**PC**	**3**	**0**	**2**	**4**

Objectives:
• To understand and appreciate the evolution of cloud from the existing technologies.
• To be familiar with cloud computing and have knowledge on the various service models.
• To introduce the concepts of Big Data and Hadoop, and implement map reduce.
• To describe the data stream analytics methodologies.
• To visualize and analyze various data visualization techniques.

UNIT-I	CLOUD ENABLING TECHNOLOGIES	9
Technologies for Network-Based Systems - System Models for Distributed and Cloud Computing - Implementation Levels of Virtualization - Virtualization Structures/Tools and Mechanisms - Virtualization of CPU, Memory, and I/O Devices - Virtual Clusters and Resource Management - Virtualization for Data-Center Automation.

UNIT-II	CLOUD ARCHITECTURE AND SERVICES	9
Layered Cloud Architecture Design - NIST Cloud Computing Reference Architecture - Public, Private and Hybrid Clouds - laaS – PaaS – SaaS - Architectural Design of Compute and Storage Clouds -Public Cloud Platforms: GAE, AWS, and Azure.

UNIT-III	INTRODUCTION TO BIG DATA AND HADOOP	9
Introduction to Big Data, Types of Digital Data, Challenges of conventional systems - Web data, Evolution of analyticprocesses and tools, Analysis Vs reporting - Big Data Analytics, Introduction to Hadoop - Distributed Computing Challenges - History of Hadoop, Hadoop Eco System - Use case of Hadoop – Hadoop Distributors – HDFS – Processing Data with Hadoop – Map Reduce.

UNIT-IV	MINING DATA STREAMS	9
Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stockmarket predictions.

UNIT-V	DATA VISUALIZATION	9
Input for Visualization: Data and Tasks - Encoding Data with Marks and Channels - Creating a Scatter Plot - CommonVisualization Idioms: Bar Chart - Vertical & Horizontal - Pie Chart and Coxcomb Plot -Line Chart - Area Chart - Making Maps - Visualizing Trees and Networks - Data Reduction: Histograms - Hexbin Mapping – Crossfiltering.

	Total Contact Hours	**:**	**45**

	List of Experiments
1	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3	Install Google App Engine. Create hello world app and other simple web applications using python/java
4	Use GAE launcher to launch the web applications
5	Install Hadoop single node cluster and run simple applications like word count

6	Create a visualization of the dataset you chose for your project
	a) Bar Chart, Vertical & Horizontal
	b) Pie Chart and Coxcomb Plot
	c) Line Chart
	d) Area Chart
7	Create a histogram or aggregated bar chart of your project dataset.

		Contact Hours	:	30
		Total Contact Hours	:	75

Course Outcomes:

On completion of course students will be able to

CO1	Learn the key and enabling technologies that help in the development of cloud.
CO2	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
CO3	Understand the usage scenarios of Big Data Analysis and Hadoop framework and apply Mapreduce over HDFS.
CO4	Apply stream data models.
CO5	Use various data visualization techniques.

Text Book(s):

1	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2	Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley India; First Edition , 2015.
3	Visualization Analysis and Design, Tamara Munzner, AK Peters Visualization Series, CRC Press, Nov. 2014.
4	Anand Rajaraman and Jeffrey David Ulman, ―Mining of Massive Datasets‖, Cambridge University Press, First Edition , 2012.
5	Jiawei Han, Micheline Kamber –Data Mining Concepts and Techniques‖, Second Edition, Elsevier, Reprinted 2008.

Reference Books(s):

1	Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
2	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing‖, Tata Mcgraw Hill, 2013.
3	Jay Liebowitz, –Big Data and Business Analytics‖ Auerbach Publications, CRC press First Edition, 2013.
4	Tom White ― Hadoop: The Definitive Guide‖ Third Edition, O'Reilly Media, 2012.
5	Bill Franks, –Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, John Wiley & sons, First Edition, 2012.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	2	3	3	-	2	-	-	-	-	2	3
CO2	-	-	2	2	3	-	2	-	-	-	-	2	3
CO3	-	-	2	2	3	-	2	-	-	-	-	1	3
CO4	-	2	2	3	3	-	2	-	-	-	-	1	3
CO5	1	2	2	3	3	-	2	-	-	-	-	1	3
CO(Avg)	1.00	2.00	2.00	2.60	3.00	-	2.00	-	-	-	-	1.40	3.00

IT3602	MOBILE ARCHITECTURE AND DEVELOPMENT (LAB INTEGRATED)	L	T	P	C
		3	0	2	4

OBJECTIVES
- To endow with the knowledge required to understand emerging communications networks
- To describe the basic concepts and principles in mobile computing
- To understand the concept of Wireless LANs, PAN, and Mobile Networks
- To explain the structure and components for Mobile IP and Mobility Management
- To familiarize with Mobile apps development aspects

UNIT I	WIRELESS COMMUNICATION SYSTEMS	9

Cellular Networks - Types of handover - IEEE 802.11: System and Protocol Architecture - Bluetooth : User Scenarios– Architecture - GSM – Architecture - Location tracking and call setup - Mobility management - Handover- GSM SMS–International roaming for GSM – Mobile Number portability - VoIP service for Mobile Networks – GPRS –Architecture - Attach and detach procedures

UNIT II	MOBILE NETWORK AND TRANSPORT LAYERS	9

Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols– Multicast routing-TCP overWireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery –Transmission/Timeout Freezing-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks.

UNIT III	INTRODUCTION TO ANDROID	9

Mobile Application development and trends – Android overview and Versions – Android open stack, features – Setting up Android environment (Eclipse, SDK, AVD)- Simple Android application development – Anatomy of Android applications – Activity and Life cycle – Intents, services and Content Providers

UNIT IV	ANDROID USER INTERFACE	9

Android Architecture - Activity life cycle - Android User Interface – Layouts: Linear, Absolute, Table, Relative, Frame, Scrollview, Resize and reposition - Screen orientation — Views: Textview, EditText, Button, ImageButton, Checkbox, ToggleButton, RadioButton, RadioGroup, ProgressBar, AutocompleteText, Picker, Listviews and Webview– Displaying pictures with views: Gallery and ImageView, ImageSwitcher, Gridview — Displaying Menus: Helper methods, Option and Context.

UNIT V	NETWORKING SERVICES & APPLICATION COMPONENTS IN ANDROID	9

SMS Messaging: Sending and Receiving – Sending email and networking – Downloading binary and text data files – Access Web services – Developing android services: create your own services, performing long running task in a serviceperforming repeated task in a service-Location based service - Display map, zoom control, view and change, Marking, Geocoding, Get location - Publish Android applications and Deployment

TOTAL : 45 PERIODS

LIST OF EXPERIMENTS
1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that creates alarm clock.
6. Implement an application that uses Multi-threading.
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message

3

TEXT BOOKS

1. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2008.
2. Yi Bing Lin Inrichchlamtac, "Wireless and mobile network architecture", Wiley India Edition, Second Edition,2008.
3. Bill Phillips, Chris Stewart, and Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide" ,PearsonEducation, Third Edition, 2017.

REFERENCE BOOKS

1. William Stallings, "Wireless Communications and Networks", Pearson Education, SecondEdition, 2009.
2. Ed Burnette (2010), "Hello Android: Introducing Google's Mobile Development Platform", ThePragmatic Publishers, 3rd edition, North Carolina USA
3. Wei-Meng Lee, "Beginning Android 4 Application Development", John Wiley, First edition,2012.
4. Reto Meier, "Professional Android 4 Application Development", John Wiley, Second edition,2012.
5. ZigurdMednieks, Laird Dornin, Blake Meike G, Masumi Nakamura (2011), "Programming Android: Java Programming for the New Generation of Mobile Devices", OReilly Media, USA

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Identify the various types of handoff and Mobile Networks
CO2	Attain the knowledge to administrate and to maintain a Mobile Communication
CO3	Apply the network and transport layer protocols for mobile networks
CO4	Design and develop simple mobile applications with Android
CO5	Develop mobile applications using various components in Android

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)											PROGRAM SPECIFIC OUTCOMES (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	2	2	3	3
CO2	3	3	3	3	2	-	-	-	-	2	2	3	3
CO3	3	3	3	3	2	-	-	-	-	2	2	3	3
CO4	3	3	3	3	2	-	-	-	-	2	2	3	3
CO5	3	3	3	3	2	-	-	-	-	2	2	3	3

IT3603   FULL STACK WEB DEVELOPMENT   L T   P   C

(LAB INTEGRATED)

3 0   2 4

COURSE OBJECTIVES:
- To understand the fundamentals of web programming and client side scripting.
- To learn client side development using ReactJS.
- To understand and architect databases using NoSQL and SQL databases.
- To understand API development with Express Framework
- To learn the deployment of web application in Cloud

UNIT I   ADVANCED CSS &JAVASCRIPT CONCEPTS   9

Introduction to bootstrap- BS Grid- Images- Buttons- pagination- Icons-Dropdowns- Forms-Input-Carousel- Navigation bar and Tabs- Modal components - Objects – Promises – ES6 Let and Const – this keyword –Hoisting – type of - type Conversion – Template literals – Arrow function – Default parameter – Async Await – JSON

UNIT II   ADVANCED CLIENT SIDE PROGRAMMING   9

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - - JS Localstorage - Events - Lifting State Up - Composition and Inheritance

UNIT III   ADVANCED NODE JS AND DATABASE   9

Introduction to No SQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS Mongo DB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS

UNIT IV   SERVER SIDE PROGRAMMING WITH NODE JS   9

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines Static Files - async/await - Fetching JSON from Express

UNIT V   APP IMPLEMENTATION IN CLOUD   9

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

THEORY TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:
1. Create a responsive simple e-commerce home page with carousel, products in grid layout and login form in modal.
2. Fetch data from jsonplaceholder.com using both asynchronous function and promises.
3. Write a node js application which renders a simple html page. Note: use template engines and render static files from server side
4. Install mongodb local server; create a database which contains student info such as name, marks and department. Filter the student's database based on marks and department.
5. Create a sign up and login form with authentication in node js. Store the user data into mongodb database.
6. Create a simple e-commerce app using react.js with features such as filtering products and placing

5

order

Note: fetch the product data from mongodb through node.js

Deploy the e-commerce application developed on some cloud hosting platform.

Practicals: 30 Periods
Total Hours: 75 Periods

COURSE OUTCOMES:

Upon completion of the course the students should be able to:

- Write client side scripting CSS and JS.
- Implement and architect the client side of the web application.
- Implement Web Application using NodeJS.
- Architect NoSQL databases with MongoDB.
- Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud.

REFERENCES:

1. David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
3. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020
4. Marc Wandschneider, "Learning Node", Addison-Wesley Professional, 2nd Edition, 2016
5. Joe Beda, Kelsey Hightower, Brendan Burns, "Kubernetes: Up and Running", O'Reilly Media, 1 st edition, 2017
6. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, SaiVennam, "Cloud Without Compromise", O'Reilly Media, 1st edition, 2021

OPEN ELECTIVES OFFERED TO OTHER DEPARTMENT

S.No	Subject Code	Course Title	Contact Periods	L	T	P	C
1.	OIT601	Digital Forensics	3	3	0	0	3
2.	OIT602	Multimedia and Animation Techniques	3	3	0	0	3
3.	OIT603	Basics on Cyber Security and Ethical Hacking	3	3	0	0	3

OIT601   **DIGITAL FORENSICS**   **L T P C**
                                                                    3 0 0 3

OBJECTIVES
- Describe digital forensics and relate it to an investigative process.
- Explain the legal issues of preparing for and performing digital forensic analysis.
- Demonstrate the process of Electronic Discovery
- Explains the Intrusion Investigation Process
- Explain how to recover hidden data for forensic analysis from Windows file system

UNIT I   INTRODUCTION TO DIGITAL FORENSICS   9

Forensics Soundness, Forensic Analysis Fundamentals, Crime Reconstruction, Networks and the Internet, Conclusion.

UNIT II   FORENSIC ANALYSIS   9

Introduction, Applying the Scientific Method to Digital Forensics, Uses of Digital Forensic Analysis, Data Gathering and Observation, Hypothesis Formation, Evaluating Hypotheses, Conclusions and Reporting.

UNIT III   ELECTRONIC DISCOVERY   9

Introduction to Electronic Discovery, Case Management, Identification of Electronic data, Forensic Preservation of Data, Data Processing, Production of Electronic Data

UNIT IV   INTRUSION INVESTIGATION   9

Introduction and Methodologies, Preparation, Case Management and Reporting, Common Initial Observations, Scope Assessment, Collection, Analyzing Digital Evidence, Combination/ Correlation, Feeding Analysis Back into the Detection Phase.

UNIT V   WINDOWS FORENSIC ANALYSIS   9

Introduction - NTFS Overview, Forensic Analysis of the NTFS Master File Table (MFT) , Metadata , Artifacts of User Activities , Deletion and Destruction of Data, Windows Internet and Communications Activities , Windows Process Memory, BitLocker and Encrypting File System (EFS)

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of the course the students will be able to
- Gain in-depth knowledge in the field of Digital **forensics**
- Analysis of data to identify evidence
- Perform the Electronic Discovery of data
- Use mathematical techniques to detect fake data
- Perform forensic analysis on NTFS file system.

TEXT BOOKS:

1. Handbook of Digital Forensics and Investigation, Eoghan Casey , Elsevier Academic

Press, USA.2010

REFERENCES:
1. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics
Book by John Sammons, 2012.
2. Computer Forensics For Dummies 1st Edition by Carol Pollard,2008.

OIT602   **MULTIMEDIA AND ANIMATION TECHNIQUES**   **L T P C**
                                                                    3 0 0 3

OBJECTIVES
- To comprehend the building blocks of multimedia,
- To learn multimedia authoring tools,
- To understand data compression and applications of multimedia
- To know about the various multimedia tools
- To learn basic animations

UNIT I   **MULTIMEDIA –AN OVERVIEW**   **9**
Introduction- Components of Multimedia-Software Tools-Multimedia Presentation and
Production-Characteristics of a Multimedia Presentation-Hardware and Software
Requirements-Data Compression-Multimedia Sharing and Distribution-Uses of Multimedia-
Analog and Digital Representations–Digitization-Nyquist's Sampling Theorem-Quantization
Error-Visual Display Systems.

UNIT II   **MULTIMEDIA BASICS**   **9**
Text, Image, Audio, Video –types, representations, standards, file formats.

UNIT III   **MULTIMEDIA AUTHORING AND TOOLS**   **9**
Multimedia Authoring-Requirements - Intramedia Processing-Intermedia processing -
Multimedia Authoring Paradigms and User Interfaces-Device-Independent Content
Authoring-Distributed Authoring and Versioning-Multimedia Services and Content
Management-Asset Management- Adobe DreamWeaver-Flash- Edge Animate CC, Camatasia
Studio 8, Claro, E-Learning Authoring Tools –Articulate, Elucidate, Hot Lava.

UNIT IV   **MULTIMEDIA APPLICATIONS**   **9**
Multimedia Databases – Content Based Information Retrieval, Multimedia Communications -
Multimedia Information Sharing and Retrieval – Applications – Social Media Sharing, Online
Social Networking - Virtual Reality - Multimedia for Portable Devices, Collaborative
Multimedia Applications

UNIT V   **ANIMATION**   **9**

Appeal - Solid Drawing-Squash and Stretch - Timing- Staging - Secondary Action-Follow Through and Overlapping Action - Exaggeration-Arcs - Straight Ahead and Pose to Pose- Anticipation - Slow In and Slow Out-Character Design- Methods of Creation-Wave Forms- Character Speech -Character Movement-The Walk Cycle.

TOTAL (L:45): 45 PERIODS

TEXT BOOK:

1. Ranjan Parekh, "Principles of Multimedia", 2nd Edition, Mcgraw Hill, 2012.
2. Parag Havaldar and Gerard Medioni, ―Multimedia Systems - Algorithms, Standards and Industry Practices‖, Course Technology, Cengage Learning, 2010.

REFERENCES:

1. Ralf Steinmetz and Klara Nahrstedt, ―Multimedia Computing, Communications and Applications‖, First Edition, Pearson, 2005.
2. Ze - Nian Li, Mark S Drew and Jiangchuan Liu ―Fundamentals of Multimedia‖, Second Edition, Springer, 2014.
3. Heather D.Freeman "The Moving Image Workshop: Introducing Animation, Motion Graphics and Visual Effects in 45 Practical Projects" Published by Fairchild Books,2015

OIT603   **BASICS ON CYBER SECURITY AND ETHICAL**   **L T P C**
                                     HACKING   **3 0 0 3**

OBJECTIVES

- Acquire fundamental knowledge on the concepts of cyber security and Ethical Hacking
- Understand cyber-attack, types of cybercrimes, cyber laws
- Demonstrate the techniques for system hacking
- Detect and prevent the security attacks in different environments

UNIT I   **INTRODUCTION TO CYBER SECURITY**   **9**

Network and Security concepts- Information Assurance Fundamentals, Basic Cryptography- Symmetric Encryption, Public Key Encryption, Firewalls, Microsoft Windows Security Principles.

UNIT II   **ATTACKERS TECHNIQUES AND MOTIVATION**   **9**

Proxies- Types – Detecting the use of proxies , Tunneling Techniques- HTTP, DNS, ICMP, Steganography- Detection and prevention, Fraud Techniques- Phishing-Malicious code, Rogue Antivirus, Threat Infrastructure- Botnets, Fast-flux.

UNIT III   **MALICIOUS CODE**   **9**

Self-Replicating Malicious Code- Virus, worms, Evading Detection and Elevating Privileges,

Rootkits, Spyware, Token Kidnapping, Man in the middle attack, Form Grabbing, DLL injection- Windows Registry DLL Injection- Injecting Applications - Reflective DLL Injections, Browser Helper Objects

UNIT IV   INTRODUCTION TO ETHICAL HACKING   9

Foundation Topics, Security Fundamentals, Security Testing, Hacker and Cracker Description, Ethical Hackers, Test Plans, Ethics and Legality, Attacker's Process, The ethical hacker's process, Security and the Stack.

UNIT V   TECHNICAL FOUNDATIONS OF HACKING   9

Footprinting & Scanning- Overview of the Seven-Step Information-Gathering Process, Information Gathering, Documentation, Google Hacking, Usenet, Identifying Active machines, Finding Open Ports and Access Points, OS Fingerprinting, System Hacking, Malware threats – Trojans, Keystroke Logging and Spyware, Covert Communication, Malware Countermeasures, Sniffers, Session Hijacking, and Denial of Service.

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of the course the students will be able to

- Able to understand cyber-attack, types of cybercrimes, cyber laws
- Understand how to protect them self and ultimately society from such attacks
- Describe and understand the basics of the ethical hacking
- Demonstrate the techniques for system hacking
- Detect and prevent the security attacks in different environments

TEXT BOOKS:

1. Cyber Security Essentials by James Graham , Richard Howard, Ryan Olson, CRS Press, Taylor & Francis Group, New York, 2019
2. Certified Ethical Hacker, Version 9, Second Edition, Michael Gregg, Pearson IT Certification, 2013

REFERENCES:

1. Anti- Hacker Tool Kit (Indian edition) by Mike Sherma , Mc Graw Hill publication. 2012
2. Hacking the Hacker, Roger Grimes, Wiley, 2010
3. The Unofficial Guide to Ethical Hacking, Ankit Fadia, Premier Press, 2013

PROFESSIONAL ELECTIVE – III
SEMESTER-VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT3605	Digital Image Processing	PE	3	3	0	0	3
2.	IT3606	Social Network Analysis	PE	3	3	0	0	3
3.	IT3607	Information Security	PE	3	3	0	0	3
4.	IT3608	Software Defined Networks	PE	3	3	0	0	3
5.	IT3609	Cyber Forensics	PE	3	3	0	0	3
6.	IT3610	Deep Learning Techniques	PE	3	3	0	0	3
7.	IT6011	Service Oriented Architecture	PE	3	3	0	0	3
8.	IT6012	Embedded and Realtime System	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE – IV
SEMESTER-VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT6013	Information Retrieval Techniques	PE	3	3	0	0	3
2.	IT6014	Green Computing	PE	3	3	0	0	3
3.	IT6015	GPU Architecture and Programming	PE	3	3	0	0	3
4.	IT6016	Natural Language Processing	PE	3	3	0	0	3
5.	IT6017	Parallel Algorithms	PE	3	3	0	0	3
6.	IT6018	Mobile Pervasive Computing	PE	3	3	0	0	3
7.	IT6019	Electronic Commerce	PE	3	3	0	0	3
8.	IT6020	Fundamentals of Nano Science	PE	3	3	0	0	3