SRI VENKATESWARA COLLEGE OF ENGINEERING,

(An Autonomous Institution, Affiliated to Anna University, Chennai – 600025)

B. E. Computer Science and Engineering

CURRICULUM AND SYLLABUS

REGULATION – 2022

CHOICE BASED CREDIT SYSTEM

Curriculum Revision No:		Board of Studies recommendation date :		Academic Council Approved date:	
Salient Points of the revision	01.	The courses "Scientific Thoughts in Tamil" in Semester I and "Heritage of Tamil" in Semester II are introduced as per the recommendations of Anna University/Government of Tamil Nadu.			
	02.	The course "Technical Drawing " is introduced in Semester-II in place of "Engineering Drawing" of R2018.			
	03.	The Course Python For Data Science is introduced in Semester II as Lab integrated Course			
	04.	Mini project is introduced in the course Digital Principles and System Design Laboratory			
	05.	Communication Skills development is ensured through Communicative English and Induction Programme			

SRI VENKATESWARA COLLEGE OF ENGINEERING,

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REGULATIONS 2022

B. E COMPUTER SCIENCE AND ENGINEERING

CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Computer Science and Engineering program will prepare its graduates:

1. Create value to organizations as an employee at various levels, by improving the systems and the processes using appropriate methods and tools learnt from the programmme
2. Run an organization successfully with good social responsibility as an entrepreneur, making use of the knowledge and skills acquired from the programme
3. Contribute to the future by fostering research in the chosen area as an erudite scholar, based on the motivation derived from the programme

PROGRAM OUTCOMES (POs)

POGRADUATE ATTRIBUTES

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex **engineering** problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs **with** appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and **interpretation** of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilitiesrelevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Ability to adapt to a rapidly changing environment by learning and employing new programming skills and technologies.
2. Ability to use diverse knowledge across the domains with inter-personnel skills to deliver the Industry need.

PEO's – PO's& PSO's MAPPING: (Example)

POs	PEOs		
	I	II	III
1.	✓	✓	✓
2.		✓	✓
3.	✓	✓	✓
4.	✓		
5.	✓	✓	✓
6.		✓	
7.		✓	
8.	✓	✓	
9.	✓	✓	✓
10.	✓		
11.	✓	✓	✓
12.	✓		✓
PSO1	✓		✓
PSO2	✓	✓	✓

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REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM FOR SEMESTERS I TO III AND SYLLABI FOR SEMESTERS I AND III

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
1.	IP22151	Induction Programme (Common to all Branches)		-	-	-	-	-	Nil	F
Theory Subjects										
2.	HS22151	Tamil language and Heritage of Ancient Tamil Society (Common to all Branches)	MC	1	0	0	1	1	NIL	F
3.	HS22152	Communicative English (Common to all Branches)	HS	3	0	0	3	3	NIL	F
4.	MA22151	Applied Mathematics I (Common to all Branches except MR)	BS	3	1	0	4	4	NIL	F
5.	PH22151	Applied Physics (Common to AD, CS, EE, EC, IT)	BS	3	0	0	3	3	NIL	F
6.	CY22151	Applied Chemistry (Common to AD, CS, EE, EC, IT)	BS	3	0	0	3	3	NIL	F
7.	EE22151	Basic Electrical and Electronics Engineering (Common to all Branches except CH, EE, EC)	ES	3	0	0	3	3	NIL	F
8.	IT22101	Programming for Problem Solving (Common to IT, AD, CS, EE, EC)	ES	3	0	0	3	3	NIL	F
Practical Subjects										
9.	PH22161	Physics Laboratory (Common to all Branches except BT)	BS	0	0	2	1	2	NIL	F
10.	EE22111	Basic Electrical and Electronics Engineering Laboratory (Common to all Branches except EC)	ES	0	0	2	1	2	NIL	F
11.	IT22111	Programming for Problem Solving Laboratory (Common to IT, AD, CS, EE, EC)	ES	0	0	3	1.5	3	NIL	F
			Total	**19**	**1**	**7**	**23.5**	**27**	**-**	**-**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
Theory Subjects										
1.	HS22251	Science and Technology in Ancient Tamil Society (Common to all Branches)	MC	2	0	0	2	2	NIL	F
2.	HS22252	Technical English (Common to all Branches)	BS	3	0	0	3	3	NIL	F
3.	MA22251	Applied Mathematics II (Common to all Branches except MR)	BS	3	1	0	4	4	NIL	F
4.	ME22251	Technical Drawing (Common to AD, CS, IT)	BS	1	0	2	2	3	NIL	F
5.	CS22201	Python For Data Science (Common to CS & AD)	ES	3	0	2	4	4	NIL	F
6.	CS22202	Digital Principles and System Design (Common to CS & AD)	PC	3	0	0	3	3	NIL	F
7.	CS22203	Object Oriented Programming	PC	3	0	0	3	3	NIL	F
Practical Subjects										
8.	CS22211	Digital Principles and System Design Laboratory	PC	0	0	3	1.5	3	NIL	F
9.	CS22212	Object Oriented Programming Laboratory	PC	0	0	3	1.5	3	NIL	F
			Total	**18**	**1**	**10**	**24**	**28**	**-**	**-**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
Theory Subjects										
1.	MA22353	Discrete Mathematics (Common to CS & IT)	BS	3	1	0	4	4	Nil	F
2.	AD22301	Artificial Intelligence (Common to AD & CS)	PC	3	0	0	3	3	Nil	F
3.	CS22301	Database Management Systems (Common to CS & AD)	PC	3	0	0	3	3	Nil	F
4.	CS22302	Datamining and Data warehousing (Common to CS & AD)	PC	3	0	0	3	3	Nil	F
5.	CS22303	Data Structures	PC	3	0	0	3	3	Nil	F
6.	CS22304	Microprocessor and Computer Architecture	PC	3	0	0	3	3	Nil	F
Practical Subjects										
7.	CS22311	Database Management Systems Laboratory (Common to CS & AD)	PC	0	0	3	1.5	3	Nil	F
8.	CS22312	Data Structures Laboratory	PC	0	0	3	1.5	3	Nil	F
9.	CS22313	Microprocessor Laboratory	PC	0	0	3	1.5	3	Nil	F
			Total	**18**	**1**	**9**	**23.5**	**28**	-	-

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
Theory Subjects										
1.	MA22454	Probability and Queuing Theory (Common to CS and IT)	BS	3	1	0	4	4	Nil	F
2.	CS22401	Operating Systems (Common to CS and AD)	PC	3	0	0	3	3	Nil	F
3.	CS22402	Machine Learning Techniques (Common to CS and AD)	PC	3	0	0	3	3	Nil	F
4.	CS22403	Design and Analysis of Algorithms	PC	3	0	0	3	3	Nil	F
5.	CS22409	Java Programming: Theory and Practices	PC	3	0	2	4	5	Nil	F
6.	GE22451	Environmental Sciences and Sustainability (Common to All Branches)	BS	3	0	0	3	3	Nil	F
Practical Subjects										
7.	CS22411	Operating Systems Laboratory (Common to CS and AD)	PC	0	0	3	1.5	3	Nil	F
8.	CS22412	Artificial Intelligence and Machine Learning Laboratory	PC	0	0	3	1.5	3	Nil	F
			Total	**18**	**1**	**8**	**23**	**27**	-	-

HS22151

தமிழ் மொழியும் தமிழர் மரபும்
TAMIL LANGUAGE AND HERITAGE OF TAMILS

(Common to all Branches)

L	T	P	C
1	0	0	1

பாடத்தின்நோக்கங்கள் :

- தமிழ் மொழியின் தோற்றம் பற்றியும், திணை கருத்துக்கள் வாயிலாக வாழ்வியல் முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.
- இந்திய தேசிய சுதந்திர இயக்கத்தில் தமிழர்களின் பங்களிப்பு மற்றும் தமிழர்களின் மேலாண்மை முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.

OBJECTIVES:

- They will learn about the origin of the Tamil language and the ways of life through five types of lands.
- They will also learn about the contribution of Tamils in the Indian National Freedom Movement and the management methods of Tamils.

அலகு 1 தமிழுக்கும் தொழில்நுட்பக் கல்விக்கும் உள்ள தொடர்பு **3**

மொழி மற்றும் பாரம்பரியம்: இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழில் செம்மொழி இலக்கியம் - உ.வே.. சாமிநாதய்யர். ஆறுமுகநாவலர் ஆகியோரின் பங்களிப்பு – தொழில் நுட்பக் கல்வியில் தமிழ் மொழியின் முக்கியத்துவம்.

UNIT I LANGUAGE AND HERITAGE

Language families in India – Dravidan Languages – Tamil as a Classical language – Classical Literature in Tamil – Contribution of U. Ve. Saminathaiyar. Arumuka Navalar – Importance of Tamil language in technical education.

அலகு 2 திணை கருத்துக்கள் **9**

திணை கருத்துக்கள்: -ஐந்து வகை நிலங்கள், விலங்குகள், கடவுள்கள், தொழில், வாழ்க்கை முறைகள், இசை, நடனம், உணவு முறை, தமிழர்களின் தாவரங்கள் மற்றும் விலங்கினங்கள் – தொல்காப்பியம் மற்றும் சங்க இலக்கியங்களில் இருந்து அகம் மற்றும் புரம் கருத்து – தமிழ் பற்றிய அறம் கருத்து – கல்வி மற்றும் எழுத்தறிவு சங்க காலம் – சங்ககாலத்தின் பண்டைய நகரங்கள் மற்றும் துறைமுகங்கள் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – சோழர்களின் வெளிநாட்டு வெற்றி.

UNIT II THINAI CONCEPTS

Five types of lands, animals, Gods, occupation, life styles, music, dance , food style, Floara and Fauna of Tamils - Agam and puram concept from Tholkappiyam and Sangam Literature – Aram concept of Tamil – Education and Literacy during Sangam Age – Ancient cities and Ports of Sangam Age – Export and Import during Sangam Age - Overseas Conquest of Choloas.

அலகு 3 தமிழரின் மரபு **3**

இந்திய தேசிய சுதந்திர இயக்கம் மற்றும் இந்திய கலாச்சாரத்திற்கு தமிழர்களின் பங்களிப்பு:- சுப்ரமணிய பாரதி, வாஞ்சிநாதன், சுப்பிரமணிய சிவா, வீரபாண்டிய கட்ட பொம்மன், வா..ஊ சிதம்பரம் பிள்ளை, தீரன் சின்னமலை, மருது பாண்டிய சகோதரர்கள், பூலி தேவர், திருப்பூர் குமரன், வீரமங்கை வேலு நாச்சியார் - ,தமிழர் இலக்கியங்களில் மேலாண்மை கருத்துக்கள் (கி. மு. 500 முதல் கி. பி 200 வரை) – அகநானூறு, புறநானூறு, திருக்குறள் ஆகியவற்றில் மேலாண்மைக் கருத்துகள்.

UNIT -3 HERITAGE OF TAMILS

Contribution of Tamils to Indian National Freedom Movement and Indian Culture: Contributions of Subramanya Bharathi, Vanchinathan, Subramaniya Siva, Veerapandiya Kattabomman, V O Chidambaram Pillai, Dheeran Chinnamalai, The Maruthu Pandiyar, Puli Thevar, Tiruppur Kumaran, Veera Mangai Velunachiyar.

TOTAL : 15 PERIODS

பாடநெறி முடிவுகள் :
OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	மாணவர்கள் தமிழ் மொழித் தோற்றம் பற்றித் தெரிந்து கொள்வார்கள். Students will learn about the origin of the Tamil language	1
CO2	தமிழர்களின் வாழ்வியல் முறைகளைத் தெரிந்து கொள்வார்கள். They will know the ways of life of Tamils.	2
CO3	தமிழர்களின் சுதந்திர போராட்ட வீரர்களை பற்றியும், மேலாண்மைகளை பற்றியும் தெரிந்து கொள்வார்கள். They will know about the freedom fighters of Tamils and the management of Tamils	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

பாடநூல்கள்:
REFERCENCES:

1. **பொன். முத்துகுமாரன்** (2002), "தமிழ் மரபு", காந்தளகம், 68, அண்ணா சாலை, சென்னை 600 002
2. **பி. டிஸ்ரீனிவாச ஐயங்கார்** (தமிழக்கமும் திறனாய்வும்) **புலவர் கா. கோவிந்தன்** (1988), "தமிழர் வரலாறு (முதல் பகுதி)", திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூற்பதிப்பு கழகம் ,154, TTK சாலை, சென்னை 18.
3. **டாக்டர். கே. கே. பிள்ளை** (2009), "தமிழக வரலாறு மக்களும் பண்பாடும்", உலக தமிழாராய்ச்சி நிறுவனம், தரமணி , சென்னை 600113
4. **முனைவர். ச. இராஜேந்திரன்** (2004), "தமிழில் சொல்லாக்கம்", தஞ்சாவூர் தமிழ் பல்கலைக் கழகம் வெளியீடு

COURSE ARTICULATION MATRIX:

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	3	-	3	3	2	-	3	3	-	2	-	-
2	-	-	3	2	3	3	-	1	3	3	-	-	-	-
3	-	-	3	2	3	3	2	-	3	3	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

HS22152 **COMMUNICATIVE ENGLISH**

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES

- Enable learners to interact fluently on everyday social contexts.
- Train learners to engage in conversations in an academic/scholarly setting.
- Instil confidence in learners to overcome public speaking barriers.
- Develop learners' ability to take notes and in the process, improve their listening skills
- Enhance learners' reading skill through reading text passages for comprehension and contemplation.
- Improve learners' skills to write on topics of general interest and drafting correspondences for general purposes.

UNIT I **9**

Listening - short video clips - conversational scenes form movies, celebrities' speeches /interviews. Speaking - several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading - short comprehension passages - making inferences, critical analysis. Writing - completing the incomplete sentences - developing hints from the given information. Grammar - Wh-Questions and Yes or No questions - Parts of speech. Vocabulary development - prefixes - suffixes - articles - countable / uncountable nouns.

UNIT II **9**

Listening - customer care voice files, short narratives - identifying problems and developing telephone etiquettes. Speaking - speaking over skype/ whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading - reading the headlines on news magazines - slogans and taglines from advertisements. Writing - free writing - writing - headlines, slogans and taglines individual inspirations. Grammar- conjunctions, idioms, phrases, quotes. Vocabulary development - guessing the meanings of words in different contexts.

UNIT III **9**

Listening - courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking - language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading - language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers- coherence, rearranging the jumbled sentences. Grammar - adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development - concise approach, single word substitution.

UNIT IV **9**

Listening - Sports commentaries, advertisements with users' criticisms; Speaking - for social causes, for promoting a concept, negotiating and bargaining; Reading - review of a product, movie, movement or a system; Writing - writing for advertisements, selling a product; Grammar – Tenses - Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development - synonyms, antonyms and phrasal verbs.

UNIT V **9**

Listening - video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading - columns and articles on home science; Writing - correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses - Vocabulary development - collocations.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Acquire adequate vocabulary for effective communication	**3**
CO2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and newspapers.	**3**
CO3	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	**4**
CO4	Comprehend conversations and short talks delivered in English.	**6**
CO5	Write short write-ups and personal letters and emails in English	**6**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

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1. Department of English, Anna University. "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai, 2012.
2. Downes, Colm, "Cambridge English for Job-hunting", Cambridge University Press, New Delhi, 2008.
3. Murphy, Raymond, "Intermediate English Grammar with Answers", Cambridge University Press, 2000.
4. Thomson, A.J., "Practical English Grammar 1 & 2", Oxford, 1986.

Web Link:

1. http://www.usingenglish.com
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3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

Software

1. Face2Face Advance - Cambridge University Press, 2014
2. English Advance Vocabulary - Cambridge University Press
3. IELTS test preparation - Cambridge University Press 2017
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition
5. CAMBRIDGE Preparation for the TOEFL TEST - Cambridge University Press, 2017

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

MA22151 **APPLIED MATHEMATICS – I**

(Common to all Branches except MR)

L	T	P	C
3	1	0	4

OBJECTIVES

- Compute eigen values and eigen vectors and use in diagonalization and in classifying real quadratic forms.
- Study differential calculus and its applications to relevant Engineering problems.
- Compute derivatives using the chain rule or total differentials.
- Understand the rotation of two dimensional geometry using definite integrals.
- Acquaint with the Mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES **12**

Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem –Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms.

UNIT II APPLICATION OF DIFFERENTIAL CALCULUS **12**

Curvature and radius of Curvature– Centre curvature – Circle of curvature –Evolutes– Envelopes-Evolute as Envelope of Normals.

UNIT III DIFFERENTIAL CALCULUS FOR SEVERAL VARIABLES **12**

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians 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 IV APPLICATION OF DEFINTE INTEGRALS **12**

Integration by Parts-Bernoulli's formula for integration- Definite integrals and its Properties- Solids of Revolution- Disk Method- Washer Method- Rotation about both x and y axis and Shell method.

UNIT V MULTIPLE INTEGRALS **12**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals – Volume of solids.

TOTAL : 60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Solve the Eigen value problems in matrices.	**2**
CO2	Apply the basic notion of calculus in Engineering problems and to tackle for different geometries	**2**
CO3	Perform calculus for more than one variable and its applications in Engineering problems.	**2**
CO4	Apply definite integrals for design of three dimensional components	**2**
CO5	Evaluate multiple integral in Cartesian and polar coordinates.	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics",43rd Edition, Khanna Publications, Delhi, (2015).

REFERCENCES

1. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications Pvt. Ltd., 2014.
2. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education,(2016).
3. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).

Web Link:

1. https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf
2. https://www.sydney.edu.au/content/dam/students/documents/mathematics-learning-entre/integration-definite-integral.pdf

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	-	-	-	-	-	-	-	-	3	2	-
2	3	3	2	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	3	-	1
4	3	3	2	-	-	-	-	-	-	-	-	3	-	-
5	3	3	2	-	-	-	-	-	-	-	-	3	-	1

3-High, 2-Medium, 1-Low, '-' – no correlation

PH22151 **APPLIED PHYSICS**

(Common to AD, CS, EE, EC, IT)

L	T	P	C
3	0	0	3

OBJECTIVES

- To enhance the fundamental knowledge in Physics and its applications relevant to various Streams of Engineering and Technology

UNIT I LASERS AND FIBER OPTICS **9**

Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser – CO_2 Laser – Exceimer Laser – Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication - fibre optic sensors: pressure and displacement - Endoscope.

UNIT II QUANTUM PHYSICS **9**

Black body radiation – Planck's theory (derivation)- deduction of Wien's and Rayleigh Jean's law – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional - three dimensional potential box–Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals

UNIT III CRYSTAL PHYSICS **9**

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances- coordination number and packing factor for SC, BCC, FCC, HCP and Diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults

UNIT IV WAVES AND OSCILLATIONS **9**

Travelling waves, Wave equation for string ,Energy and momentum , Resonance Superposition & Reflection, Standing waves, Harmonic oscillations, Damped harmonic motion- Forced oscillations, amplitude resonance - Expression for Resonant frequency, Electrical analogy of mechanical oscillations, Quality factor and sharpness of resonance, Electrical analogy of mechanical oscillators

UNIT V ELECTROMAGNETIC WAVES **9**

Maxwell's Equations. Vector and Scalar Potentials. Plane waves in Dielectric media. Poynting Theorem and Poynting Vector.- Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density, EM Wave Propagation in Unbounded Media, Plane EM waves

through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Develop an understanding about photonics and Fiber Optic communication system	**2**
CO2	Acquire the knowledge of Quantum mechanics	**3**
CO3	Classify and demonstrate the fundamentals of crystals and their defects.	**3**
CO4	Gain knowledge in waves and oscillations	**2**
CO5	Enable to explore the theory of electromagnetic waves and its propagation	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Gaur R.K., Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.
2. Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
3. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
4. Arumugam M, "Materials Science", Anuradha Publications, 2015.

REFERCENCES:

1. David Halliday, Robert Resnick, Jearl Walker, "Principles of Physics", 10th Edition, Wiley,2015.
2. Peter Atkins, Julio De Paula, "Physical Chemistry",10th Edition., Oxford University Press,2014.
3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S,"Concepts of Modern Physics", 7th Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	-	2	2	-	-	-	1	-	-	1	-
2	3	3	2	2	2	2	-	-	-	1	-	2	-	1
3	3	-	-	-	-	-	-	-	-	1	-	-	1	-
4	3	-	2	-	-	-	-	-	-	1	-	-	-	-
5	3	3	2	2	2	-	-	-	-	1	-	2	-	2

3-High, 2-Medium, 1-Low, '-' – no correlation

CY22151 **APPLIED CHEMISTRY**

(Common to AD, CS, EE, EC, IT)

L	T	P	C
3	0	0	3

OBJECTIVES

- To make the students conversant with basics of electrochemistry and batteries.
- To develop an understanding of the laws of photochemistry and its basics.
- To acquaint the students with the basics of nanomaterials, their properties and uses.
- To acquire the basic knowledge on sensors which are essential for the software engineers for develop new devices.
- To enable the students to understand the types of instruments for material analysis and their working principle.

UNIT I ELECTROCHEMISTRY 9

Electrodes and electrochemical cells – electrode potential, standard electrode potential, single electrode potential and its determination, types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation - Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (dry cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery) and next generation batteries.

UNIT II PHOTOCHEMISTRY 9

Laws of photochemistry – Grotthuss-Draper law, Stark–Einstein law and Lambert Beer Law – determination iron by spectrophotometer. Quantum efficiency – Photo processes – internal conversion, inter-system crossing, fluorescence, phosphorescence and photo-sensitization-quenching of fluorescence and its kinetics, Stern-Volmer relationship. Applications of photochemistry.

UNIT III NANOCHEMISTRY 9

Basics and scale of nanotechnology, different classes of nanomaterials, Distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Synthesis of nanomaterials, fabrication (lithography) and its applications – Basics of nanophotonics and quantum confined materials (surface plasmon resonance).

UNIT IV CHEMICAL SENSOR 9

Sensors, sensor science and technology, types of sensors. Chemical Sensors – characteristics and elements. Electrochemical sensors – voltammetry, potentiometric sensors, amperometric sensors, polarization techniques.

UNIT V INSTRUMENTATION TECHNIQUES 9

Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental method - Electromagnetic radiation-UV-visible and IR spectroscopy: principles, instrumentation (Block diagram only) and applications. Separation techniques chromatography: Gas chromatography, liquid chromatography -importance of column technology (packing, capillaries), separation based on increasing number of factor (volatility, solubility, interactions with stationary phase, size)

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Describe the electrolytic and electrochemical cell, various fundamental aspects of electrochemistry and batteries	**2**
CO2	Interpret the photochemical reactions and their applications	**2**
CO3	Differentiate the nano and bulk materials, their synthesis and its applications in various fields.	**3**
CO4	Acquire the basic knowledge on chemical sensors to develop an interdisciplinary approach among the students which are essential for the software engineers	**1**
CO5	Develop theoretical principles of UV-visible and IR spectroscopy and separation techniques	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010.
2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
3. B.K.Sharma, "Instrumental Methods of Chemical Analysis", 28th Edition, Goel Publishing House, 2012.
4. Skoog, D.A. Holler F.J. Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India.

REFERCENCES:

1. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
2. B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.

3. John Vetelino, AravindReghu, Introduction to Sensors , Taylor & Francis Group, CRC Press, 1st edition, 2010.
4. Peter Gründler, Chemical Sensors, An Introduction for Scientists and Engineers, Springer-Verlag Berlin Heidelberg 2007.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	-	-	-	-	-	-	-	3	1	1
2	3	3	-	-	-	3	3	-	-	-	-	3	-	-
3	3	3	3	-	-	3	3	1	-	-	-	3	-	1
4	3	3	3	-	1	3	3	-	-	-	-	3	-	1
5	3	3	-	2	-	3	3	-	-	-	-	3	1	-

3-High, 2-Medium, 1-Low, '-' – no correlation

EE22151 **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

(Common to all Branches except CH, EE, EC)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the basic theorems used in Electrical circuits.
- To educate on the different concepts and functions of electrical machines.
- To introduce electron devices and its applications.
- To explain the principles of digital electronics.
- To impart knowledge on the principles of measuring instruments.

UNIT I ELECTRICALCIRCUITS **9**

Ohm's Law – Kirchhoff's Laws - Steady State Solution of DC Circuits using Mesh and Nodal Analysis -Introduction to AC Circuits - Waveforms and RMS Value - Power and Power factor - Single Phase and Three Phase AC Balanced Circuits.

UNIT II ELECTRICAL MACHINES **9**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor, Single Phase Transformer.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS **9**

Characteristics of PN Junction Diode - Zener Effect - Zener Diode - LED, Photo diode and its Characteristics-Half Wave and Full Wave Rectifiers-Voltage Regulation. Bipolar Junction Transistor-Common Emitter Configuration, Characteristics and CE as an Amplifier - Photo transistors

UNIT IV DIGITAL ELECTRONICS **9**

Number System Conversion Methods–Simplification of Boolean Expression using K-Map – Half and Full Adders – Flip-Flops – Shift Registers - SISO, SIPO, PISO, PIPO and 4-bit Synchronous and Asynchronous UP Counters.

UNIT V MEASURING INSTRUMENTS **9**

Types of Signals: Analog and Digital Signals- Construction and working Principle of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters. Instrumentation Amplifier, – R-2R ladder Type D/A Converter - Flash Type and Successive Approximation Type A/D Converter.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Compute the electric circuit parameters for simple problems	**2**
CO2	Understand the construction and characteristics of different electrical machines.	**1**
CO3	Describe the fundamental behavior of different semiconductor devices and circuits.	**2**
CO4	Design basic digital circuits using Logic Gates and Flip-Flops.	**3**
CO5	Analyze the operating principle and working of measuring instruments.	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020.
2. SedhaR.S., "A Text Book of Applied Electronics", S.Chand&Co., 2014.

REFERCENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics Engineering", Tata McGraw Hill, 2013.
2. MehtaVK,"Principles of Electronics", S. Chand &CompanyLtd, 2010.
3. M. Morris Mano, "Digital Logic & Computer Engineering", Prentice Hall of India, 2004.
4. Mahmood Nahvi and Joseph A.Edminister,"Electric Circuits", Schaum' Outline Series, McGraw Hill, Fourth Edition, 2007.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	2	-	-	-	-	2	-	-
2	3	3	3	3	-	-	2	-	-	-	-	2	-	-
3	3	3	3	3	-	-	2	-	-	-	-	2	-	-
4	3	3	3	3	-	-	2	-	-	-	-	2	-	-
5	3	3	3	3	-	-	2	-	-	-	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

IT22101 **PROGRAMMING FOR PROBLEM SOLVING**
(Common to IT, AD, CS, EE, EC)

L	T	P	C
3	0	0	3

OBJECTIVES

- Learn the organization of a digital computer.
- Learn to think logically and write algorithms or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Simple model of a Computer – Hardware – Software – Data Representation, Introduction to Computer Networks and Internet, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart

Suggested Activities: Case study – Understanding the analysis and design of the Student Management System (SMS).

UNIT II C PROGRAMMING BASICS 9

Introduction to 'C' programming – structure of a 'C' program – Conversion of simple algorithm to program. Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

Suggested Activities: Case study: Dataset creation and Grade calculation in SMS

UNIT III ARRAYS AND STRINGS 9

Array: declaration, initialization. Multi dimensional arrays. Strings: Strings vs Character arrays, string operations

Suggested Activities - Grade sheet generation in SMS

UNIT IV FUNCTIONS AND STRUCTURES 9

Need for Modular programming, Functions: definition, call, arguments, call by value. Call by reference, Recursion. structures and unions: Need, declaration, Accessing Structure elements, Arrays of structures

Suggested Activities: Redesigning SMS in terms of modules

UNIT V POINTERS AND FILE HANDLING IN C 9

Pointers : Introduction, pointers to primitive datatypes, pointers to user defined datatypes: arrays and structures, array of pointers, Dynamic Memory Allocation. Files: Read/Write of binary and text files. Preprocessor directives

Suggested Activities: Mange I/O in SMS using Files

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Identify input and output from the real word problem scenarios	**3**
CO2	Represent the design flow using Flow-charts and application logic using pseudo code	**3**
CO3	Apply appropriate programming constructs to implement a given design using C.	**3**
CO4	Debug and customize an existing software developed in C	**5**
CO5	Develop a modularized software application In C for the given user requirements	**6**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018.
2. R G Dromey, "How to Solve it using Computer", Pearson,2006.

REFERCENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGrawHill, 2010
4. Reema Thareja, "Programming in C", 2nd ed., Oxford University Press, 2016

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	3	-	-	-	-	-	-	3	-	-	2	2	-
2	1	3	-	-	-	-	-	-	3	-	-	2	2	1
3	1	-	3	2	1	-	-	-	3	-	-	2	3	-
4	1	-	3	2	1	-	-	-	3	-	-	2	-	3
5	1	-	3	2	1	-	-	-	3	-	-	2	1	3

3-High, 2-Medium, 1-Low, '-' – no correlation

PH22161 **PHYSICS LABORATORY**

(Common to all Branches except BT)

L	T	P	C
0	0	3	1.5

OBJECTIVES

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS

1. a) Determination of Wavelength, and particle size using Laser.
   b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of Young's modulus by Non uniform bending method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
7. Determination of Rigidity modulus of a given wire -Torsional Pendulum
8. Energy band gap of a Semiconductor
9. Determine the Hysteresis loss of a given Specimen
10. Calibration of Voltmeter & Ammeter using potentiometer.

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos. or Server with C compiler supporting 30 terminals or more

REFERENCES:

1."Physics Laboratory practical manual", 1st Revised Edition by Faculty members, 2018.

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	**4**
CO2	Comprehend the Experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of Engineering.	**3**
CO3	Apply the basic concepts of Physical Science to think innovatively and also improve the creative skills that are essential for engineering.	**3**
CO4	Evaluate the process and outcomes of an experiment quantitatively and qualitatively	**3**
CO5	Extend the scope of an investigation whether or not results come out as expected	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**3**	**1**	**-**	**2**	**2**	**-**
2	**3**	**3**	**-**	**3**	**-**	**2**	**-**	**-**	**3**	**1**	**-**	**2**	**2**	**-**
3	**3**	**3**	**2**	**3**	**2**	**2**	**-**	**-**	**3**	**1**	**-**	**2**	**1**	**2**
4	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**1**	**-**	**2**	**-**	**-**
5	**3**	**3**	**-**	**3**	**2**	**-**	**-**	**-**	**3**	**1**	**-**	**2**	**-**	**1**

3-High, 2-Medium, 1-Low

EE22111 **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY**
(Common to all Branches except EC)

L	T	P	C
0	0	2	1

OBJECTIVES

- To provide exposure to the students with hands on experience in basic of Electrical and Electronics wiring connection and measurements.
- To introduce the students to Electrical Machines and basic laws of Electrical Circuits.

LIST OF EXPERIMENTS

1. Wiring – Residential house wiring and Stair case wiring.
2. (a) AC Analysis- Measurement of electrical quantities–voltage, current, power, and power factor using RLC.
   (b) Study of three phase system.
3. Energy conservation - Measurement and comparison of energy for incandescent lamp and LED lamp.
4. (a) Identification of circuit components (Resistor, Capacitor, Diode and BJT) and soldering practice.
   (b) Signal Measurement- Measurement of peak to peak, RMS, average, period, frequency of signals using CRO.
5. (a) VI Characteristics of Solar photovoltaic panel.
   (b) Design of Solar PV Array and Battery sizing for Residential solar PV system.
6. Design a 5V/12V Regulated Power Supply using FWR and IC7805 / IC7812.
7. DC Analysis- Verification of Ohm's Law and Kirchhoff's Laws.
8. Study of Transformer and motor characteristics.

TOTAL : 30 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Wiring of basic electrical system and measurement of electrical parameters.	**4**
CO2	Verify the basic laws of Electric circuits and select various Electrical Machines.	**4**
CO3	Construct electronic circuits and design solar photovoltaic system.	**4**
CO4	Apply the concept of three-phase system.	**4**
CO5	Construct a fixed voltage regulated power supply.	**4**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	2	-	-	2	-	-
2	3	3	3	3	-	-	-	-	2	-	-	2	-	-
3	3	3	3	3	-	-	-	-	2	-	-	2	-	-
4	3	3	3	3	-	-	-	-	2	-	-	2	-	-
5	3	3	3	3	-	-	-	-	2	-	-	2	-	-

3-High, 2-Medium, 1-Low

IT22111 **PROGRAMMING FOR PROBLEM SOLVING LABORATORY**
(Common to IT, AD, CS, EE, EC)

L	T	P	C
0	0	3	1.5

OBJECTIVES

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

LIST OF EXPERIMENTS

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions.
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files
13. Develop modularized application for any one of the following scenarios Scenarios:
    - Student Management System
    - Stock Management System
    - Banking Application
    - Ticket Reservation System

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Hardware/Software Requirements (For a batch of 30 students)
Computer with Windows/Linux OS and C compiler -30 No.s

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply appropriate programming constructs to solve problems.	**3**
CO2	Design, implement, test and debug programs that use the basic features of C.	**5**
CO3	Design modularized applications in C to solve real world problems.	**6**
CO4	Use C pointers and dynamically allocated memory to solve complex problems	**4**
CO5	Apply file operations to develop solutions for real-world problems	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	3	-	-	-	-	-	-	3	-	-	2	2	1
2	1	3	-	-	-	-	-	-	3	-	-	2	-	-
3	1	-	3	2	1	-	-	-	3	-	-	2	2	1
4	1	-	3	2	1	-	-	-	3	-	-	2	-	2
5	1	-	3	2	1	-	-	-	3	-	-	2	1	1

3-High, 2-Medium, 1-Low

HS22251 **அறிவியல் மற்றும் தொழில்நுட்பத்தில் தமிழ்**
SCIENCE AND TECHNOLOGY IN ANCIENT TAMIL SOCIETY

(Common to all Branches)

L	T	P	C
2	0	0	2

பாடத்தின்நோக்கங்கள் :

- **அறிவியலில் தமிழின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.**
- **தொழில்நுட்பத்தில் தமிழ் பாரம்பரியத்தின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்.**

OBJECTIVES:

- They will know about the use of Tamil in science.
- Learn about the impact of Tamil heritage on technology.

அலகு 1 அறிவியல் தமிழ் **6**

கருவி உருவாக்கம் – ஆராய்ச்சி மேம்பாடு – கல்வி வளர்ச்சி – அறிவியல் தமிழ் சொற்கள் உருவாக்கம்.

UNIT I SCIENTIFIC TAMIL

Tool Development - Research Development - Educational Development - Scientific Tamil words Creation.

அலகு 2 தொழில்நுட்பத்தில் தமிழ் **24**

வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் : சங்க காலத்தில் கட்டுமானப் பொருட்கள் – சோழர்களின் பெரியகோவில்கள் மற்றும் பிற வழிபாட்டுதலங்கள் – பல்லவர்களின் சிற்பங்கள் மற்றும் கோவில்கள் (மாமல்லபுரம்) - நாயக்கன் கால கோவில்கள் (மதுரை மீனாட்சி அம்மன் கோவில்), திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள்.

உற்பத்தி தொழில் நுட்பம் : கப்பல் கட்டும் கலை, உலோகவியல் ஆய்வுகள், தங்கம், தாமிரம், இரும்பு பற்றிய அறிவு – தொல்பொருள் சான்றுகள் – சுட்டக் களிமண் மணிகள், சங்கு மணிகள், எலும்பு மணிகள்.

விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பம் : அணைகள், ஏரிகள், குளங்கள், மதகுகள், சோழர் கால குமுழி தூம்பு ஆகியவற்றின் முக்கியத்துவம் – கால்நடை பராமரிப்பு, கால்நடைகளின் பயன்பாட்டிற்காக வடிவமைக்கப்பட்ட கிணறுகள். விவசாயம் மற்றும் வேளாண் செயலாக்கம் – கடல் பற்றிய அறிவு – மீன் பிடித்தல், முத்து குளித்தல், சங்கு சேகரித்தல்.

தமிழ் கணினி: அறிவியல் தமிழ் வளர்ச்சி – தமிழ் கணினி, தமிழ் புத்தகங்களின் டிஜிட்டல்மயமாக்கல், தமிழ் டிஜிட்டல் நூலகம், தமிழ் மென்பொருள் உருவாக்கம் – தமிழ் மெய் நிகர் அகாடமி – சொற்குவை திட்டம்.

தமிழின் எதிர்காலமும் தகவல் தொழில்நுட்பமும்- உலகமயமாக்கலும் தகவல் தொழில்நுட்பமும் – கணினிக்கு தமிழ் கற்று கொடுத்தல் – தமிழ்மொழித் தொழில்நுட்பத்தில் வளங்கள்.

UNIT II TAMIL IN TECHNOLOGY

Design and Construction Technology : Building materials in Sangam age – Great temples of Cholas and other workship places – Sculptures and Temples of Pallavas (Mamallapuram) – Temples of Nayakas period (Madurai Meenakshi amman temple), Thirumalai Nayakar Mahal, Chetti Nadu Houses.

Manufacturing Technology : Art of Ship building, Metallurgical studies, Knowledge about Gold, Copper, Iron – Archeological evidences – Terracotta beads, Shell beads, Bone beads.

Agriculture and Irrigation Technology: Dams, Tank, ponds, sluice, Significance of Kumuzhi Thoompu of Cholas period- Animal Husbandry, Wells designed for cattle use. Agriculture and Agro processing, - Knowledge about Sea – Fisheries, Pearl, Conche diving.

Tamil Computing : Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project. Future of Tamil and Information Technology- Globalization and Information Technology- Teaching Tamil for Computer-Resources in Tamil Language Technology.

TOTAL : 30 PERIODS

பாடநெறி முடிவுகள் :
OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	அறிவியலில் தமிழ் மொழியின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள் They will know about the use of Tamil language in science	2
CO2	பல்வேறு தொழில்நுட்பத்தில் தமிழ்மொழியின் தாக்கம் பற்றி அறிந்து கொள்வார்கள் They will learn about the influence of Tamil language in various technologies	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

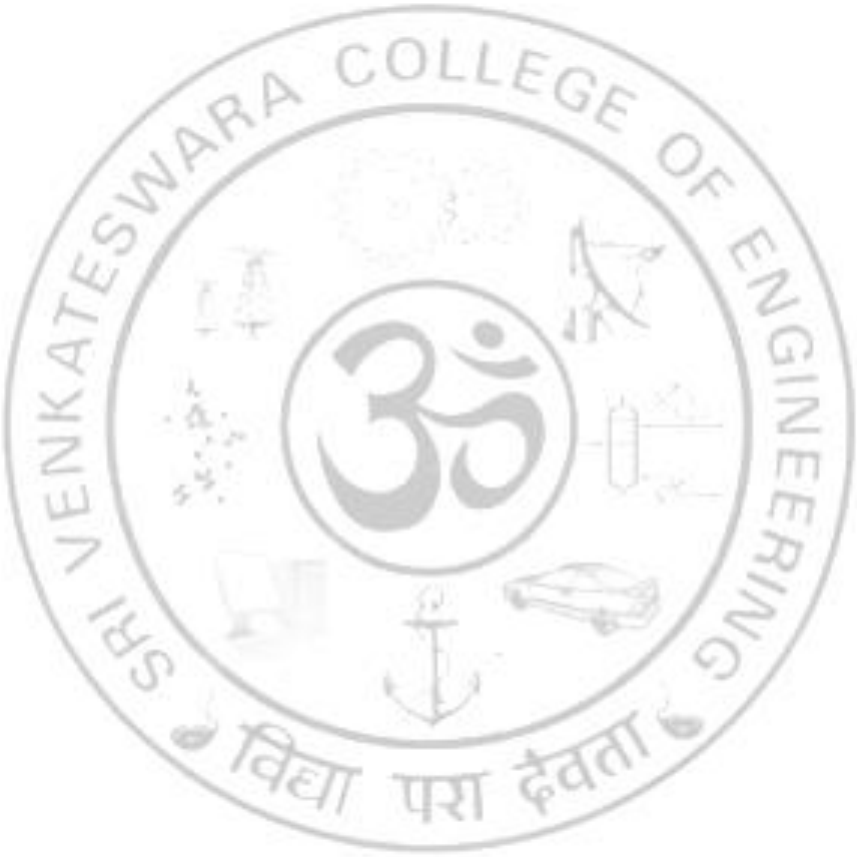
பாடநூல்கள்:
REFERCENCES:

1. டாக்டர், வா.செ .குழந்தைசாமி (1985), "அறிவியல் தமிழ்" , பாரதி பதிப்பகம், 126/108, உஸ்மான் சாலை, தியாகராய நகர் , சென்னை 600017.
2. சுப. திண்ணப்பன், (1995), "கணினியும் தமிழ் கற்பித்தலும்", புலமை வெளியீடு, 38-B மண்ணத்நதோட்டத் தெரு, ஆழ்வார்பேட், சென்னை 600018.
3. மு. பொன்னவைக்கோ, (2003), "வளர்தமிழில் அறிவியல் – இணையத் தமிழ்", அனைத்திந்திய அறிவியல் தமிழ்க் கழகம், தஞ்சாவூர் 615 005.
4. துரை. மணிகண்டன், (2008), "இணையமும் தமிழும்", நல்நிலம் பதிப்பகம், 7-3, சிமேட்லி சாலை, தியாகராய நகர், சென்னை 600 017.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	3	2	3	3	2	2	3	3	-	2	-	-
2	-	-	3	2	3	3	2	-	3	3	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



HS22252

TECHNICAL ENGLISH

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable learners to define and understand technical communication and scientific writing.
- To expose learners to nuances of seminar presentation, group discussion, and public speaking.
- To expose learners to writing for scientific purposes.
- To expose learners to drafting correspondences for business purposes.
- To expose learners to writing for documenting purposes.
- To enable students to have a holistic understanding of job interviews and recruiting process.

UNIT I **9**

Listening - AV files pertaining to manufacturing processes of products, scientific documentaries; **Speaking** - syllable division and word stress, intonation, sharing opinions; **Reading** - news articles related to science and technology; **Writing** - definitions, instruction, recommendation, data interpretation, resume; **Grammar** - tenses and their aspects, sentence connectors - discourse markers, sequential words, active and passive voice, subject-verb agreement.

UNIT II **9**

Listening - AV pertaining to marketing strategies, peer reading and pronunciation; **Speaking** - turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience; **Reading** - analytical documents, descriptive documents; **Writing** - fliers, brochures, resume - letter of application, checklists; **Grammar** - modal verbs, clauses - types and uses, conditional clauses, articles.

UNIT III **9**

Listening - AV related to how to use components, scientific description, **Speaking** - speaking for motivation and initiation, speaking at a seminar presentation; **Reading** - scientific journals, papers; **Writing** - Technical descriptions - process description, purpose and function, PowerPoint, Google forms, user manuals; **Grammar** - phrasal verbs, prepositions, technical and scientific affixes.

UNIT IV **9**

Listening - scientific debates, crisis management; **Speaking** - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, **Reading**- documented evidences of uses and functions of a product, review of a product, **Writing** - memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. **Grammar** - reported speech and tag questions, sentence structure - comparative, imperative, cause and effect, infinitive of result.

UNIT V **9**

Listening - AV of Group discussions, panel discussions, face to face interviews for recruitment purposes; **Speaking**- speaking at group discussions, interviewing a personality, answering at the interviews; **Reading** - WebPages of topnotch engineering companies, **Writing** - blogging, e-mails, letter of complaint, minutes of the meeting; **Grammar** - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improvising ideas).

TOTAL : 45 PERIODS

Suggested Activities [task based] - case study, guest lectures as models, problem solving, understanding teamwork.

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Understand the nuances of technical communication and scientific writing	**3**
CO2	Present papers and give seminars	**6**
CO3	Discuss in groups and brainstorm	**6**
CO4	Draft business correspondences and write for documenting purposes	**6**
CO5	Face job interviews with confidence	**6**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERCENCES

1. Department of English, Anna University. "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai, 2012.
2. Downes, Colm, "Cambridge English for Job-hunting", Cambridge University Press, New Delhi, 2008.
3. Murphy, Raymond, "Intermediate English Grammar with Answers", Cambridge University Press, 2000.
4. Thomson, A.J., "Practical English Grammar 1 & 2", Oxford, 1986.
5. Herbert A J, "The Structure of Technical English", Longman, 1965.

Web Link:

1. http://www.usingenglish.com
2. http://www.uefap.com3
3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

Software

1. Face2Face Advance - Cambridge University Press, 2014
2. English Advance Vocabulary - Cambridge University Press
3. IELTS test preparation - Cambridge University Press 2017
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition
5. CAMBRIDGE Preparation for the TOEFL TEST - Cambridge University Press, 2017

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

MA22251 **APPLIED MATHEMATICS – II**

(Common to all Branches except MR)

L	T	P	C
3	1	0	4

OBJECTIVES

- Acquire the concepts of vector calculus needed for problems in all engineering disciplines and compute different types of integrals using Green's, Stokes' and Divergence theorems.
- Skilled at the techniques of solving ordinary differential equations that model engineering problems.
- Extend their ability of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- Explain geometry of a complex plane and state properties of analytic functions.
- Understand the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

UNIT I VECTOR CALCULUS **12**

Gradient, divergence and curl - Directional derivative - Vector identities – Irrotational and solenoidal vector fields - Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes'theorem (excluding proofs) – Verification and application in evaluating line, surface and volume integrals.

UNIT II ORDINARYDIFFERENTIAL EQUATIONS AND ITS APPLICATIONS **12**

Differential equations of first order – Equations of the first order and first degree – Linear equations – Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients – Applications of Linear differential equations – Oscillatory electrical circuit – Deflection of beams.

UNIT III LAPLACE TRANSFORM **12**

Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions – Basic properties – Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem – Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV ANALYTIC FUNCTIONS **12**

Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) - Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping –

Mapping by functions W = Z + C, CZ, 1/Z, Z^2 – Joukowski's transformation- Bilinear transformation.

UNIT V COMPLEX INTEGRATION **12**

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour.

TOTAL : 60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Interpret the fundamentals of vector calculus and execute evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems.	**3**
CO2	Solve first order linear, homogeneous differential equations and use series solution method to solve second order differential equations.	**3**
CO3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.	**3**
CO4	Explain Analytic functions and Categorize transformations.	**3**
CO5	Perform Complex integration to evaluate real definite integralsusing Cauchy integral theorem and Cauchy's residue theorem.	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics",43rd Edition, Khanna Publications, Delhi, (2015).

REFERCENCES

1. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications(p) Ltd., 2014.

Web Link:

1. https://nptel.ac.in/courses/111/105/111105134/
2. https://nptel.ac.in/courses/111/105/111105121/

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
2	3	3	2	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	3	-	-
4	3	3	-	-	-	-	-	-	-	-	-	3	-	-
5	3	3	-	-	-	-	-	-	-	-	-	3	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

ME22251 **TECHNICAL DRAWING**

(Common to AD, CS, IT)

L	T	P	C
1	0	2	2

OBJECTIVES

- This course will introduce the students to build their ability to read drawings and interpret the position and form of simple geometries.

UNIT 0 **CONCEPTS AND CONVENTIONS AND GEOMETRIC CONSTRUCTION (NOT FOR EXAM)** **2**

Importance of drawing in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning. Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons.

UNIT I **CONICS, CYCLOID, AND INVOLUTES** **7**

Geometric construction - Curves used in engineering practices: Conics - Construction of parabola and hyperbola by eccentricity method - Construction of ellipse by Concentric circle method - Drawing of tangents and normal to the above curves - Construction of cycloid in a straight line only - Drawing of tangents and normal to the above curve. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

UNIT II **PROJECTION OF LINES AND PLANE SURFACES** **9**

Orthographic projection – First angle projection - 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 and perpendicular to other by rotating object method.

UNIT III **PROJECTION OF SOLIDS** **9**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

UNIT IV **DEVELOPMENT OF SURFACES** **9**

Development of Surfaces – Development of lateral surfaces of simple solids - Parallel line Development – Prisms, Cylinder - Radial line development – Pyramids and Cone.

UNIT V **ORTHOGRAPHIC AND ISOMETRIC PROJECTION** **9**

Isometric view of simple solids -Free Hand Drawing - Orthographic Projection - Orthographic views of simple blocks from their Isometric view

TOTAL (L:15 + P:30): 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	***Construct*** conic sections, cycloid and involutes as per drawing standards.	**3**
CO2	***Draw*** orthographic projections of lines and plane surfaces.	**2**
CO3	***Sketch*** orthographic projections of simple solids.	**2**
CO4	***Develop*** the lateral surfaces of simple solids.	**2**
CO5	***Sketch*** the orthographic projections of a given isometric view using free hand.	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Dhananjay M. Kulkarni, A.P. Rastogi, Ashoke K. Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Private Ltd., 2009.
3. Venugopal K. and Prabhu Raja V., "Engineering Drawing + AutoCAD", New Age International (P) Limited, 6th edition, 2022

REFERCENCES

1. Dhananjay A Jolhe, "Engineering Drawing with an Introduction to AutoCAD", Tata McGraw-Hill Publishing Company Limited., 2008
2. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
4. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

Web Link:

1. https://nptel.ac.in/courses/112105294
2. https://nptel.ac.in/courses/112103019

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	-	1	-	-	-	-
2	-	-	-	-	-	-	-	-	-	2	-	-	-	-
3	-	-	-	-	-	-	-	-	-	2	-	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

CS22201 **PYTHON FOR DATA SCIENCE**

(Common to CS & AD)

L	T	P	C
3	0	2	4

OBJECTIVES

The Student should be made to:

- Acquire knowledge on the mathematical background for understanding data science.
- Learn the basics of Python programming.
- Be familiar in performing array manipulation using NumPy.
- Understand the concepts of storing, retrieving and manipulating data using Pandas.
- Create appealing plots to understand the trend and pattern of data in the simple and efficient way.

UNIT I STATISTICS FOR DATA SCIENCE **9+6**

Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates.

UNIT II INTRODUCTION TO PYTHON **9+6**

Types and Operation: Numeric Types, String Fundamentals, List and Dictionaries, Tuples, Files, Statements: Assignments, Expressions, if tests, while and for loops, Functions: Function Basics, Scopes, Arguments, Modules: Module Coding Basics, Module Packages.

UNIT III INTRODUCTION TO NUMPY **9+6**

Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything in Between Computation on Arrays, Comparisons, Masks, and Boolean, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

UNIT IV DATA MANIPULATION WITH PANDAS **9+6**

Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas: eval() and query().

UNIT V VISUALIZATION WITH MATPLOTLIB **9+6**

Matplotlib, Simple Line Plots, Simple Scatter, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots, Text and Annotation, Customizing Ticks, Customizing Matplotlib: Configurations and

Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn.

TOTAL (L:45+P:30): 75 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Students will be able to understand the mathematical foundation for data science.	**2**
CO2	Students will be able to solve computational problems in python.	**3**
CO3	Students will be able to handle python arrays using NumPy package.	**3**
CO4	Students will be able to manipulate data using Pandas.	**3**
CO5	Students will be able to understand the pattern of data by graphical displays using Matplotlib.	**2**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

LIST OF EXPERIMENTS:

1. Write a python program to perform all statistical operations using statistics package.
2. Write a python program to remove the punctuations from the string.
3. Write a python function to print the sum of numbers if and only if the number is even.
4. Write a python module to perform binary search.
5. Write a python program to create a structured array using NumPy containing employee details such as employee name, department, designation and salary. Now sort by name, if the salary is greater than 25000.
6. Write a python program to create structured arrays using NumPy containing student details such as student name, register number, marks in 5 subjects. Apply aggregation function to implement the following:
   i. Find the total marks, average marks of each student.
   ii. Identify the maximum and minimum mark subjectwise.
   iii. Find the topper of the class.
   iv. Find the pass percentage for each subject.
   v. Find the class pass percentage.
7. Write a python program to create a dataframe using pandas. Perform the following operations on the dataframe.
   i. Data Selection
   ii. Data Indexing
   iii. Handling missing data in nominal attributes

iv. Handling missing data in numeric attributes
v. Grouping operations

8. Write a python program to implement the following plots using Matplotlib
   i. Line plot
   ii. Scatter plot
   iii. Density plot
   iv. Box plot
   v. Histogram

TEXT BOOKS

1. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, Sixth Edition, Wiley Publication, 2016.

2. Mark Lutz, Learning Python, Fifth Edition, O'Reilly Publication, 2013. (Revised in 2020)

3. Jake VanderPlas, Python Data Science Handbook - Essential Tools for Working with Data, Second Edition, O'Reilly Publication, 2022.

4. Wes McKinney, Python for Data Analysis, Third Edition, O'Reilly Publication, 2022.

5. David Beazley and Brian K. Jones, Python Cookbook, Third Edition, O'Reilly Publication, 2013.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3							3	3		3		3
2	3	3	3						3			3	3	3
3	3	3	2						2	3		3	3	
4	3	3										3		3
5	3	3								3		3	3	

3-High, 2-Medium, 1-Low, '-' – no correlation

CS22202 **DIGITAL PRINCIPLES AND SYSTEM DESIGN**

(Common to CS & AD)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand various number systems, different methods are used for the simplification of Boolean functions.
- To design and implement a system that uses combinational logic for the given specification; Simulate combinational logic systems using Verilog or VHDL
- To design and implement a synchronous sequential system for the given specification; Simulate sequential logic systems using Verilog or VHDL.
- To design and implement memory accessing systems and systems using PLA, PAL.
- To use RTL notation for describing register operations in a clocked sequential circuit.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES **9**

Digital Systems - Binary Numbers - Number Base Conversions - Complements of Numbers - Introduction to Boolean Algebra and Boolean Functions - Canonical and Standard Forms - Digital Logic Gates - Integrated Circuits

UNIT II COMBINATIONAL CIRCUITS **9**

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and De-Multiplexers – Tri-State Gates – HDL Models of Combinational Circuits

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC **9**

Introduction - Latches and Flip Flops – Analysis of Clocked Sequential Circuits and Design Procedures – State Diagram, State Table - State Reduction & Assignment - Shift Registers – Ripple Counters – Synchronous Counters

UNIT IV MEMORY AND PROGRAMMABLE LOGIC **9**

RAM - Memory Decoding – Error Detection and Correction - ROM – Programmable Logic Array – Programmable Array Logic

UNIT V DESIGN AT THE REGISTER TRANSFER LEVEL **9**

Introduction - RTL Notation - RTL Description - Algorithmic State Machine - Design Example (ASMD Chart) - Design of Sequential Binary Multiplier

TOTAL (L:45): 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Students will be able to learn the different types of number systems and simplification of Boolean functions	**1**
CO2	Students will be able to understand various logic gates and their usage	**2**
CO3	Students will be able to study, analyze and design various combinational circuits and its implementation using VHDL	**4**
CO4	Students will be able to understand the different type of memory and their structures	**2**
CO5	Students will be able to study, analyze of RTL notation register operations in a clocked sequential circuit	**4**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. "Digital Design with An Introduction to Verilog HDL, VHDL and System Verilog" by M. Morris Mano and Michael D. Ciletti, 6th Edition, Pearson, 2017.

REFERCENCES

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education,2007
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition – Jaico Publishing House, Mumbai, 2003
3. Donald D. Givone, "Digital Principles and Design", Tata Mcgraw Hill, 2003
4. Kharate G. K., "Digital Electronics", Oxford University Press, 2010.
5. http://www.learnabout-electronics.org/Digital/dig44.php

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	-	-	-	-	-	-	-	-	3	3	3
2	3	3	3	-	3	-	-	-	-	-	-	-	2	3
3	3	3	3	-	3	-	-	-	-	-	-	-	3	3
4	3	3	3	-	-	-	-	-	-	-	-	3	3	2
5	3	3	3	-	3	-	-	-	-	-	-	3	3	3

3-High, 2-Medium, 1-Low, '-' – no correlation

CS22203 OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand object-oriented methodology, the approach to modular and reusable software systems
- To learn how to abstract a problem in an object oriented style
- To learn object oriented programming, basics to advanced level, using C++
- To understand file handling in C++
- To use the Standard Template Library (STL)

UNIT I OBJECT-ORIENTED PROGRAMMING BASICS 9

Object oriented programming - need - procedural languages - object oriented approach. Characteristics of object oriented languages - objects – classes – inheritance –reusability - polymorphism and overloading. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const and volatile functions - static members – objects – pointers and objects – constant objects – nested classes.

UNIT II COMPILE TIME POLYMORPHISM 9

Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – Copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion.

UNIT III RUNTIME POLYMORPHISM 9

Inheritance – public, private, and protected derivations – multiple inheritance - virtual base class – abstract class – Runtime polymorphism – virtual functions – pure virtual functions – RTTI.

UNIT IV TEMPLATES AND EXCEPTION 9

Function templates- class templates - linked list class using templates - storing user defined data types - UML and templates. Exceptions - simple exception - multiple exceptions - exceptions with the Distance Class - exceptions with arguments.

UNIT V FILES AND STANDARD TEMPLATE LIBRARY 9

Streams and formatted I/O – I/O manipulators - file handling – random access – object serialization. Introduction to the STL - algorithms - sequence containers - iterators - specialized iterators - associative containers - strong user-defined objects - function objects

TOTAL (L:45): 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Apply the concepts of data abstraction, encapsulation and inheritance for problem solutions. Critically analyze the problem and apply Object Oriented Concepts for practical problem solving.	**2**
CO2	Develop applications with function and operator overloading.	**3**
CO3	Develop programs with reusability.	**3**
CO4	Design and implement generic classes with C++ templates and handle exceptions.	**3**
CO5	Handle large data set using file I/O and use STL.	**2**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. B. Trivedi, “Programming with ANSI C++”, Second Edition, Oxford University Press, 2012.

REFERCENCES

1. Ira Pohl, “Object oriented programming using C++”, Second Edition, Pearson Education Asia, 2012.
2. Bjarne Stroustrup, "The C++ programming language", Fourth Edition, Addison Wesley, 2013.
3. Robert Lafore, “Object-Oriented programming in C++”, Fourth Edition, SAMS, 2001.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	3	-	-	-	-	-	-	3	3	3
2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	3	-	-	-	-	-	-	3	3	3
5	3	3	3	3	3	-	-	-	-	-	-	3	3	3

3-High, 2-Medium, 1-Low, ‘-‘ – no correlation

CS22211 DIGITAL PRINCIPLES AND SYSTEM DESIGN LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES

- To be an adjunct to the "Digital System Design" Course through hands-on experience with design, construction, and implementation of digital circuits like combinational / sequential
- To provide the capability to understand and to simulate digital circuits through Xilinx

LIST OF EXPERIMENTS

1. Verification of logic gates
2. Verification of Boolean theorems
3. Combinational Circuits-Implementation of arbitrary functions and code converters.
4. Design and implementation of Binary adder/subtractor.
5. Design and implementation of Parity generator/checker.
6. Design and implementation of magnitude comparator.
7. Design and implementation of seven segment display
8. Design and implementation of applications using multiplexers.
9. Study and Implementation of Flip-Flops.
10. Design and implementation of shift registers.
11. Design and implementation of synchronous and asynchronous counters
12. Coding combinational circuits using hardware description language. (HDL s/w required)
13. Coding sequential circuits using HDL. (HDL s/w required)
14. Design and implementation of simple digital System(Mini Project)

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Digital Trainer Kits
2. Breadboard and components
3. PC s – with Xilinx for HDL
4. IC tester-1

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Students will be able to understand the working of various logic gates.	**2**
CO2	Students will be able to understand the various combinational circuits and their applications.	**2**
CO3	Students will be able to study, analyze and design sequential circuits	**4**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	-	-	-	-	-	3	-	-	3	3	3
2	3	3	3	-	3	-	-	-	3	-	-	-	2	3
3	3	3	3	-	3	-	-	-	3	-	-	-	3	3

3-High, 2-Medium, 1-Low

CS22212 **OBJECT ORIENTED PROGRAMMING LABORATORY**

L	T	P	C
0	0	3	1.5

OBJECTIVES

- To understand object-oriented methodology, the approach to modular and reusable software systems
- To learn how to abstract a problem in an object oriented style

LIST OF EXPERIMENTS

1. Programs Using Functions
   - Functions with default arguments
   - Implementation of Call by Value, Call by Address and Call by Reference
2. Classes with objects, member functions and Constructors
   - Classes with primitive data members
   - Classes with arrays as data members
   - Classes with pointers as data members – String Class
   - Classes with constant data members
   - Classes with data members and member functions
3. Compile time Polymorphism
   - Operator Overloading including Unary and Binary Operators
   - Operator Overloading including friend functions
   - Function Overloading
4. Runtime Polymorphism
   - Inheritance
   - Virtual functions
   - Virtual Base Classes
5. Function Templates
6. Class Templates
7. Exception Handling
8. File Handling
   - Sequential access
   - Random access
9. RTTI
10. Standard Template Library

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C++ compiler (or) Server with C++ compiler supporting 30 terminals or more.

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Students will be able to apply object-oriented programming concepts in problem solving.	3
CO2	Students will be able to do file operations, I/O operations and exception handling.	3
CO3	Students will be able to develop applications using the standard template library.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	3	-	-	-	3	-	-	3	3	3
2	3	3	3	3	-	-	-	-	3	-	-	3	3	3
3	3	3	3	3	-	-	-	-	3	-	-	3	3	3

3-High, 2-Medium, 1-Low

MA22353 **DISCRETE MATHEMATICS**

(Common to CS & IT)

L	T	P	C
3	1	0	4

OBJECTIVES

The Students should be made to:

- Extend student's Logical and Mathematical ability to deal with abstraction.
- Acquire basics of set theory, functions and counting ,apply them in day to day problems
- Understand the fundamental concepts of the Graph theory and Network connectivity
- Gain the concepts to identify structures of algebraic nature, prove and use properties about them.
- Learn relations, Lattice, Boolean algebras and their properties to comprehend problems in computer Science.

UNIT I LOGIC (9+3)

Propositional Logic- Connectives -– Propositional equivalences -Normal form –Predicates and Quantifiers – Nested Quantifiers -Validity of a well-formed formula– Rules of inference

UNIT II SET THEORY AND BASICS OF COUNTING (9+3)

Basic Concepts of Set Theory- Cartesian product- The Power Set – Functions- Composition of functions -Mathematical induction- The basics of counting - Inclusion and exclusion principle and its applications – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions.

UNIT III GRAPH THEORY (9+3)

Graphs and Graph models- Graph terminology and special types of Graphs – Matrix representation of Graphs and Graph isomorphism – connectivity – Eulerian and Hamiltonian Graphs

UNIT IV ALGEBRAIC STRUCTURES (9+3)

Algebraic structures with one binary operation – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Algebraic structures (Definitions and simple examples only) with two binary operation- Ring, Integral domain and field.

UNIT V LATTICES AND BOOLEAN ALGEBRA (9+3)

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

TOTAL (L:45+T:15):60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Acquire the concepts of set theory and logic to convert from informal language to logic expressions and test the validity of a program.	
CO2	Apply the counting techniques to comprehend computer simulations	
CO3	Develop graph theory tools to map day-to-day applications.	
CO4	Expose to the concepts and properties of algebraic structures which provides solutions in design and analysis of algorithms.	
CO5	Explore Boolean algebraic structures on numerous levels, the concepts needed to test the logic of a program.	

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 8thEdition, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, 2021.
2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 53rd reprint 2018.

REFERCENCES

1. Ralph P.Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2018.
2. Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Seymour Lipschutz and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd reprint, 6th Edition, 2016.

WEB LINK:

1. https://home.iitk.ac.in/~arlal/book/mth202.pdf
2. https://archive.nptel.ac.in/courses/106/103/106103205

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	-	-	-	3	-	-
2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
4	3	3	-	-	-	-	-	-	-	-	-	3	-	-
5	3	3	3	2	-	-	-	-	-	-	-	3	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

AD22301 **ARTIFICIAL INTELLIGENCE**

(Common to AD & CS)

L	T	P	C
3	0	0	3

OBJECTIVES

The main objectives of this course are to:

- Learn the basic AI approaches to develop problem solving agent
- Learn game playing
- Perform knowledge representation in Logic
- Perform probabilistic reasoning under uncertainty
- Perform Planning and Controlling Uncertain movements in robots

UNIT I PROBLEM-SOLVING **9**

Foundations of Artificial Intelligence, History of Artificial Intelligence, State of the Art, Risk and Benefits of AI; Intelligent Agents – Agents and Environments, Concept of Rationality, Nature of Environments, Structure of Agents; Problem-solving – Problem-Solving Agents, Search Algorithms, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions

UNIT II ADVERSARIAL SEARCH **9**

Game Theory, Optimal Decisions in Games, Heuristic Alpha-Beta Tree Search, Monte Carlo Tree Search, Stochastic Games; Constraint Satisfaction Problems – Inference, Backtracking Search and Local Search and Structure of Problems

UNIT III KNOWLEDGE, REASONING AND PLANNING **9**

Logical Agents - Knowledge-based agents, Logic, Propositional Logic; First-Order Logic – Representation, Syntax and Semantics, Using First-Order Logic; Inference in First-Order Logic – Unification, Forward Chaining, Backward Chaining, Resolution

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING **9**

Quantifying Uncertainty – Acting under Uncertainty, Inference using Full Joint Distributions, Bayes' Rule, Naive Bayes Model; Probabilistic Reasoning – Representing Knowledge in an Uncertain Domain, Semantics of Bayesian Networks, Exact Inference, Approximate Inference in Bayesian Networks; Probabilistic Reasoning Over Time – Inference in Temporal Models, Hidden Markov Models

UNIT V ROBOTICS **9**

Reinforcement Learning – Learning from Rewards, Passive and Active Reinforcement Learning, Policy Search, Applications; Robotics – Robots, Robots Hardware, Robotic Perception, Planning and Control, Planning Uncertain Movements, Reinforcement Learning in Robotics, Humans and Robots, Robotic Frameworks, Application Domains

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Apply intelligent agent frameworks for toy problems	**3**
CO2	Apply search algorithms for game playing	**3**
CO3	Perform logical reasoning	**3**
CO4	Perform probabilistic reasoning under uncertainty	**3**
CO5	Learn robotic frameworks for various application domains	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Stuart Russell and Peter Norvig, Artificial Intelligence : A Modern Approach, Pearson, 4th Edition, 2020

REFERCENCES

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. https://nptel.ac.in/

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	3	3	3	-	-	-	-	-	-	3	3	3
2	3	3	3	-	3	-	-	-	-	-	-	3	3	3
3	3	-	3	-	3	-	-	-	-	-	-	3	3	3
4	3	-	3	3	3	-	-	-	-	-	-	3	3	3
5	3	3	3	-	3	-	-	-	-	-	-	3	3	3

3-High, 2-Medium, 1-Low, ‘-‘ – no correlation

CS22301 **DATABASE MANAGEMENT SYSTEMS**

(Common to CS & AD)

L	T	P	C
3	0	0	3

OBJECTIVES

- To learn the fundamentals of data models and to represent a database system using ER diagrams
- To learn the Relational Algebra, SQL queries and advanced SQL features
- To learn the concepts of Functional dependencies and Normalization
- To understand the fundamental concepts of transaction, concurrency and recovery processing
- To study the various data storage and indexing techniques and cloud databases

UNIT I DATABASE DESIGN **9**

Purpose of Database Systems - View of Data - Database System Architecture - Database Languages - Entity Relationship Model – Constraints - Entity Sets – Attributes – Keys - ER Diagrams - Design Issues – Extended ER Features - Introduction of Relational Model – ER Reduction to Relational Schemas

UNIT II RELATIONAL DATABASE MODELS **9**

Structure of Relational Databases – Schema Diagrams – Relational Query Languages - Relational Algebra – Integrity Constraints - Basic Queries in SQL – Set Operations – Aggregate Operations – Sub Queries - Joins – Views – Authorization – Advanced SQL – Triggers – Functions and Procedures– Embedded SQL – Dynamic SQL

UNIT III RELATIONAL DATABASE DESIGN **9**

Functional Dependencies and Keys – Closure of Functional Dependencies Set – Closure of attributes - Dependency Preservation - Decomposition using functional dependencies – Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies - Decomposition using Multivalued dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form.

UNIT IV TRANSACTION MANAGEMENT **9**

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit -- Save Points – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Recovery Isolation Levels

UNIT V DATA STORAGE TECHNIQUES **9**

Overview of Physical Storage Media – 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 - Cloud Databases

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Design database using Entity Relationship model and construct ER diagrams for enterprise databases	**2**
CO2	Construct queries using Relational Algebra and SQL with advanced features	**4**
CO3	Normalize the databases to reduce cost due to data redundancy	**3**
CO4	Analyze the basic issues of transaction processing and maintain consistency of the databases.	**3**
CO5	Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the modern databases	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", McGraw Hill, Seventh Edition, 2019.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Pearson Education/Addison Wesley, Seventh Edition, 2021.

REFERCENCES

1. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, Fifth Edition, 2009.
2. C. J. Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition, 2004.
4. G.K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
5. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V.S. Subrahmanian, Roberto Zicari, "Advanced Database Systems", Morgan Kaufmann publishers, 2006.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	-	-	-	-	-	-	3	-	3	3
2	3	3	3	3	-	-	-	-	-	-	-	-	3	2
3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
4	3	3	3	3	-	-	-	-	-	-	-	-	3	3
5	3	3	3	3	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

CS22302 DATAMINING AND DATAWAREHOUSING

(Common to CS & AD)

L	T	P	C
3	0	0	3

OBJECTIVES

- To introduce students to the basic concepts and techniques of Data Mining and various classification techniques.
- To understand frequent pattern and association rule mining techniques for data analysis.
- To understand and apply various clustering techniques.
- To understand data warehouse concepts, architecture and schema.
- To understand various types of online analytical processing techniques.

UNIT I DATA MINING INTRODUCTION AND CLASSIFICATION 9

Introduction to Data Mining-Need-Applications-Process-Techniques-Predictive modeling-Database segmentation, Link analysis and Deviation detection-Data Preprocessing-Classification-Introduction and Types of Classification-Input and Output Attributes-Working of Classification-Guidelines for Size and Quality of the Training Dataset-Decision Tree Classifier-Introduction, Building decision tree using Information gain-Building a decision tree with Gini Index-Naïve Bayes Method-Understanding Metrics to Assess the Quality of Classifiers.

UNIT II ASSOCIATION MINING 9

Introduction-Defining Association Rule Mining-Representations of Items for Association Mining-The Metrics to Evaluate the Strength of Association Rules-The Naïve Algorithm for Finding Association Rules-The Apriori Algorithm -Closed and Maximal Itemsets – The Apriori–TID Algorithm for Generating Association Mining Rules-Direct Hashing and Pruning-Dynamic Itemset Counting-Mining Frequent Patterns without Candidate Generation.

UNIT III CLUSTER ANALYSIS 9

Cluster Analysis-Introduction-Applications-Desired Features of Clustering-Distance Metrics-Major Clustering Methods-Partitioning Clustering-k-means clustering-Hierarchical Clustering Algorithms-Agglomerative clustering-Divisive clustering-Density-based clustering-DBSCAN algorithm-Strengths of DBSCAN algorithm-Weakness of DBSCAN algorithm.

UNIT IV DATA WAREHOUSING & DATA MODELING 9

Data Warehouse-Historical developments-Defining data warehousing-Data warehouse architecture-Benefits of data warehousing-Data Marts-Data warehouses versus OLTP: similarities and distinction-Data Warehouse Schema-Introduction to Data Warehouse Schema-Dimension-Measure-Fact Table-Multi-dimensional view of data-types-Star Schema-Snowflake Schema-Fact Constellation Schema.

UNIT V ONLINE ANALYTICAL PROCESSING 9

Introduction-Defining OLAP-OLAP applications-Features of OLAP-OLAP Benefits-Strengths of OLAP-Comparison between OLTP and OLAP-Differences between OLAP and data mining-Representation of Multi-dimensional Data-Data Cube-Improving efficiency of OLAP by pre-computing the queries-Types of OLAP Servers-Relational OLAP and MOLAP-Comparison of ROLAP and MOLAP-OLAP Operations.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand data mining concepts and apply classification techniques.	**2**
CO2	Do data analysis using frequent pattern and association rule mining techniques.	**3**
CO3	Students will be able to apply various clustering techniques.	**3**
CO4	Students will be able to understand data warehouse concepts, architecture and schema.	**2**
CO5	Students will be able to understand various types of online analytical processing techniques.	**2**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Parteek Bhatia, Data Mining and Data Warehousing: Principles and Practical Techniques,Cambridge University Press,2019.

REFERCENCES

1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
2. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
3. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition
5. Pang, N. T., Steinbach, M. and Kumar, V., “Introduction to Data Mining”, Pearson Education

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	-	-	-	3	-	-	3	3	3
2	3	3	3	3	3	-	-	-	3	-	-	3	3	3
3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
4	3	3	3	3	3	-	-	-	3	-	-	3	3	3
5	3	3	3	3	2	-	-	-	3	-	-	3	3	3

3-High, 2-Medium, 1-Low

CS22303 **DATA STRUCTURES**

L	T	P	C
3	0	0	3

OBJECTIVES

This course will develop the student's ability

- To understand the concepts of ADTs, Lists
- To Learn linear data structures – Stacks, and Queues
- To Learn and apply nonlinear data structures - Trees
- To Learn and apply and nonlinear data structures - Graphs
- To understand Sorting, Searching and Hashing algorithms

UNIT I LINEAR DATA STRUCTURES – LIST **9**

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – –Singly linked lists- Doubly-linked lists - Circularly linked lists – All operations (Insertion, Deletion, Merge, Traversal) - Applications of lists –Polynomial Manipulation – Radix sort.

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES **9**

Stack ADT – Operations - Applications - Conversion of Infix to postfix expression - Evaluating a postfix expression - Queue ADT – Operations - Circular Queue – deQueue – Applications of queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES **9**

Tree ADT – Tree traversals - Binary Tree ADT – Expression trees – Applications of trees – Binary search tree ADT – AVL Trees – B-Tree – Heap (Priority Queues) – Binary heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS **9**

Graphs - Representation of Graphs; Depth First Search and Breadth First Search; Topological Sort; Shortest Path Algorithms - Dijkstra's Algorithm - All Pairs Shortest Path; Minimum Spanning Tree - Prim's Algorithm - Kruskal's Algorithm

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES **9**

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort – Shell Sort - Merge Sort - Quick Sort - Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Use list ADT for a variety of applications and classify them	**2**
CO2	Earn a thorough knowledge in Stack and Queue ADT and will appraise the applications in various real time scenarios.	**3**
CO3	Distinguish linear and non-linear data structures, and appraise the use of Tree ADT.	**3**
CO4	Appraise the usage of graph algorithms for various applications	**3**
CO5	Critically analyze the various hashing, searching and sorting algorithms.	**4**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2013.

REFERCENCES

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. Reema Thareja, Data Structures using C, Second Edition, Oxford Publishers, 2014
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Fundamentals of Data Structures in C, Second Edition, University Press, 2008

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	-	-	3	-	-	-	-	-	-	3	3
2	3	3	3	3	-	3	3	-	-	-	-	-	3	3
3	3	3	3	3	-	3	3	-	-	-	-	-	3	3
4	3	3	3	3	-	-	3	-	-	-	-	-	3	3
5	3	3	3	3	2	-	2	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

CS22304 **MICROPROCESSOR AND COMPUTER ARCHITECTURE**

L	T	P	C
3	0	0	3

OBJECTIVES

- Study the functional units of computer and basic instructions
- Study the Architecture of 8086 microprocessor
- Learn the Multiprocessor Configuration
- Learn the interfacing of I/O circuits.
- Study about the Pipelining and Hazards

UNIT I INTRODUCTION **9**

Functional units- Input-Memory- ALU-Output-Control Unit- Operational concept – Bus Structure – Software- Performance-Memory and addresses-Memory operations.Instruction Sequencing- Register Transfer- Assembly Language –Instruction Execution- Straight line Sequencing- Branching- Condition codes-Generating Memory Address

UNIT II 8086 MICROPROCESSOR **9**

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation

UNIT III MULTIPROCESSOR SYSTEM **9**

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Features of Pentium Processor

UNIT IV I/O INTERFACING **9**

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Case studies: Stepper Motor Interface, Traffic Light control, LED display.

UNIT V PIPELINING **9**

Basic Concepts- Data Hazards- Instruction Hazards- Influence on Instruction set-Data path and Control Considerations

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand the flow of instructions and data	**2**
CO2	Design and implement programs on 8086 microprocessor.	**2**
CO3	Design Multiprocessor based System	**3**
CO4	Design I/O Interfacing circuits	**3**
CO5	Understand the advantages of pipelining and apply them effectively	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007
2. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI edition, McGraw-Hill Inc, 2012

REFERCENCES

1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware:, MH, 2012
2. David A. Patterson and John L. Hennessey, "Computer organization and design, The Hardware/Software Interface", Morgan kauffman /Elsevier, Fifth edition, 2014

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	3	-	3	-	-	-	-	-	-	3	2	3
2	2	-	3	-	3	-	-	-	-	-	-	3	2	3
3	2	-	3	-	3	-	-	-	-	-	-	3	3	3
4	3	-	3	-	3	-	-	-	-	-	-	3	3	3
5	2	-	3	-	3	-	-	-	-	-	-	3	3	3

3-High, 2-Medium, 1-Low

CS22311 **DATABASE MANAGEMENT SYSTEMS LABORATORY**

(Common to CS & AD)

L	T	P	C
0	0	3	1.5

OBJECTIVES

- To identify different issues involved in the design and implementation of a database system for real time applications
- To identify exact queries to extract information from the database
- To work with PL/SQL features

LIST OF EXPERIMENTS

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures.
9. Creation of database triggers and functions
10. Database Connectivity with Front End Tools
11. Case study of Big Data and NoSQL.
12. Mini project
    - Inventory Control System.
    - Material Requirement Processing.
    - Hospital Management System.
    - Railway Reservation System.
    - Personal Information System.
    - Web Based User Identification System.
    - Timetable Management System.
    - Hotel Management System

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:
Standalone desktops 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE:

OS: Fedora / Linux, Hadoop package.

Front end: VB/VC ++/JAVA or Equivalent,

Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent.

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Design and implement a database schema for given problem statement.	2
CO2	Develop PL/SQL blocks such as stored procedures, stored functions, cursors, packages	3
CO3	Make the database connectivity using front-end tools for various real time applications.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	3	-	3	-	3	3
2	3	-	3	3	-	-	-	-	3	-	3	-	3	3
3	3	-	3	3	3	-	-	-	3	-	3	-	3	3

3-High, 2-Medium, 1-Low

CS22312 **DATA STRUCTURES LABORATORY**

L	T	P	C
0	0	3	1.5

OBJECTIVES

This course will develop the student's ability to

- Learn the applications of different linear data structures
- Getting exposure in implementing the different data structures and algorithms
- Understand the sorting, searching and hashing techniques

LIST OF EXPERIMENTS

1. Study of simple Node creation using pointers, structures and study of functions.
2. Implementation of Single Linked List - Array & PointerImplementation.
3. Creation of Stack using Array implementation and Pointer implementation.
4. Conversion of Infix expression into Postfix notation using stack.
5. Creation of Queue using Array implementation.
6. Construct a Binary Search Tree with Tree traversal Techniques – Preorder, Post order and In order.
7. Construct an AVL trees as a balanced search tree and perform the Single rotation.
8. Graph Traversal Algorithm Breadth-first search, Depth-first search.
9. Perform the single source shortest path using Dijkstra’s algorithm.
10. Construct the Minimum Spanning Tree using Kruskal's and Prim's algorithm.
11. Sorting - Insertion Sort, Bubble Sort and Quick Sort.
12. Hashing Implementation of Separate chaining and Open Addressing (Linear Probing)

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C/C++ compiler 30 Nos. (or) Server with C/C++ compiler supporting 30 terminals or more

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply linear data structures and nonlinear data structures to real world problems	**3**
CO2	Apply graph algorithms to various real time applications and demonstrate various graph algorithms	**3**
CO3	Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	-	-	3	-	-	3	-	-	-	3	3
2	3	3	3	3	-	3	3	-	3	-	-	-	3	3
3	3	3	3	3	-	3	3	-	3	-	-	-	3	3

3-High, 2-Medium, 1-Low

CS22313 **MICROPROCESSOR LABORATORY**

L	T	P	C
0	0	3	1.5

OBJECTIVES

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations and sorting
- Understand Interfacing of I/O Devices

LIST OF EXPERIMENTS

1. Movement of data using simple instructions
2. Arithmetic operations using simple instructions
3. Problem solving using simple instructions

Experiments using Intel 8086 Processor

4. Basic Arithmetic and Logical operations
5. Moving data without overlapping
6. Code conversion
7. Swapping data between blocks
8. Matrix operations.
9. Sorting
10. String manipulations and searching
11. Password checking
12. Digital clock
13. Stepper Motor Interfacing
14. Traffic Light Control Interfacing

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Equipment List

1) 8086 Microprocessor Trainer kits – 30 nos
2) Interfacing modules – 3 nos. Each
3) Desktop Computers – 15 nos

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Practice assembly language programming	**2**
CO2	Perform various arithmetic operations, sorting using 8086	**2**
CO3	Perform interfacing of I/O devices with processor	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	3	-	3	-	-	-	3	-	-	3	2	3
2	2	-	3	-	3	-	-	-	3	-	-	3	2	3
3	2	-	3	-	3	-	-	-	3	-	-	3	3	3

3-High, 2-Medium, 1-Low

MA22454 **PROBABILITY AND QUEUEING THEORY**

(Common to CS and IT)

L	T	P	C
3	1	0	4

OBJECTIVES

- To perform probability calculations for discrete and continuous random variables.
- To categorize discrete and continuous distributions by learning their properties.
- To compute and interpret correlation coefficient and regression describing association between two variables.
- To expose the fundamental concepts of random processes and related structures.
- To describe various key features of queuing systems.

UNIT I PROBABILITY AND RANDOM VARIABLES 9+3

Notion of Probability – Conditional Probability - Baye's Theorem - Random Variables - Discrete and Continuous Random Variables – Moments – Moment generating functions.

UNIT II SPECIAL DISTRIBUTIONS 9+3

Discrete Distributions - Binomial, Poisson, Geometric, Hypergeometric Distributions; Continuous Distributions - Uniform, Exponential, Gamma, Weibull and Normal Distributions and their properties.

UNIT III TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression for two variables– Transformation of random variables – Central Limit Theorem.

UNIT IV RANDOM PROCESS 9+3

Definition - Classification – Poisson Process – Markov Process – Discrete parameter Markov Chain – Chapman Kolmogorov equations – Limiting distributions - Birth and Death Processes.

UNIT V QUEUEING SYSTEMS 9+3

Characteristics of queuing systems - Little's Formula - Markovian queues – Single and multiple server queueing models – Queues with finite waiting rooms - Finite source models – Non- Markovian queues - M/G/1 queue – Pollaczek Khinchin formula.

TOTAL (L:45+T:15):60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Extend and formalize the knowledge of probability theory and random variables.	**3**
CO2	Describe commonly used univariate discrete and continuous probability distributions and apply various distributions to solve real world problems.	**3**
CO3	Identify various distribution functions and acquire skills in handling situations involving more than one variable.	**3**
CO4	Analyse various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	**3**
CO5	Understand the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Edition Indian Reprint, 2010.
2. Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2013.

REFERCENCES

1. Robertazzi, "Computer Networks and Systems: Queueing Theory and Performance Evaluation", Springer, 3rd Edition, Reprint 2011.
2. Taha H.A., "Operations Research", Pearson Education, Asia, 10th Edition, 2019.
3. Veerarajan. T, “Probability, Statistics and Random Processes”, McGraw Hill Publishers, 3rd Edition, 2013.
4. Hwei Hsu, "Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2013.
5. Yates R.D. and Goodman. D. J., "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

WEBLINKS:

1. https://www.analyticsvidhya.com/blog/2016/04/predict-waiting-time-queuing-theory/
2. https://www.informit.com/articles/article.aspx?p=1863432&seqNum=3

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2									2		
2	3	3	2									2		
3	3	3	2	2								2		
4	3	3	2	2								2		
5	3	3	2	2	2							2		

3-High, 2-Medium, 1-Low

CS22401 **OPERATING SYSTEMS**

(Common to CS and AD)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the basics and functions of operating systems.
- To analyze scheduling algorithms and process synchronization
- To understand the concept of deadlocks and analyze various memory management schemes
- To be familiar with I/O management and file systems.
- To be familiar with the Influential Operating Systems

UNIT I INTRODUCTION 9

Computer System - Organization and Architecture- Operating System Overview - Evolution of Operating System- Operating System Structures – Operating System Services - User and Operating System Interface - System Calls – System Programs - Design and Implementation - Operating System Generation and System Boot.

UNIT II PROCESS MANAGEMENT AND PROCESS SYNCHRONIZATION 10

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication- CPU Scheduling - Scheduling criteria - Scheduling algorithms. Threads - Multithread Models – Threading issues. Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization – Monitors.

UNIT III DEADLOCK AND MEMORY MANAGEMENT 10

Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock. Memory- Memory Partitioning - Memory Allocation Algorithms – Segmentation – Paging. Virtual Memory - Demand Paging – Copy on Write - Page Replacement Algorithms - Allocation of Frames – Thrashing.

UNIT IV STORAGE MANAGEMENT 9

Mass Storage system – Disk Structure - Disk Scheduling and Management, File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT V INFLUENTIAL OPERATING SYSTEMS 7

Feature Migration-Early Systems- Atlas- XDS-940- THE- RC 4000- CTSS- MULTICS- IBM OS/360- TOPS-20- MS/DOS- Macintosh Operating System- Mach-Case Study-The Linux System

TOTAL: 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Infer the OS features and operations while working in operating system	**2**
CO2	Analyze various scheduling algorithms and process synchronization	**4**
CO3	Evaluate the performance of various memory management techniques	**5**
CO4	Design a simple file system and analyze the performance	**4**
CO5	Work with some popular operating systems like Linux, Windows	**5**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERCENCES

1. Ramaz Elmasri, A. Gil Carrick, David Levine, " Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7 th Edition, Prentice Hall, 2018
3. Achyut S. Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016
4. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	2					3	2	3	1	1	2
2	2	2	3	1	1				2	1	1	2	2	2
3	1	3	2	2	1				2	2	1	1	1	2
4	1	3	3	3					1	2	1	2	1	2
5	3	1	2	1	1				3	2	3	2	2	1

3-High, 2-Medium, 1-Low

CS22402 **MACHINE LEARNING TECHNIQUES**

(Common to CS and ADs)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the basic concepts of machine learning and parametric estimation methods.
- To gain knowledge on supervised learning methods.
- To provide insights on unsupervised learning methods and ensemble models.
- To introduce basic graphical models and advanced machine learning techniques.
- To apply various metrics to evaluate the performance of the models.

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Machine learning concepts - Need for Machine Learning - Types of Machine Learning - Supervised Learning - Unsupervised Learning - Reinforcement Learning.

Leaning Theory - Learning Types - Computation Learning - Concept Learning - Design of learning system - Bias and Variance, Modelling - Learning frameworks.

UNIT II SUPERVISED LEARNING 9

Classification models - Naïve Bayes Classifier - K-Nearest Neighbor model - Perceptron - Backpropogation Algorithm - Multilayer Perceptron – Linear and Logistic Regression - Support Vector Machines.

UNIT III UNSUPERVISED LEARNING AND ENSEMBLE MODELS 9

Clustering - K-Means clustering - Hierarchical Clustering - Dimensionality Reduction - Principal Component Analysis (PCA) - Linear Discriminant Analysis (LDA). Ensemble Methods: Bagging - Boosting - Gradient boosting.

UNIT IV GRAPHICAL MODELS AND REINFORCEMENT LEARNING 9

Markov random fields - Hidden Markov Models - Representation - Learning - Decoding - Inference in graphical models - Monte Carlo models – Sampling.

Reinforcement Learning - Model Based - Model Free - Q learning - Introduction to Deep learning - Introduction to Evolutionary Computing.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments - Cross Validation (CV) and Resampling – K-fold Cross Validation – Bootstrapping - Measuring classifier performance – Assessing a single classification algorithm – Comparing two classification algorithms – t test, McNemar's test.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Illustrate basics of the machine learning concepts and Learning theory	**2**
CO2	Demonstrate the usage of supervised learning models.	**3**
CO3	Demonstrate the usage of unsupervised learning models and ensemble models.	**3**
CO4	Illustrate the graphical models and graphical learning techniques.	**3**
CO5	Analyse the performance of machine learning models.	**4**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Sridhar S, Vijayalakshmi M, "Machine Learning", Oxford University Press, First Edition, 2021.
3. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

REFERCENCES

1. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
2. Peter Flach, "Machine Learning", First Edition, Cambridge University Press, 2012.
3. Tom Mitchell, "Machine Learning", First Edition, McGraw Hill, 1997.
4. Kevin P. Murphy. "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
5. Ameet V Joshi, "Machine Learning and Artificial Intelligence", Springer, 2020.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	3	2	2	2	2	2	3	3	2	2	2	2
2	3	3	3	2	3	2	2	2	2	3	3	3	3	3
3	3	3	3	3	3	2	2	2	2	3	3	3	3	3
4	3	3	3	3	3	2	2	2	3	3	3	3	3	3
5	2	3	3	3	2	2	2	2	3	3	3	2	2	2

3-High, 2-Medium, 1-Low

CS22403 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

OBJECTIVES

- Analyze the asymptotic performance of various algorithms
- Design algorithms using divide and conquer approach
- Design algorithms using dynamic programming and greedy technique
- Understand the methods for iterative improvement and computational geometry
- Design algorithms using Backtracking and Brach and bound approach and learn about Class P, NP, NP-complete and NP-hard.

UNIT I INTRODUCTION **9**

The Role of Algorithms in Computing: Algorithms as a technology - Fundamentals of algorithmic problem solving – Analysis framework – Growth of functions: Asymptotic notation – Standard notations and common functions. Mathematical analysis of Non recursive and recursive algorithms- Insertion Sort algorithm and analysis – Brute force approach: Sequential search, Traveling Salesman Problem, Knapsack problem.

UNIT II DIVIDE AND CONQUER **9**

The Substitution Method for Solving Recurrences – The Recursion-Tree method for Solving Recurrences- The Master Method for Solving Recurrences – Merge sort, Quick sort algorithm and analysis – The maximum-sub array problem – Finding Closest Pair of Points.

UNIT III DYNAMIC PROGRAMMING, GREEDY TECHNIQUE AND STRING MATCHING ALGORITHMS **9**

Dynamic Programming: Knapsack Problem and memory functions, Longest common subsequence, Optimal Binary Search Tree, Warshall's and Floyd's Algorithm. Greedy Technique: Minimum Spanning Trees – Kruskal's and Prim's Algorithms, Single source Shortest Paths - Dijkstra's Algorithm, Huffman Trees. String Matching algorithms: The naïve approach, Rabin-Karp algorithm, Knuth- Morris-Pratt algorithm.

UNIT IV ITERATIVE IMPROVEMENT AND COMPUTATIONAL GEOMETRY **9**

Maximum Flow: Flow networks, Ford Fulkerson method, Maximum Bipartite matching – Linear Programming: Standard and Slack Forms, The Simplex Algorithm, Geometric Interpretation of Linear Programming - Computational Geometry: Line Segment Properties, Graham Scan, Jarvis's March.

UNIT V COPING WITH LIMITATIONS OF ALGORITHMIC POWER AND NP-COMPLETENESS **9**

Backtracking: N-Queen's problem, Subset-sum problem – Branch and bound: Knapsack problem, Traveling salesman problem - NP-completeness and the classes P and NP: Polynomial Time, Polynomial Time

Verification, Circuit Satisfiability, Formula satisfiability, 3-CNF satisfiability, The Clique Problem, Vertex Cover.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Analyze the running time of algorithms using asymptotic analysis.	**4**
CO2	Apply the divide-and-conquer techniques and analyze the running time of the algorithms in real-world problems.	**3**
CO3	Apply the dynamic programming and greedy paradigms and analyze the running time of the algorithms using those techniques.	**3**
CO4	Employ iterative improvement and computational geometry methods to solve engineering problems.	**3**
CO5	Describe the limitations of algorithm power and methods to cope with the limitations of algorithm power for various problems	**2**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERCENCES

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009.
3. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
4. http://nptel.ac.in/

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	1	1	-	1	1	1	2	1	3
2	2	3	3	3	-	-	-	-	2	-	1	1	1	2
3	2	3	3	3	-	-	-	-	2	-	1	1	1	2
4	2	2	3	3	-	-	-	-	1	-	-	-	1	3
5	3	2	2	3	1	-	-	-	1	-	-	-	1	3

3-High, 2-Medium, 1-Low, '-' – no correlation

CS22409 JAVA PROGRAMMING: THEORY AND PRACTICES

L	T	P	C
3	0	2	4

OBJECTIVES

- To understand the basic concepts of object-oriented programming (OOP) and how they apply to Java.
- To be familiar with the fundamentals of Classes, Packages and Inheritance.
- To define and implement Interfaces and Exceptions in Java
- To understand and demonstrate I/O Streams and Multithreading concept.
- To design and build Graphical User Interface Application using Applet and JAVAFX

UNIT I INTRODUCTION TO OOP AND JAVA 12

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment – Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Comments, Data Types, Variables, Operators, Control Flow, Arrays - JavaDoc comments.

Suggested Activities :

Develop a Java program which initializes earning of an employee. The program should calculate the income tax to be paid by the employee as per the criteria given below:

SLAB RATE	IT RATE
Upto Rs.50000	NIL
Upto Rs.60000	10% on additional amount
Upto Rs.150000	20% on additional amount
Above Rs.150000	30% on additional amount

UNIT II CLASSES, PACKAGES AND INHERITANCE 12

Defining classes in Java – constructors, methods -access specifiers - static members – Package creation Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes –- Object cloning -inner classes.

Suggested Activities :

Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary

UNIT III INTERFACES , STRINGS AND EXCEPTION HANDLING 12

Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces -Exceptions - exception hierarchy - throwing and catching exceptions – built-

in exceptions, creating own exceptions- String Manipulations.

Suggested Activities :

- Write a java program to define an interface advancedArithmetic which contains a method signature int divisor sum(int n). Implement it in a class mycalculator to calculate sum of divisors of a number.
- Write a java program to check if two strings are anagrams of each other
- Write a java program to create your own exception as NeagtiveValueException whenever negative values are put in an array

UNIT IV I/O STREAMS AND MULTITHREADING 12

Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files. Differences between multi-threading and multitasking, thread life cycle, creating threads, Inter-thread communication.

Suggested Activities :

- Write a java program to copy the contents of one file to another using file stream.
- Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number

UNIT V JAVA APPLET AND JAVAFX 12

Introduction and Advantage of Applet-How to create and run an Applet and Applet Viewer-Life, cycle of Applet-Introduction to JAVAFX - Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – Menus – Basics – Menu – Menu bars – MenuItem.

Suggested Activities :

Develop Student management application using JavaFX controls, layouts and menus

TOTAL : 60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand the fundamentals of Java programming including variables, data types, control structures and methods.	**2**
CO2	Apply the concepts of problems classes, objects, packages and inheritance to solve simple problems.	**3**
CO3	Create Java applications with Interfaces, Strings and Exception Handling mechanism.	**6**
CO4	Apply the concepts of streams and multithreaded model to solve real world problems	**3**
CO5	Apply the concepts of Applet, JavaFX components and controls for developing GUI based applications	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERCENCES

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
2. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018.
3. Steven Holzner, ―Java 2 Black book, Dreamtech press, 2011.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	1	3	1	3	-	-	-	3	2	2	2	3	1
2	2	1	3	2	1	-	-	-	2	1	1	3	3	3
3	3	3	1	2	2	-	-	-	3	2	1	2	3	1
4	3	1	2	2	2	-	-	-	1	2	1	3	3	1
5	1	1	2	3	2	-	-	-	3	2	1	2	3	3

3-High, 2-Medium, 1-Low

GE22451 **ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**

L	T	P	C
3	0	0	3

(Common to All Branches)

OBJECTIVES

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.
- To study and understand the various types of renewable sources of energy and their applications.
- To familiarize the concept of sustainable development goals, economic and social aspects of sustainability, recognize and analyze climate changes, and environmental management challenges.
- To inculcate and embrace sustainability practices, develop a broader understanding of green materials and energy cycles, and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY **9**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– food chains, food webs and ecological pyramids, ecological succession. Biodiversity- types-genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: fragmentation and 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 **9**

Definition, causes, effects and preventive measures of air, water and soil pollution. Marine and thermal pollution - causes, effects and control measures. Light and noise pollution - effect on flora and fauna. Nuclear pollution- Sources, effects and control measures. Disposal of radioactive wastes (Nuclear hazards). Pollution case studies. Role of an individual in the prevention of pollution. Solid, hazardous and E-waste management. Occupational health and safety management system (OHASMS). Environmental protection, Environmental protection acts, categorization of spices according to IUCN.

UNIT III RENEWABLE SOURCES OF ENERGY **9**

Energy resources: Growing energy needs, Nonrenewable resources – types, uses. Energy management and conservation - New energy sources, Need of new sources - geo suitability of establishing renewable energy sources, different types new energy sources. Applications of hydrogen energy, ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Role of an individual in conservation of energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT **9**

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols, Sustainable Development Goals-targets, indicators and intervention areas - Principles of green chemistry, Climate change- Global, Regional and local environmental issues and possible solutions-case studies - Role of non-governmental organization, Concept of carbon credit, carbon footprint - Environmental management in industry - A case study

UNIT V SUSTAINABILITY PRACTICES **9**

Zero waste and R concept, circular economy, ISO 18000 series, material life cycle assessment, environmental impact assessment. Wasteland reclamation, Sustainable habitat: green buildings, green materials, energy efficiency and energy audit, sustainable transports. Energy cycles, carbon cycle, emission and sequestration, Green engineering: sustainable urbanization- socio-economical and technological change. Rainwater harvesting, watershed management, environmental ethics: Issues and possible solutions.

TOTAL : 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Recognize the fundamental role of ecosystems and suggest an appropriate method for the conservation of biodiversity.	3
CO2	Describe the different types of pollution, their effects and strategies to control pollution.	3
CO3	Identify the various renewable energy resources and use the appropriate one thereby conserving non-renewable resources for future generation.	3
CO4	Explain the various goals of sustainable development applicable to suitable technological advancement and societal development.	2
CO5	Summarize the various sustainability practices, green materials, energy cycles, and the role of green engineering in sustainable urbanization.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 7th Edition, New Age International Publishers, 2022.
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, Pearson. 2011.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, CL Engineering, 2015.

6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERCENCES

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 3rd edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 3rd edition, 2021.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	-	-	3	3	2	-	2	-	1	-	-
2	3	-	-	-	-	3	3	2	-	2	-	2	-	-
3	3	-	1	-	-	3	3	1	-	2	-	1	-	-
4	3	-	-	-	-	3	3	3	-	2	-	2	-	-
5	3	-	-	-	-	3	3	3	-	2	-	2	-	-

3-High, 2-Medium, 1-Low

CS22411 **OPERATING SYSTEMS LABORATORY**

(Common to CS and AD)

L	T	P	C
0	0	3	1.5

OBJECTIVES

- To install Linux operating systems and understanding the basics of Unix command and shell programming.
- To implement various various Memory management and Storage management strategies.
- To implement Process Management techniques

LIST OF EXPERIMENTS

1. Installation of Linux operating system
2. Implement UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close
4. Write C programs to Implement the various File Organization Techniques
5. Implement the following File Allocation Strategies using C programs
    a. Sequential b. Indexed c. Linked
6. Write C programs for the implementation of FCFS disk scheduling algorithm
7. Write C programs to implement the various CPU Scheduling Algorithms
8. Implement the Inter-Process communication strategy
9. Implement Mutual Exclusion by Semaphore
10. Write a C programs to avoid Deadlock using Banker's Algorithm
11. Write a C program to Implement Deadlock Detection Algorithm
12. Write C program to implement Threading
13. Implement the Paging and SegmentationTechniques using C program
14. Write C programs to implement the following Memory Allocation Methods
    a. First Fit b. Worst Fit c. Best Fit
15. Write C programs to implement the various Page Replacement Algorithms

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C / C++ / Java / Equivalent complier 30 Nos.

Server with C / C++ / Java / Equivalent complier supporting 30 terminals.

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Define and implement UNIX Commands,	**1**
CO2	Experiment the various Memory management and Storage management strategies.	**3**
CO3	Demonstrate Process Management techniques	**2**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	3	1	1				1	3	3	3	2	1
2	3	1	1	2	2				3	2	1	1	3	1
3	3	3	2	1	2				3	3	1	2	2	2

3-High, 2-Medium, 1-Low

CS22412 **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY**

L	T	P	C
0	0	3	1.5

OBJECTIVES

- To implement search strategies for toy and real-world problem
- To construct knowledge base and perform inferencing using First-order Logic
- To learn to implement supervised and unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS

1. Implement **exhaustive search** for Tic-Tac-Toe game
2. Implement **Breadth First Search** and **Depth First Search** for Water Jug problem
3. Implement **A*** algorithm to find the shortest path
4. Implement **Minimax** algorithm for Tic-Tac-Toe game
5. Study of **Prolog** Commands
6. Implement **Forward Chaining and Backward chaining** using First Oder Logic
7. Implement **Linear Regression** model to predict the house price and evaluate the error rate and R^2 value.
8. Implement **Naïve Bayes Classifier** using the iris data set for building the model and apply this knowledge to classify a new sample.
9. Implement **decision tree based ID3 algorithm** using the diabetes data set for building the decision tree and apply this knowledge to classify a new sample.
10. Implement **Multilayer Perceptron** model to classify a set of documents and measure the accuracy, precision, and recall.
11. Implement **XGBoost Regression** to predict the car prices. Analyze the performance of the model by applying various metrics.

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

Standalone desktops – 30 Nos. (or) Server supporting 30 terminals or more

SOFTWARE:

Prolog, Python compiler in Ubuntu OS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Implement search strategies for toy and real-world problems	**3**
CO2	Apply supervised and unsupervised machine learning algorithms on standard datasets and evaluate the performance.	**3**
CO3	Assess and compare the performance of different ML algorithms and select the suitable one based on the application.	**3**

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	2	2	2	2	2	2	2	2	3	3	3	3
2	3	2	3	3	2	2	2	2	3	3	3	2	3	3
3	3	3	3	3	3	2	2	2	2	3	3	2	2	3

3-High, 2-Medium, 1-Low