NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode-638 052, Tamilnadu, India, Phone: 04294 – 225585

Curriculum and Syllabi

for

B.Tech – Artificial Intelligence and Data Science [R22]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year (2022-23) onwards)

AUGUST 2022

INSTITUTE VISION AND MISSION	
VISION	• To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society.
MISSION	• To provide quality education to produce ethical and competent professionals with social Responsibility • To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems. • To create a learner centric environment and improve continually to meet the changing global needs.

B.TECH – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE	
VISION	• To emerge as a renowned department in providing quality Artificial Intelligence and Data Science education to meet the ever growing needs of the society.
MISSION	Artificial Intelligence and Data Science department is committed • To provide quality and value based education to produce Artificial Intelligence professionals with ethical and social responsibility. • To excel in the thrust areas of Artificial Intelligence, Machine Learning and Data Science by imparting programming knowledge and Mathematical skill set to solve real world problems. • To create a learner centric environment that motivates the students in adopting emerging technologies of the rapidly changing artificial intelligence and data science society.
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	The graduates of Artificial intelligence and data science will be able: **PEO1: Core Competency:** To apply mathematical, scientific and engineering concepts for an artificial intelligence and data scientist to remit the various challenges using emerging AI technologies. **PEO2: Research, Innovation and Entrepreneurship:** To work productively in multidisciplinary teams and provide innovative ideas for real time problems through research. **PEO3: Ethics, Human values and Life-long learning:** To embrace lifelong learning with higher ethical standards and be the source for socio economic growth.
PROGRAMME SPECIFIC OUTCOMES (PSO)	**PSO1: Analytical Skill:** Ability to Design and develop innovative automated systems applying mathematical, analytical, programming and operational skills to meet society needs. **PSO2: Knowledge Proficiency:** Provide a tangible foundation and enhance the abilities to qualify for employment, higher studies and research in artificial intelligence and data science with ethical values.

PROGRAM OUTCOMES:

At the end of this programme the students will be able to

a-l	GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
a	Engineering Knowledge	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b	Problem Analysis	PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c	Design and Development of Solutions	PO3	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.
d	Investigation of Complex Problems	PO4	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.
e	Modern Tool Usage	PO5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
f	The Engineer and Society	PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g	Environment and Sustainability	PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h	Ethics	PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i	Individual and Team Work.	PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j	Communication	PO10	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.
k	Project Management and Finance	PO11	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.
l	Lifelong Learning	PO12	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.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Programme Educational Objectives and the Programme Outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
1	3	3	2	3	3	2	2	2	2	2	3	3
2	3	3	3	3	3	2	2	1	2	1	2	1
3	3	2	2	1	2	3	2	3	2	2	2	2

MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Programme Specific Objectives and the Programme Outcomes is given in the following table

PROGRAM SPECIFIC OUTCOMES	PROGRAMME OUTCOMES											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
1	3	3	2	3	3	2	2	1	2	1	2	2
2	3	2	2	3	3	2	3	2	2	2	3	3

Contribution 1: Reasonable 2: Significant 3: Strong

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REGULATIONS – R22 CHOICE BASED CREDIT SYSTEM

B.TECH – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER: I									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
I	22MAN01	Induction Programme	MC	-	-	-	-	-	-
THEORY									
2	22EYA01	Professional Communication - I	HSMC	-	4	2	0	2	3
3	22MYB01	Calculus and Linear Algebra*	BSC	-	4	3	1	0	4
4	22PYB01	Semiconductor Physics	BSC	-	3	3	0	0	3
5	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3
6	22ECC01	Basics of Electronics Engineering	ESC	-	3	3	0	0	3
7	22GYA01	தமிழர் மரபு / Heritage of Tamils*	HSMC	-	1	1	0	0	1
PRACTICAL									
8	22PYP01	Physics Laboratory*	BSC	-	2	0	0	2	1
9	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2
10	22ECP01	Basics of Electronics Engineering Laboratory	ESC	-	4	0	0	4	2
Mandatory Non Credit Courses									
11	22MAN02	Soft /Analytical Skills - I	MC	-	3	1	0	2	0
12	22MAN03	Yoga – I*	MC	-	1	0	0	1	0
				TOTAL	**32**	**16**	**1**	**15**	**22**

*Ratified by Eleventh Academic Council

SEMESTER: II									
S.NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22EYA02	Professional Communication- II	HSMC	22EYA01	4	2	0	2	3
2	22MYB03	Statistics and Numerical Methods*	BSC	-	4	3	1	0	4
3	22AIC01	Data Structures using C*	BSC	22CSC01	3	3	0	0	3
4	22AIC02	Python Programming	ESC	-	3	3	0	0	3
5	22AIC03	Digital Principles and Computer Organization*	ESC	-	3	3	0	0	3
6	22GYA02	**தமிழரும் தொழில்நுட்பமும்/** Tamils and Technology*	HSMC	-	1	1	0	0	1
PRACTICAL									
6	22AIP01	Data structures Laboratory*	BSC	22CSP01	4	0	0	4	2
7	22AIP02	Python Programming Laboratory	ESC	-	4	0	0	4	2
8	22MEP01	Engineering Graphics Laboratory	ESC	-	4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN04	Soft/Analytical Skills - II	MC	22MAN02	3	1	0	2	0
10	22MAN05	Yoga – II*	MC	22MAN03	1	0	0	1	0
				TOTAL	**34**	**16**	**1**	**17**	**23**

*Ratified by Eleventh Academic Council

SEMESTER: III									
S.NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MYB05	Discrete Mathematics	BSC	-	4	3	1	0	4
2	22AIC04	Java Programming	PCC	-	3	3	0	0	3
3	22AIC05	Artificial Intelligence	PCC	-	3	3	0	0	3
4	22AIC06	Algorithms	PCC	22AIC01	3	3	0	0	3
5	22AIC07	Data Exploration and Visualization	PCC	-	5	3	0	2	4
PRACTICAL									
6	22AIP03	Java Programming Laboratory	PCC	-	4	0	0	4	2
7	22AIP04	Artificial Intelligence Laboratory	PCC	-	4	0	0	4	2
8	22AIP05	Algorithms Laboratory	PCC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
9	22MAN07	Soft / Analytical Skills - III	MC	22MAN04	3	1	0	2	0
10	22MAN09	Indian Constitution	MC	-	1	1	0	0	0
				TOTAL	**34**	**17**	**1**	**16**	**23**

SEMESTER: IV									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MYB08	Probability and Statistics	BSC	-	4	3	1	0	4
2	22CYB07	Environmental Science and Engineering	BSC	-	3	3	0	0	3
3	22AIC08	Operating Systems	PCC	-	3	3	0	0	3
4	22AIC09	Database Design and Management	PCC	-	3	3	0	0	3
5	22AIC10	Machine Learning	PCC	-	3	3	0	0	3
6	22AIC11	Fundamentals of Data Science and Analytics	PCC	-	3	3	0	0	3
PRACTICAL									
7	22AIP06	Database Design and Management Laboratory	PCC	-	4	0	0	4	2
8	22AIP07	Machine Learning Laboratory	PCC	-	4	0	0	4	2
9	22AIP08	Data Science and Analytics Laboratory	PCC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
10	22MAN08	Soft/Analytical Skills - IV	MC	22MAN07	3	1	0	2	0
11	22GED01	Personality and Character Development	MC	-	1	0	0	1	0
				TOTAL	**35**	**19**	**1**	**15**	**25**

SEMESTER: V									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22AIC12	Computer Networks	PCC	-	3	3	0	0	3
2	22AIC13	Deep Learning	PCC	-	3	3	0	0	3
3	22AIC14	Internet of Things and its Applications	ESC	-	3	3	0	0	3
4	E1	Elective (PEC)	PEC	-	3	3	0	0	3
5	E2	Elective (PEC)	PEC	-	3	3	0	0	3
6	E3	Elective (OEC/PEC)	PEC	-	3	3	0	0	3
PRACTICAL									
7	22AIP09	Deep Learning Laboratory	PCC	-	4	0	0	4	2
8	22AIP10	Internet of Things and its Applications Laboratory	ESC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
9	22MAN10	Soft/Analytical Skills - V	MC	22MAN08	3	1	0	2	0
10	22MAN11	Certification Course - I	MC	-	1	0	0	1	0
				TOTAL	**30**	**19**	**0**	**11**	**22**

SEMESTER: VI									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22AIC15	Data and Information security	PCC	-	4	3	1	0	4
2	22AIC16	Big Data Analytics	PCC	-	3	3	0	0	3
3	E4	Elective (PEC)	PEC	-	3	3	0	0	3
4	E5	Elective (OEC)	OEC	-	3	3	0	0	3
5	E6	Elective (OEC/PEC)	PEC/OEC	-	3	3	0	0	3
6	E7	Elective (PEC)	PEC	-	3	3	0	0	3
PRACTICAL									
6	22AIP11	Big Data Analytics Laboratory	PCC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
7	22MAN12	Soft/Analytical Skills - VI	MC	22MAN10	3	1	0	2	0
8	22MAN13	Certification Course - II	MC	-	1	0	0	1	0
				TOTAL	**27**	**19**	**1**	**7**	**21**

SEMESTER: VII									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22GEA01	Universal Human Values	HSMC	-	2	2	0	0	2
2	EM1	Elective - Management	HSMC	-	3	3	0	0	3
3	E8	Elective (PEC)	PEC	-	3	3	0	0	3
4	E9	Elective (OEC)	OEC	-	3	3	0	0	3
5	E10	Elective (OEC)	OEC	-	3	3	0	0	3
PRACTICAL									
6	22GED02	Internship/Industrial Training	EEC	-	0	0	0	0	2
				TOTAL	**14**	**14**	**0**	**0**	**16**

SEMESTER: VIII									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
PRACTICAL									
1	22AID01	Project Work	EEC	-	20	0	0	20	10
				TOTAL	**20**	**0**	**0**	**20**	**10**

(A) HS,BS, and ES Courses

(a) Humanities and Social Sciences (HS)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1.	22EYA01	Professional Communication - I	HSMC	-	4	2	0	2	3
2.	22GYA01	தமிழர் மரபு / Heritage of Tamils	HSMC	-	1	1	0	0	1
3.	22EYA02	Professional Communication- II	HSMC	22EYA01	4	2	0	2	3
4.	22GYA02	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	HSMC	-	1	1	0	0	1
5.	22GEA01	Universal Human values	HSMC		2	2	0	0	2
6.	EM1	Elective - Management	HSMC		3	3	0	0	3

(b) Basic Sciences (BS)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1.	22MYB01	Calculus and Linear Algebra	BSC	-	4	3	1	0	4
2.	22PYB01	Semiconductor Physics	BSC	-	3	3	0	0	3
3.	22PYP01	Semiconductor Physics Laboratory	BSC	-	2	0	0	2	1
4.	22MYB03	Statistics and Numerical Methods	BSC	-	4	3	1	0	4
5.	22CYB07	Environmental Science and Engineering	BSC	-	3	3	0	0	3
6.	22MYB05	Discrete Mathematics	BSC		4	3	1	0	4
7.	22MYB08	Probability and statistics	BSC		4	3	1	0	4
8.	22AIC02	Digital Principles and Computer Organization	BSC	-	3	3	0	0	3

(c) EEC

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22GED02	Internship/Industrial Training	EEC		0	0	0	0	2
2	22AID01	Project Work	EEC		20	0	0	20	10

(d)	Engineering Sciences (ES)								
S.NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ECC01	Basics of Electronics Engineering	ESC	-	3	3	0	0	3
2.	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3
3.	22ECP01	Basics of Electronics Engineering Laboratory	ESC	-	4	0	0	4	2
4.	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2
5.	22AIC01	Data structures using C	ESC	22CSC01	3	3	0	0	3
6.	22AIC02	Python Programming	ESC	-	3	3	0	0	3
7.	22AIP01	Data structures using C Laboratory	ESC	22CSP01	4	0	0	4	2
8.	22AIP02	Python Programming Laboratory	ESC	-	4	0	0	4	2
9.	22MEP01	Engineering Graphics Laboratory	ESC	-	4	0	0	4	2
10.	22AIC14	Internet of Things and its Applications	ESC	-	3	3	0	0	3
11.	22AIP10	Internet of Things and its Applications Laboratory	ESC	-	4	0	0	4	2
(e)	**Mandatory Non-Credit Courses (MC)**								
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22MAN01	Induction Programme	MC	-	0	0	0	0	0
2.	22MAN02	Soft/Analytical Skills - I	MC	-	3	1	0	2	0
3.	22MAN03	Yoga - I	MC	-	1	0	0	1	0
4.	22MAN04	Soft/Analytical Skills - II	MC	22MAN02	3	1	0	2	0
5.	22MAN05	Yoga - II	MC	22MAN03	1	0	0	1	0
6.	22MAN07	Soft / Analytical Skills - III	MC	22MAN04	3	1	0	2	0
7.	22MAN09	Indian Constitution	MC		1	1	0	0	0
8.	22MAN08	Soft/Analytical Skills - IV	MC	22MAN07	3	1	0	2	0
9.	22GED01	Personality and Character Development	MC		1	0	0	1	0
10.	22MAN10	Soft/Analytical Skills - V	MC	22MAN08	3	1	0	2	0
11.	22MAN11	Certification Course - I	MC		1	0	0	1	0
12.	22MAN12	Soft/Analytical Skills - VI	MC	22MAN10	3	1	0	2	0
13.	22MAN13	Certification Course - II	MC	22MAN11	1	0	0	1	0

(f) Program Core Courses (PCC)									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22AIC04	Java Programming	PCC	-	3	3	0	0	3
2	22AIC05	Artificial intelligence	PCC	-	3	3	0	0	3
3	22AIC06	Algorithms	PCC	22AIC01	3	3	0	0	3
4	22AIC07	Data Exploration and Visualization	PCC	-	5	3	0	2	4
5	22AIP03	Java Programming Laboratory	PCC	-	4	0	0	4	2
6	22AIP04	Artificial intelligence Laboratory	PCC	-	4	0	0	4	2
7	22AIP05	Algorithms Laboratory	PCC	-	4	0	0	4	2
8	22AIC08	Operating Systems	PCC	-	3	3	0	0	3
9	22AIC09	Database Design and Management	PCC	-	3	3	0	0	3
10	22AIC10	Machine Learning	PCC	-	3	3	0	0	3
11	22AIC11	Fundamentals of Data Science and Analytics	PCC	-	3	3	0	0	3
12	22AIP06	Database Design and Management Laboratory	PCC	-	4	0	0	4	2
13	22AIP07	Machine Learning Laboratory	PCC	-	4	0	0	4	2
14	22AIP08	Data Science and Analytics Laboratory	PCC	-	2	0	0	2	1
15	22AIC12	Computer Networks	PCC	-	3	3	0	0	3
16	22AIC13	Deep Learning	PCC	-	3	3	0	0	3
17	22AIC15	Data and Information security	PCC	-	4	3	1	0	4
18	22AIC16	Big Data Analytics	PCC	-	3	3	0	0	3
19	22AIP09	Deep Learning Laboratory	PCC	-	4	0	0	4	2
20	22AIC11	Big Data Analytics Laboratory	PCC	-	4	0	0	4	2

Semester/ Category	HSMC	BSC	PCC	ESC	EEC	PEC	OEC	Total
I	4	8		10				22
II	4	9		10				23
III		4	19					23
IV		7	18					25
V			8	5		9		22
VI			9			9	3	21
VII	5				2	3	6	16
VIII					10			10
Total	13	28	54	25	12	21	9	162
%	8.1	17.4	32.9	15.5	7.5	13.0	5.6	
AICTE Credits Recommended	16	23	59	29	15	12	9	163
AICTE MODEL CURRI %	10%	14%	36%	18%	9%	7%	6%	

TOTAL CREDITS (22+23+23+25+22+21+16+10) = 162 CREDITS

22EYA01 - PROFESSIONAL COMMUNICATION - I *(Common to All Branches)*				
	L	**T**	**P**	**C**
	2	**0**	**2**	**3**

PREREQUISITE: NIL

	Course Objectives		Course Outcomes
1.0	To build essential English skills to address the challenges of communication in today's work environment	**1.1**	The students will be able to apply knowledge of communication and language processes occur in various work environment
2.0	To comprehend the various dimensions of communication by employing LSRW skills	**2.1**	The students will be able to involve in diverse discourse forms utilizing LSRW skills
3.0	To deploy students in contextual initiatives by assisting them in developing communication abilities	**3.1**	The students will be able to participate actively in communication activities that enhance their creative skill
4.0	To facilitate students in comprehending the intent, target audience and environments of various forms of communication	**4.1**	The students will be able to associate with the target audience and contexts using varied types of communication
5.0	To enhance coherence, cohesion, and proficiency in both verbal and nonverbal communication in the workplace environment	**5.1**	The students will be able to convey the idea distinctly both in verbal and non-verbal communication in work culture

UNIT I –INTRODUCTORY SKILLS	**(6+6)**
Grammar – Parts of Speech – Verb (Auxiliaries – Primary & Modal, Main Verb) -**Listening** – Listening to Short Conversations or Monologues - Listening to Experiences – Listening to Descriptions- **Speaking** – Introducing Oneself – Exchanging Personal information - Talking about food and culture - **Reading**– Reading for Interrogation – Reading Newspaper, Advertisements and Interpreting - **Writing** - Seeking Permission for Industrial Visit & In-plant Training	
UNIT II – LANGUAGE ACUMEN	**(6+6)**
Grammar – Word Formation – Tenses (Present Tense) – Synonyms & Antonyms - **Listening** – Listening to Announcements – Listening to Interviews - Listening and Note-taking - **Speaking** – Talking about Holidays & Vacations – Narrating Unforgettable Anecdotes - **Reading** – Skimming – Scanning (Short Texts and Longer Passages) – Critical Reading - **Writing** – Instruction – Process Description	
UNIT III – COMMUNICATION ROOTERS	**(6+6)**
Grammar– Cause and Effect – Tenses (Past Tense) – Discourse Markers - **Listening** – Listening to Telephonic Conversations – Listening to Podcasts - **Speaking** – Talking about neoteric Technologies – Eliciting information to fill a form - **Reading** –Book Reading(Motivational) - Practicing Speed Reading (reading newspaper reports & biographies) - **Writing** – Checklist – Circular, Agenda & Minutes of the Meeting	
UNIT IV – DISCOURSE FORTE	**(6+6)**
Grammar – Tenses (Future Tense) –Yes/No & WH type questions – Negatives - **Listening** – Listening to TED/ Ink talks -**Speaking** – Participating in Short Conversations - **Reading** – Reading Comprehension (Multiple Choice / Short / Open Ended Questions) - **Writing** - E-Mail Writing	
UNIT V – LINGUISTIC COMPETENCIES	**(6+6)**
Grammar – Articles – Homophones & Homonyms – Single line Definition – Phrasal Verb - **Listening** – Intensive listening to fill in the gapped text - **Speaking** –Expressing opinions through Situations & Role play **Reading** – Cloze Texts - **Writing** – Paragraph Writing	

LIST OF SKILLS ASSESSED IN THE LABORATORY
1. Grammar 2. Listening Skills 3. Speaking Skills 4. Reading Skills 5. Writing Skills
TOTAL (L:30 , P:30) = 60 PERIODS

TEXT BOOK
1. Shoba K N., Deepa Mary Francis, "English for Engineers and Technologists", Volume 1, 3rd Edition, Orient BlackSwan Pvt.Ltd, Telangana, 2022.
REFERENCES
1. Koneru, Aruna, "English Language Skills", Tata McGraw Hill Education (India) Private Limited, Chennai, 2006. 2. Hewings M, "Advanced English Grammar", Cambridge University Press, Chennai, 2000. 3. Jack C Richards, Jonathan Hull and Susan Proctor, "Interchange", Cambridge University Press, New Delhi, 2015 (Reprint 2021).

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	-	-	-	-	-	-	-	3	3	-	2	-	1
3	-	-	-	-	-	-	-	-	3	3	-	2	-	1
4	-	-	-	-	-	-	-	-	3	3	-	2	-	1
5	-	-	-	-	-	-	-	-	3	3	-	2	-	1
CO (W.A)	-	-	-	-	-	-	-	-	3	3	-	2	-	1

22MYB01-CALCULUS AND LINEAR ALGEBRA *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To develop the use of matrix algebra techniques needed by engineers for practical applications.	**1.1**	The students will be able to apply the concept of orthogonal reduction to diagonalise a given matrix.		
2.0	To use the techniques, skills and engineering tools necessary for engineering practice, with geometric concepts.	**2.1**	The students will be able to identify the geometric aspects of plane, straight line and sphere.		
3.0	To improve the ability of the students in solving geometrical applications of differential calculus problems.	**3.1**	The students will be able to evaluate the radius of curvature, circle of curvature and centre of curvature for a given curve.		
4.0	To learn the important role of mathematical concepts in engineering applications with the functions of several variables.	**4.1**	The students will be able to calculate the maxima and minima for a given function with several variables by finding the stationary points.		
5.0	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.	**5.1**	The students will be able to evaluate the area and volume by double and triple integrals.		

UNIT I - MATRICES	**(9+3)**
Characteristic Equation - Eigen values and Eigen vectors of a matrix - Cayley Hamilton Theorem (excluding proof) and its applications - Quadratic form-Reduction of a Quadratic form to canonical form by orthogonal transformation.	
UNIT II – ANALYTICAL GEOMETRY OF THREE DIMENSIONS	**(9+3)**
Equation of plane – Angle between two planes – Equation of straight lines - Coplanar lines –Equation of sphere – Orthogonal spheres.	
UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	**(9+3)**
Curvature – Curvature in Cartesian co-ordinates-Centre and Radius of curvature-Circle of curvature-Evolutes and Involutes.	
UNIT IV - FUNCTIONS OF SEVERAL VARIABLES	**(9+3)**
Partial derivatives - Euler's theorem on homogeneous function-Jacobian-Maxima and Minima of functions of two variables-Constrained Maxima and Minima by Lagrange's multiplier method.	
UNIT V - MULTIPLE INTEGRALS	**(9+3)**
Double integration in Cartesian Co-ordinates-Change of order of integration-Area as double integral- Triple integration in Cartesian Co-ordinates-Volume as triple integrals.	
TOTAL (L:45+T:15) :60 PERIODS	

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LIST OF PROGRAMS USING MATLAB (Assignment/Online Test**)**:

1. Introduction to MATLAB
2. Matrix operations – Addition, Multiplication, Transpose and Inverse
3. Characteristic equation of a Matrix
4. Eigen values and Eigen vectors of Higher order Matrices.
5. Curve Tracing
6. Determining Maxima and Minima of a function of one variable.
7. Determining Maxima and Minima of a function of two variables.
8. Evaluating double integrals
9. Evaluating triple integrals
10. Finding area between two curves.

TEXT BOOKS

1. Dr.B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna publications, 2012.
2. Erwin Kreyszig , "Advanced Engineering Mathematics", 9th Edition , JOHN Wiley & sons ,2013
3. Veerarajan.T, "Engineering Mathematics of Semester I & I"I, 3rd Edition, Tata McGraw Hill. ,2016

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1. N.P.Bali, Manish Goyal, "A Text book of Engineering Mathematics -Sem-II", 6th Edition, Laxmi Publications, 2014.
2. Kandasamy.P, Thilagavathy.K, Gunavathy .K, "Engineering Mathematics for first year", 9th Revised Edition, S.Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics" , 7th Edition, Wiley India, 2007

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	1	-	-	-	1	-	2	2	2	1
2	3	2	2	-	1	1	-	-	1	-	-	2	2	-
3	3	2	2	-	1	-	-	-	-	-	-	2	2	-
4	3	2	2	1	1	-	-	-	1	-	-	2	2	-
5	3	2	2	1	1	-	-	-	1	-	1	2	2	1
CO (W.A)	3	2	2	1	1	1	-	-	1	-	2	2	2	1

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22PYB01-SEMICONDUCTOR PHYSICS
(Common to AI&DS, CSE, CSE (CS), CSE (IoT) and IT Branches)

L	T	P	C
3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To expose the concepts of conducting materials	**1.1**	Predict the importance of conducting materials in the communication field.
2.0	To gain fundamental knowledge about electrical properties of semiconductors.	**2.1**	Acquire knowledge about the electrical properties of semiconductors.
3.0	To Understand the basics of semiconductor laser.	**3.1**	Update the knowledge regarding semiconductor lasers
4.0	To expand familiarity in the field of photo detectors	**4.1**	Identify the importance of opto-electronic devices and their applications
5.0	To update the recent developments in the field advanced new engineering materials	**5.1**	Gain knowledge about recent developments in Advanced new engineering materials

UNIT I – INTRODUCTION TO CONDUCTING MATERIALS	**(9)**
Classical free electron theory – Expression for electrical conductivity – Thermal conductivity, expression – Wiedemann – Franz law- Success and failure – electrons in metals - Fermi- Dirac statistics – Density of energy states- - Particle in a three dimensional box- degenerate states -Energy bands in solids- - Electron effective mass- concept of hole.	
UNIT II –ELECTRICAL PROPERTIES OF SEMICONDUCTORS	**(9)**
Elemental and compound semiconductors - Intrinsic semiconductor – carrier concentration derivation – variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors (qualitative) – variation of Fermi level with temperature and impurity concentration – Hall effect –determination of Hall coefficient – Applications	
UNIT III – SEMICONDUCTOR LASER	**(9)**
Population of energy levels – Einstein's A and B coefficients derivation -Resonant cavity – Types of Semiconductor lasers: homo junction and hetero junction- Determination of particle size using laser - Holography – construction – reconstruction – Engineering applications of lasers -Medical field (Surgery).	
UNIT IV – PHOTO DETECTORS	**(9)**
Classification of optical materials- Carrier generation and recombination processes- Absorption emission and scattering of light in metals , insulators and semiconductors (concept only)- Formation of P-N junction - Barrier potential and depletion layer – P-N junction diode-Solar cell–LED–organic LED- Laser diode – optical data storage technique.	
UNIT V- ADVANCED NEW ENGINEERING MATERIALS	**(9)**
Metallic glasses: preparation, properties and applications. Shape Memory Alloys (SMA): Characteristics, properties of NiTi alloy, application. Nano materials: Properties - Preparation – chemical vapour deposition of nano particles and applications. Carbon nano tubes: fabrication – arc method – pulsed laser deposition – structure – properties and application.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS
1. R. A. Serway and J.W. Jewett, "Physics for Scientists and Engineers", 9th Edition. Cengage Learning, 2018. 2. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2017. **3.** V.Rajendran, "Engineering Physicsll", Tata McGraw-Hill. New Delhi.2019
REFERENCES
1. Raghavan V, "Materials and Engineering", Prentice-Hall of India, New Delhi, 2013. 2. Dattuprasad and Ramanlal Joshi, "Engineering Physics" Tata McGraw hill education, 2016. 3. B. Rogers, J.Adams and S.Pennathur, "Nanotechnology: Understanding Small System" CRC Press, 2014.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	1	-	-	-	-	-	1	1	-	2	-	-
2	3	2	2	-	-	-	-	-	2	2	-	1	-	1
3	3	3	3	-	-	-	-	-	1	1	-	1	-	-
4	3	2	2	-	-	-	-	-	1	1	-	1	-	-
5	3	3	1	-	-	-	-	-	2	1	-	2	-	-
CO (W.A)	**3**	**2.4**	**1.8**	**-**	**-**	**-**	**-**	**-**	**1.4**	**1.2**	**-**	**1.0**	**-**	**1.0**

22CSC01 - PROBLEM SOLVING AND C PROGRAMMING *(Common to All Branches)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand problem solving, problem solving aspects, programming and to know about various program design tools.	**1.1**	The student will be able to identify the appropriate problem solving techniques to drive the solution for the given problem.
2.0	To learn basic structure and Control Statements in C programming.	**2.1**	The student will be able to implement the appropriate looping and control statements in C for developing applications.
3.0	To learn the manipulation of arrays and strings	**3.1**	The student will be able to develop programs on arrays of different dimensions of arrays and strings concepts.
4.0	To understand the concept of modular programming using user defined functions.	**4.1**	The student will be able to implement programs using user defined functions.
5.0	To acquaint with the use and benefits of Memory Allocation and file handling.	**5.1**	The student will be able to use dynamic memory allocation functions for assigning memory space during execution.

UNIT I -PROBLEM SOLVING AND C PROGRAMMING BASICS	**(9)**
General Problem Solving: Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms **Basics of C Programming** : Introduction to C - Structure of C program - Programming Rules – Compilation – Errors - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions.	
UNIT II - DECISION CONTROL STATEMENTS	**(9)**
Managing Input and Output operations, Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops break and continue statements.	
UNIT III - ARRAYS AND STRINGS	**(9)**
Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations -Two dimensional arrays -Strings and String handling functions.	
UNIT IV - FUNCTIONS	**(9)**
Functions: Basics - definition - Elements of User defined Functions - return statement, Function types, Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion - Storage classes.	
UNIT V - POINTERS AND FILE MANAGEMENT	**(9)**
Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory Allocation	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS

1. Ashok N. Kamthane, "Programming in C", 2nd Edition, Pearson Education, 2013.
2. Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018.

REFERENCES

1. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629
2. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, India, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645
3. YashavantKanetkar, "Let us C", 16th Edition, BPB Publications, 2018.
4. ReemaThareja, "Programming in C ", 2nd Edition, Oxford University Press, New Delhi, 2018.
5. E.Balagurusamy, "Programming in ANSI C", 7th Edition, Mc Graw Hill Education, 2017.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	-	-	-	-	-	-	-	3	3	3
2	3	2	3	-	-	-	-	-	-	-	-	3	3	3
3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	3	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO (W.A)	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**	**3**

22ECC01- BASICS OF ELECTRONICS ENGINEERING *(Common to AI&DS, CSE, CSE(CS), CSE(IOT) and IT Branches)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To make students to learn and understand the basics of Electrical circuits.	**1.1**	The Students can apply the Ohm's law and Kirchhoff's law and investigates the behavior of electric circuits by analytical techniques.
2.0	To enable the student to understand the analysis of DC and AC circuits using Network theorems.	**2.1**	The Students will be able to analyze and forecast the Network theorems in DC and AC circuits.
3.0	To enable the student to understand the working of semiconductor devices.	**3.1**	The Students will be able to understand the characteristics of semiconductor devices.
4.0	To make the students to understand the working of rectifiers, filters and amplifiers.	**4.1**	The students will be able to understand the concept of rectifiers, filters and amplifiers.
5.0	To make the students to understand the functions of transducer and measuring instruments.	**5.1**	The students will be able to design transducers, measuring instruments and logic circuits.

UNIT I - UNIT I - BASIC CIRCUITS ANALYSIS	**(9)**
Current, Voltage, Power – Nodes, Paths, Loops and Branches – Ohm's Law – Kirchhoff's laws – Single loop circuit – Series and parallel connected independent sources – Resistors in series and Parallel – Current and voltage division.	
UNIT II - NETWORK THEOREMS FOR DC CIRCUITS	**(9)**
Source transformation – Mesh Analysis-Node Analysis – Thevenins and Norton Theorem – Superposition Theorem – Maximum power transfer theorem.	
UNIT III - SEMICONDUCTOR DEVICES	**(9)**
PN junction diode, Characteristics – Diffusion and Drift Current – Zener diode, Characteristics – BJT: PNP and NPN, CE Configuration of BJT – JFET – MOSFET – UJT.	
UNIT IV - RECTIFIERS, FILTERS AND AMPLIFIERS	**(9)**
Transformers: Construction & Types – Rectifiers: Half Wave, Full Wave and Bridge – Filters: Induction, Capacitor, LC – Operational Amplifiers – Applications of Amplifier.	
UNIT V - TRANSDUCERS, MEASURING INSTRUMENTS AND DIGITAL CIRCUITS	**(9)**
LED – Piezo electric Transducers – LCD – Moving Coil and Moving Iron Instrument – CRO – Logic Gates: AND, OR, NOT and Universal Gates: NAND, NOR – Flip Flop: SR, JK.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS
1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis," 8th Editon, Tata McGraw Hill publishers, New Delhi, 2013. 2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGrawHill 4th Editon. 2017.
REFERENCES
1. Gupta.J.B, "Electronic Devices and Circuits," S. K. Kataria & Sons, 2013. 2. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 2018. 3.Nageswara Rao.T, "Circuit Theory", A.R. Publications, Chennai, 2018.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	2	3	-	-	-	-	-	-	-	-	3	2
2	2	2	3	3	-	-	-	-	-	-	-	-	3	2
3	3	-	2	-	3	-	-	-	-	-	-	-	3	3
4	2	-	2	-	2	3	2	-	-	-	-	-	3	3
5	2	-	2	-	-	2	3	-	-	-	-	-	3	3
CO (W.A)	**2.4**	**2**	**2.2**	**3**	**2.5**	**2.5**	**2.5**	**-**	**-**	**-**	**-**	**-**	**3**	**2.6**

22PYP01 - PHYSICS LABORATORY (Common to All Branches)					
			L	**T**	**P**	**C**
			0	**0**	**2**	**1**
PREREQUISITES: NIL					
Course Objectives		**Course Outcomes**			
1.0	To provide the basic practical exposure to all the engineering and technological streams in the field of physics.	1.1	The students will be able to apply the concept of stress, strain and elastic limit for a given sample to find their properties.		
2.0	To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.	2.1	The students will be able to gain the basic knowledge about handling the laser light and Identify the basic parameters of an optical fibre.		
3.0	To enable the students to correlate the theoretical principles with application oriented studies.	3.1	The students will be able to analyze the properties of matter with sound waves.		
4.0	To introduce different experiments to test basic understanding of physics concepts applied in optics and electronics	4.1	The students will be able to recall the knowledge of properties of light through spectrometer grating and fiber optic cable.		
5.0	To analyze the behavior and characteristics of solar cells and LED	5.1	The students will be able to acquire the knowledge in semiconducting devices such as solar cells and LED.		

PHYSICS LABORATORY

1. Determination of Young's modulus by non-uniform bending method
2. Determination of (a) wavelength and (b) particle size using Laser.
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of band gap of a semiconductor.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of V-I characteristics of solar cell.

*Ratified by Eleventh Academic council

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	-	-	-	-	-	-	1	-	2	1	-
2	3	3	2	-	-	-	-	-	-	-	-	1	1	-
3	3	3	2	-	-	-	-	-	1	-	-	1	-	-
4	3	2	3	-	-	-	-	-	-	-	-	2	-	-
5	3	2	2	-	-	-	-	-	-	1	-	1	-	-
CO (W.A)	**3.0**	**2.0**	**2.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**1.0**	**1.0**	**0.0**

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22CSP01 - PROBLEM SOLVING AND C PROGRAMMING LABORATORY
(Common to All Branches)

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language.	**1.1**	The student will be able to identify the appropriate programming construct to develop programs for all types of problems.
2.0	To study, analyze and implement the concepts of arrays and strings in C programming.	**2.1**	The student will be able to implement programs on arrays of different dimensions and string concepts.
3.0	To learn the importance user defined functions and pointers.	**3.1**	The student will be able to develop programs using user defined functions and pointers.
4.0	To gain knowledge in user defined data types and file handling functions in C programming	**4.1**	The student will be able to design programs using user defined data types and various file handling functions.
5.0	To acquire skill in dynamic memory allocation	**5.1**	The student will be able to use dynamic memory allocation functions for assigning memory space during execution.

C-Programming:

1. Draw the flowchart for the following using Raptor tool.
    a) Simple interest calculation
    b) Greatest among three numbers
    c) Find the sum of digits of a number
2. Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators (Sequential and Selection structures)
3. Programs for demonstrating repetitive control statements like 'for', 'while' and 'do-while' (Iterative structures)
4. Programs for demonstrating one-dimensional and two-dimensional numeric array
5. Programs to demonstrate modular programming concepts using functions
6. Programs to implement various character and string operations with and without built-in library functions.
7. Programs to demonstrate the use of pointers
8. Programs to illustrate the use of user-defined data types
9. Programs to implement various file management.
10. Program Using Dynamic memory allocation functions

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- Printers – 3 Nos.

Software:

- RAPTOR Tool
- Compiler – C

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	2	-	-	-	-	-	-	-	-	3	3	3
2	3	2	3	-	-	-	-	-	-	-	-	3	3	3
3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	3	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO (W.A)	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**	**3**

22ECP01- BASICS OF ELECTRONICS ENGINEERING LABORATORY *Common to AI&DS, CSE, CSE(CS), CSE(IOT) and IT Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PRE REQUISITE : Nil					
Course Objectives		**Course Outcomes**			
1.0	To make students to examine the basics of Semiconductor Diodes and its characteristics	**1.1**	The Students will be able to examine Semiconductor Diodes and its characteristics		
2.0	To enable the student to analyze the characteristics of BJT, FET and UJT	**2.1**	The Students will be able to analyze characteristics of BJT, FET and UJT working principles and operations		
3.0	To make the students to analyze the operation of Rectifier circuit	**3.1**	The students will be able to analyze the operation of rectifier circuit and its applications		
4.0	To motivate the students to learn and practice with measurement of Electrical circuits using various theorems	**4.1**	The Students will apply the Ohm's law, Kirchhoff's law and various theorems (Thevenin's, Norton's etc) and investigates the behavior of electric circuits by analytical techniques		
5.0	To motivate the students to design a digital circuits using various basic logic gates	**5.1**	The Students will be able to Design simple digital circuits by exploring logic gates		

(Cycle- I)
1.Plot the V-I Characteristics of PN junction diode and also find the forward and reverse resistance
2.Plot the V-I Characteristics of Zener diode and also find the forward and reverse resistance
3.Plot the Input-Output characteristics of Common Emitter Configuration(CE) using BJT
4.Find the Characteristics of FET and also plot the drain and transfer characteristics
5. Plot the V-I Characteristics of UJT
6.Construct the Half wave Rectifier & Full wave Rectifier and plot the graph
(Cycle- II)
1.Verification Kirchoff's Voltage Law (KVL) ,Kirchoff's Current Law(KCL)
2.Verfication of Thevenin's Theorem
3. Verfication of Norton's Theorem
4.Verification logic gates

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2
2	3	2	2	1	-	-	-	-	-	-	-	1	3	1
3	3	-	2	2	-	-	-	-	-	-	-	1	3	1
4	3	-	2	-	-	1	-	-	-	-	-	-	3	2
5	3	-	2	-	-	1	-	-	-	-	-	2	3	1
CO (W.A)	**3**	**2**	**1.8**	**1.3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1.3**	**3**	**1.4**

22MAN01 INDUCTION PROGRAMME *(For Common To All Branches)*				
	L	**T**	**P**	**C**
	-	**-**	**-**	**-**
PRE REQUISITE : NIL				

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

REFERENCES:

1.Guide to Induction program from AICTE

22MAN02 - SOFT/ANALYTICAL SKILLS – I (*Common to All Branches)*					
		L	**T**	**P**	**C**
		1	**0**	**2**	**0**
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To understand the basic concepts of grammar and apply them in a structured manner.	**1.1**	The students will be able to intensify their awareness on correct usage of grammar in writing and speaking		
2.0	To evaluate various real-life situations by resorting to an analysis of key issues and factors.	**2.1**	The students will be able to solve the real-time problems for performing job functions easily.		
3.0	To solve mathematical problems and thereby reducing the time taken for performing job functions.	**3.1**	The students will be able to enhance their aptitude round clearing ability in interview process.		

UNIT I – VERBAL ABILITY	**(5 +10)**
Tenses - One word substitution- Articles – Preposition - Conjunction	
UNIT II – BASIC APTITUDE	**(5 +10)**
Percentage – Ratio and Proportion – Blood Relations – Analogy	
UNIT III – LOGICAL REASONING	**(5 +10)**
Probability – Profit and Loss - Syllogism - Statement Assumptions.	
TOTAL (L:15, P: 30) :45 PERIODS	

REFERENCES:

1. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", 4th Edition, Cambridge University 2012.

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	3	2	2	-	-	1	-	2	-	-	-	1	-
3	-	3	2	2	-	-	1	-	2	-	-	-	1	-
CO (W.A)	**-**	**2**	**1.3**	**1.3**	**-**	**-**	**0.6**	**-**	**2.3**	**1**	**-**	**0.6**	**0.6**	**0.3**

22MAN03 YOGA - I *(Common To All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**I**	**0**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To make students in understanding the importance of yoga in shaping mental and physical wellness.	**1.1**	Student will be able to understand the importance of yoga for physical and mental goodness.		
2.0	To provide awareness about the significance of leading a peaceful life by following yoga exercises and principles.	**2.1**	Student will be able to perform the yoga exercises for hand, leg, eye and sun salutation etc.		
3.0	To develop mental wellbeing through meditation and breathing exercises.	**3.1**	Student will be able to learn and practice meditation techniques for keeping good mental health		
4.0	To strengthen the body through physical exercises.	**4.1**	Student will be able to develop their body by performing yoga exercises.		
5.0	To inculcate the knowledge about different types of Asanas and their benefits	**5.1**	Students will be able to demonstrate different types of yoga Asanas for improving their personal fitness.		

UNIT I – INTRODUCTION TO YOGA	**(3)**
Meaning and Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra.	
UNIT II - YOGA AND LIFE STYLE	**(3)**
Asanas as Preventive measures – Hypertension:Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana – Obesity: Procedure, Beneits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana – Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana - Diabetes: Procedure, Benefits and contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana – Asthema: Procedure, Benfits and contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.	
UNIT III – MIND EXERCISES	**(3)**
Naadi sudhi – Thanduvada sudhi – Breathing meditation – Silent meditation – Relax meditation.	
UNIT IV – PHYSICAL EXERCISES (PART– I)	**(3)**
Hand Exercises – Leg Exercises – Eye Exercises – Sun Salutation.	
UNIT V – ASANAS (PART-I)	**(3)**
Asanas –Tadasana – Yegapadhasana – Chakrasana – Udkaddasana – Thirikosana – Thandasana – Paschimottanasana.	
TOTAL(P:15) : 15 PERIODS	

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TEXT BOOKS/REFERENCES:
1. Light On Yoga by B.K.S. Iyengar.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						2	2	3	2	2		3		
2						2	2	3	2	2		3		
3						2	2	3	2	2		3		
4						2	2	3	2	2		3		
5						2	2	3	2	2		3		
CO (W.A						2	2	3	2	2		3		

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22EYA02 - PROFESSIONAL COMMUNICATION - II (*Common to All Branches*)			
L	T	P	C
2	0	2	3

PREREQUISITE : 22EYA01

	Course Objectives		Course Outcomes
1.0	To familiarize the students with the basic structures of English and to train them to use these elements correctly in speaking and writing	**1.1**	The Students will be able to frame sentences both in written and spoken forms with accuracy and fluency.
2.0	To acquire proficiency in LSRW skills on par with the expectations of the industry.	**2.1**	The Students will be able to attain and enhance competence in the four modes of literacy: Listening, Speaking, Reading and Writing.
3.0	To enable students to adopt strategies for enhancing vocabulary, language and fluency and to deliver professional presentations.	**3.1**	The Students will be able to gain essential competency to express one's thoughts orally and in writing in a meaningful way.
4.0	To communicate effectively in an academic setting using the language skills as tools.	**4.1**	The students will be able to use linguistic structures to read and understand well-structured texts encountered in academic or social contexts.
5.0	To acquire necessary language skills to follow and comprehend discourse such as lectures, conversations, interviews, and discussions.	**5.1**	The Students will be able to perform various tasks, such as role plays, debates, group discussions apart from the use of correct spelling and punctuation

UNIT I – LANGUAGE RUDIMENTS	**(6+6)**
Grammar – Active and Passive Voice – Impersonal Passive Voice – Numerical Expressions - **Listening** – Listening for Specific Information and Match / Choose / Fill in the texts - **Speaking** – Describing a Person - Making Plans -**Reading** – Intensive Reading -**Writing** – Job Application with Resume	
UNIT II - RHETORIC ENHANCERS	**(6+6)**
Grammar – Reported Speech – Infinitive and Gerund - **Listening** – Listening to Iconic Speeches and making notes - Listening news / documentaries - **Speaking** –Talking over Phone – Narrating Incidents - **Reading** – Extensive Reading (Motivational Books) - **Writing** – Recommendation	
UNIT III – TECHNICAL CORRESPONDENCE	**(6+6)**
Grammar – If Conditionals – Blended Words - **Listening** – Listening to business conversation on audio and video of Short Films, News, Biographies - **Speaking** – Synchronous communication and Asynchronous communication - Opportunities and threats in using digital platform- **Reading** - Finding key information in a given text - **Writing** –Netiquettes- Inviting Dignitaries - Accepting & Declining Invitation	
UNIT IV - CORPORATE COMMUNICATION	**(6+6)**
Grammar – Concord – Compound Words - **Listening** – Listening to Roles and Responsibilities in Corporate - Listening to technical videos - **Speaking** – Introduction to Technical Presentation - Story Telling - **Reading** – Reading and Understanding Technical Articles - **Writing** – Report Writing (Accident, Survey and feasibility)	

UNIT V - LANGUAGE BOOSTERS	(6+6)

Grammar - Idiomatic Expressions – Relative Clauses – Confusable words - **Listening** – Listening to different kinds of Interviews - Listening to Group Discussion - **Speaking** – Group Discussion - **Reading** – Reading and Interpreting Visual Materials - **Writing** – Analytical Paragraph Writing

LIST OF SKILLS ASSESSED IN THE LABORATORY

1. Grammar.
2. Listening Skills.
3. Speaking Skills.
4. Reading Skills
5. Writing Skills

TOTAL (L:30 , P:30) = 60 PERIODS

TEXT BOOKS:

1.Sudharshana, N.P and Saveetha.C, "English for Technical Communication", Cambridge University Press, New Delhi, 2016 (Reprint 2017).

REFERENCES:

1. Rizvi, M Ashraf, "Effective Technical Communication", Second Edition, McGraw Hill Education India Pvt Ltd, 2017.

2. Rodney Huddleston, Geoffrey K. Pullum and Brett Reynolds, "A Student's Introduction to English Grammar", Second Edition, Cambridge University Press, New Delhi, 2022

WEB REFERENCE:

1. http://youtu.be/URtdGiutVew

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2		1
2									3	3		2		1
3									3	3		2		1
4									3	3		2		1
5									3	3		2		1
CO									**3**	**3**		**2**		**1**

22MYB03 – STATISTICS AND NUMERICAL METHODS *(Common to CSE,IT,AI&DS,IOT,CS(Cyber security) ,EEE Branches)*					
		L	**T**	**P**	**C**
		3	**I**	**0**	**4**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.	**1.1**	The students will be able to select a hypothesis testing method for the given numerical set of data to analyze the significance .		
2.0	To understand the knowledge of design of experiments	**2.1**	The students will be able to apply analysis of Variance for the data set of selected number factors for analyzing the significance.		
3.0	To introduce the basic concepts of solving algebraic and transcendental equations.	**3.1**	The students will be able to solve an algebraic or transcendental equation using an appropriate numerical method.		
4.0	To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.	**4.1**	The students will be able to appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.		
5.0	To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.	**5.1**	The students will be able to solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.		

UNIT I - TESTING OF HYPOTHESIS	**(9+3)**
Sampling Distributions-Tests for single mean, difference of means (Large and Small samples) Using z ,t -distribution, F – distribution- Chi-square - Test for independence of attributes and Goodness of fit.	
UNIT II - DESIGN OF EXPERIMENTS	**(9+3)**
Analysis of variance- Completely randomized design - Randomized block design - Latin square design.	
UNIT III - SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	**(9+3)**
Solution of algebraic and transcendental equations - Fixed point iteration method - Newton Raphson method- Solution of linear system of equations Gauss elimination method – Iterative methods of Gauss Jacobi and Gauss Seidel Methods – Eigen values of a matrix by Power method .	
UNIT IV - INTERPOLATION AND APPROXIMATION	**(9+3)**
Lagrange's and Newton's divided difference interpolations - Newton's forward and backward difference interpolation - Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules - Romberg's Methods.	
UNITV - NUMERICAL DIFFERENTIATION AND INTEGRATION	**(9+3)**
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.	
TOTAL (L:45+T:15) : 60 PERIODS	

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TEXT BOOK:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.

WEB REFERENCES:

1. https://youtu.be/zmyh7nCjmsg
2. https://youtu.be/NmgbFJ4UwPs
3. https://youtu.be/RgKy7URFx1c
4. https://archive.nptel.ac.in/courses/111/107/111107105/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1	1	1				1	1		2		
2	3	3	1	1	1				1	1		2		
3	3	2	1	1	1				1	1		2		
4	3	3	1	1	1				1	1		2		
5	3	2	1	1	1				1	1		2		
CO (W.A)	**3**	**3**	**1**	**1**	**1**				**1**	**1**		**2**		

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22AIC01 –DATA STRUCTURES USING C *(Common to 22CSC02,22CCC01,22CIC01 and 22ITC01)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : 22CSC01					
Course Objectives		**Course Outcomes**			
1.0	To learn the concept of pointers and strings	**1.1**	The student will be able to perform array and string operations using pointers		
2.0	To be able to implement the abstract data type list as a linked list using the node and reference pattern.	**2.1**	The student will be able to manipulate different operations using linked list		
3.0	To understand the Stack and Queue ADT	**3.1**	The student will be able to deploy different operations on stack and queue.		
4.0	To gain knowledge on tree data structure.	**4.1**	The student will be able to determine the structure and operations on trees		
5.0	To understand the various operations on graph	**5.1**	The student will be able to implement the various operations on graph		

UNIT I - POINTERS USING ARRAYS AND STRINGS	**(9)**
Pointers : Introduction – Pointers and arrays– passing an array to a function– returning an array from function – NULL pointers –Array of pointers – Pointer-to-pointer – Dangling Pointer. Function pointers: calling a function using function pointer- Using pointer as a function argument	
UNIT II - LIST	**(9)**
Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT	
UNIT III - STACKS AND QUEUES	**(9)**
Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressionsInfix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues	
UNIT IV - TREE	**(9)**
Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap.	
UNIT V - GRAPHS	**(9)**
Definitions – Representation of Graphs – Types of Graph – Graph Traversal: Depth-First Search (DFS) – Breadth-First Search (BFS) – Topological Sort – Applications of DFS: Bi-connectivity – Euler Circuits – Finding Strongly Connected Components – Applications of BFS: Bipartite Graph.	
	TOTAL (L:45) : 45 PERIODS

*Ratified by Eleventh Academic council

TEXT BOOKS:

1. Sumitabha Das, "Computer Fundamentals &C Programming", McGraw Hill Education(India) Private Limited, 1st Edition, 2018.
2. Weiss M. A., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016.

REFERENCES:

1. Yashavant Kanetkar, "Pointers in C", BPP Publications, 4th Edition, 2017.
2. PradipDey, Manas Ghosh, "Programming in C", Oxford Higher Education, 2nd Edition, 2016.

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	2	1	-	-	2	-	2	3	3	3
2	3	3	2	2	2	2	-	-	1	-	2	3	3	3
3	2	3	2	2	2	2	-	-	2	-	2	3	3	3
4	3	3	2	2	2	1	-	-	1	-	2	3	3	3
5	3	3	2	2	2	1	-	-	2	-	2	3	3	3
CO (W.A)	**2.8**	**3**	**2**	**2**	**2**	**1.4**	**-**	**-**	**1.6**	**-**	**2**	**3**	**3**	**3**

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22AIC02 - PYTHON PROGRAMMING *(Common to 22CSC03,22CCC02,22CIC02 and 22ITC02)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To acquaint with data types, input output statements, decision making, looping in Python	**1.1**	The students will be able to develop understanding of basics of Python Programming constructs.		
2.0	To acquire knowledge about manipulation of strings.	**2.1**	The students will be able to impart basic knowledge of all strings functions.		
3.0	To be familiarized with programming concepts like list and tuples.	**3.1**	The students will be able to choose most appropriate programming constructs and features to solve the problems with list, tuples and dictionaries.		
4.0	To understand the concepts of dictionaries, function and modules.	**4.1**	The students will be able to exhibit the programming skills for the use of the logical constructs of language using function and files.		
5.0	To develop the skill of designing Graphical user Interfaces in Python	**5.1**	The students will be able to demonstrate significant experience with the Python program development environment.		

UNIT I - INTRODUCTION TO PYTHON	**(9)**
Introduction to python: Features - Execution of python program – Flavors of Python – Comments - Data Types: Built-in data types– Sequences – Set - Literals– Operators – Input and Output Statements - Control Statements if – if-else –if-else-if – while-For –Nested loops – the else suite - Break – Continue - pass - assert – return.	
UNIT II - STRINGS	**(9)**
Arrays: One Dimensional arrays - Multi Dimensional arrays - Strings and Characters: Creating - Length - Indexing - Slicing - Repeating - Concatenation - Comparing - Removing Spaces - Finding Sub Strings - Counting Substrings in a String - Strings are Immutable - Replacing - Splitting and Joining Strings - Changing Case - Checking Starting and Ending of a String – String Formatting - Working with Characters – Sorting and Searching Strings - Finding Number- Inserting sub string into a string.	
UNIT III - LISTS , TUPLES AND DICTIONARIES	**(9)**
Lists: Creating Lists – Updating - Concatenation - Repetition - Methods – Sorting. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a tuples. Dictionaries: Operations – Methods - Using for Loop with Dictionaries – Sorting the Elements of a Dictionary using Lambdas - Converting Lists and Strings into Dictionary - Passing Dictionaries to Functions - Ordered Dictionaries.	
UNIT IV - FUNCTIONS AND FILES	**(9)**
Functions: Defining – Calling – Returning - Pass by Object Reference – Formal, Actual, Positional, Keyword, Default & Variable Length Arguments - Local and Global Variables - Recursive Functions - Lambdas - Function Decorators. Files - Types of Files - Opening & Closing a File - Working with Text Files Containing Strings - Working with Binary Files - The with Statement - The seek() and tell() Methods - Random Accessing of Binary Files - Random Accessing of Binary Files using mmap - Zipping and Unzipping Files - Working with Directories.	

UNIT V - MODULES AND FRAMEWORKS	(9)
Modules: Importing module –Features – Built in functions. - Python Environment and Frameworks: NumPy: NumPy Arrays – Computation on NumPy Arrays – Aggregation – Sorting Arrays – Structured Arrays.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 2021 Edition.
2. Jake Vander Plas, "Python Data Science Handbook Essential Tools for Working with Data", 1st Edition O'Reilly Publishers, 2016.

REFERENCES:

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2018.
2. Wesley J. Chun, "Core Python Programming", Pearson Education, 2013.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	3	3	3	3	-	-	-	-	3	3	3
2	3	2	3	3	3	3	3	-	-	-	-	3	3	3
3	3	2	3	3	3	3	3	3	-	-	3	3	3	3
4	3	2	3	3	3	3	3	3	-	-	3	3	3	3
5	3	2	3	3	3	3	3	3	-	-	3	3	3	3
CO (W.A)	**3**	**2**	**2.8**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**

22AIC03 - DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION *(Common to 22CSC04,22CCC03,22CIC03 and 22ITC03)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To make students to analyze and design combinational circuits	**1.1**	The students will be able to compile the combinational logic circuits.		
2.0	To enable the student to analyze and design sequential circuits	**2.1**	The students will be able to design the sequential logic circuits.		
3.0	To make the students to understand the basic structure and operation of a digital computer	**3.1**	The students will be able to acquire the computer fundamentals.		
4.0	To make the students to study the design of data path unit, control unit for processor and to familiarize with the hazards.	**4.1**	The students will be able to get deep insight into the processor function.		
5.0	To make the students to understand the concept of various memories and I/O devices.	**5.1**	The students will be able to catch on to about operation of various types of memories and input output devices.		

UNIT I - COMBINATIONAL LOGIC	**(9)**
Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder –Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexer and Demultiplexers.	
UNIT II - SYNCHRONOUS SEQUENTIAL LOGIC	**(9)**
Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis of clocked sequential circuits – Shift Registers – Counters – Mod Counter –Up/Down Counter.	
UNIT III - COMPUTER FUNDAMENTALS	**(9)**
Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Design of Fast Address – Multiplication of Positive Numbers – Signed Operand Multiplication – Fast multiplication.	
UNIT IV - PROCESSOR	**(9)**
Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards.	
UNIT V - MEMORY AND I/O DEVICES	**(9)**
Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping Techniques – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.	
TOTAL (L:45) : 45 PERIODS	

*Ratified by Eleventh Academic council

TEXT BOOKS:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

REFERENCES:

1. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", 6th Edition, Morgan Kaufmann/Elsevier, 2020
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 10th Edition, Pearson Education, 2016.
3. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2018.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	3	2	1	-	-	1	2	3	2	3
2	3	3	3	3	2	1	-	-	-	1	2	3	1	2
3	3	3	3	3	2	2	1	1	-	-	2	3	2	3
4	3	3	3	3	1	-	-	-	1	1	1	2	1	3
5	3	3	3	3	1	2	1	-	-	-	-	2	1	2
CO (W.A)	**3**	**3**	**3**	**3**	**1.8**	**1.8**	**1**	**1**	**1**	**1**	**1.8**	**2.6**	**1.4**	**2.6**

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22AIP01 – DATA STRUCTURES LABORATORY *(Common to 22CSP02,22CCP01,22CIP01 and 22ITP01)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PREREQUISITE : 22CSP01					
Course Objectives		**Course Outcomes**			
1.0	To learn the concept of pointers	**1.1**	The students will be able to perform array operations using pointers		
2.0	To learn the implementation of all types linked list with its different operations.	**2.1**	The students will be able to explore various operations on linked list.		
3.0	To impart the basic stack and queue concepts and its applications.	**3.1**	The students will be able to work with stack and queue concepts.		
4.0	To Explore the concepts of tree data structures	**4.1**	The students will be able to construct and manipulate various tree operations.		
5.0	To understand the various operations on graph	**5.1**	The students will be able to deploy different operations on graphs.		

LIST OF EXPERIMENTS:

1. Pointer using 1D, 2D array
2. Implementation of singly linked list and its operations
3. Implementation of doubly linked list and its operations
4. Implementation of circular linked list and its operations
5. Implementation of Infix to postfix conversion using stack ADT
6. Implement the application for evaluating postfix expressions using array of stack ADT
7. Implementation of reversing a queue using stack
8. Binary Search Tree
9. AVL Tree
10. Priority Queues (Heaps)
11. Implementation of Graph Traversals (BFS, DFS)

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.

Software:

Compiler – C

TOTAL (P:60) : 60 PERIODS

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Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	2	2	1	-	-	2	-	2	3	3	3
2	3	3	3	3	1	2	1	2	1	1	1	2	3	2
3	2	3	2	2	1	-	3	-	2	-	3	1	3	2
4	3	3	3	1	1	2	-	1	1	-	1	-	3	2
5	3	2	3	3	2	1	-	1	-	1	2	2	3	2
CO (W.A)	**2.8**	**2.8**	**2.6**	**2.2**	**1.4**	**1.5**	**2**	**1.3**	**1.5**	**1**	**1.8**	**2**	**3**	**2.2**

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22AIP02 - PYTHON PROGRAMMING LABORATORY

(Common to 22CSP03,22CCP02,22CIP02 and 22ITP02)

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To impart the fundamental concepts of Python Programming	**1.1**	The students will be able to understand the basics of Python Programming constructs
2.0	To learn the operator concepts of Python Programming	**2.1**	The students will be able to understand the various operators of Python Programming.
3.0	To gain exposure about string manipulation, list, and tuples	**3.1**	The students will be able to realize the need of string manipulation, list, and tuples
4.0	To get knowledge about dictionaries, function and modules	**4.1**	The students will be able to design programs involving dictionaries, function and modules
5.0	To develop the skill of designing Graphical user Interfaces in Python	**5.1**	The students will be able to develop simple programs with GUI

List of Exercises:

1. Programs for demonstrating the use of different types of operators.
2. Programs for demonstrating control statements.
3. Programs to implement various string operations.
4. Programs for demonstrating the following
    a. Lists
    b. Tuples
    c. Dictionaries
5. Programs to demonstrate concepts using functions
6. Programs to implement applications using File handling
7. Programs to demonstrate modules.
8. Programs to implement applications using regular expression.
9. Program to demonstrate GUI.
10. Perform data manipulation using NumPy.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos,Printers – 3 Nos.

Software:

OS – Windows / UNIX Clone

Open Source Software – Python

TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	2	3	3	3	3	-	-	-	-	3	3	3
2	3	2	3	3	3	3	3	-	-	-	-	3	3	3
3	3	2	3	3	3	3	3	3	-	-	3	3	3	3
4	3	2	3	3	3	3	3	3	-	-	3	3	3	3
5	3	2	3	3	3	3	3	3	-	-	3	3	3	3
CO (W. A)	**3**	**2**	**2.8**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**

22MEP01 - ENGINEERING GRAPHICS LABORATORY *(Common to AI & DS, BME, CSE, CSE (IoT), CSE (CS), ECE and IT Branches)*				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

PRE REQUISITE : NIL

Course Objectives		**Course Outcomes**	
1.0	To Construct various plane curves drawing by Modeling software with dimensions	**1.1**	The students will be able to construct various plane curves drawing by Modeling software
2.0	To Construct the concept of first angle projection of points, lines and plane drawing by Modeling software with dimensions	**2.1**	The students will be able to construct the projection of points, lines and planes drawing by Modeling software with dimensions
3.0	To Develop the projection of solids drawing by Modeling software with dimensions	**3.1**	The students will be able to develop projection of solids drawing by Modeling software with
4.0	To Solve problems in sectioning of solids and developing the surfaces drawing by Modeling software with dimensions	**4.1**	The students will be able to solve problems in sections of solids and development of surfaces drawing by Modeling software with dimensions
5.0	To Apply the concepts of orthographic and isometric drawing by Modeling software with dimensions	**5.1**	The students will be able to apply the concepts of isometric in engineering practice drawing by Modeling software with dimensions

LIST OF THE EXPERIMENTS

1. Study of basic tools, commands and coordinate systems (absolute, relative, polar, etc.) used in 2D software.
2. Draw the conic curves and special curves by using drafting software.
3. Draw the front view, top view, side view of objects from the given isometric view.
4. Draw the projections of straight line inclined to both the principal planes.
5. Draw the projections of polygonal surface.
6. Draw the projections of prism, pyramid inclined to anyone of the principal plane.
7. Draw the sectional view and the true shape of the given cylinder and cone.
8. Draw the development of surfaces like prism and pyramid.
9. Draw the isometric projections of cylinder and cone.
10. Draw the isometric projections of Prism and Pyramid.

TOTAL (P:60) : 60 PERIODS

REFERENCE:

1. K.Venugopal and V.Prabhu Raja,–"Engineering Graphics", New Age International (P) Limited,2022

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	1	-	3	1	-	-	-	2	-	3	-	2
2	3	2	1	-	3	1	-	-	-	2	-	3	-	2
3	3	2	1	-	3	1	-	-	-	2	-	3	-	2
4	3	2	1	-	3	1	-	-	-	2	-	3	-	2
5	3	3	2	-	3	1	-	-	-	2	-	3	-	2
CO (W. A)	**3**	**2.2**	**1.2**	**-**	**3**	**1**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	**2**

22MAN04 – SOFT/ANALYTICAL SKILLS – II (*Common to All Branches)*					
		L	**T**	**P**	**C**
		1	**0**	**2**	**0**
PRE REQUISITE: 22MAN02					
Course Objectives		**Course Outcomes**			
1.0	To acquire satisfactory competency in use of verbal reasoning	**1.1**	The students will be able to enhance their vocabulary which in turn will be helpful in developing their speaking skills.		
2.0	To develop skill to meet the competitive examinations for better job opportunity.	**2.1**	The students will be able to solve the problems easily by using Short-cut method with time management.		
3.0	To enrich their knowledge and to develop their logical reasoning thinking ability.	**3.1**	The students will be able to analyze the problems logically and approach the problems in a different manner.		

UNIT I – VERBAL COMPETENCY	**(5+10)**
Voice - Modal Verbs – Synonyms & Antonyms - Confusable Words	
UNIT II – NUMERICAL REPRESENTATION	**(5+10)**
Average – Data Interpretation – Simple Interest and Compound Interest – Venn Diagram.	
UNIT III - RESOLUTION TENDENCY	**(5+10)**
Time and Work – Pipes and Cistern – Number Series and Odd man Out – Cube Problems.	
TOTAL(L :15,P:30) : 45 PERIODS	

REFERENCES

1. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
2. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", 4th Edition, Cambridge University 2012.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1									3	3		2		1
2		3	2	2			1		2				1	
3		3	2	2			1		2				1	
CO (W. A)		**2**	**1.3**	**1.3**			**0.6**		**2.3**	**1**		**0.6**	**0.6**	**0.3**

22MAN05 YOGA – II *(Common To All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**I**	**0**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To strengthen the body through physical exercises.	**1.1**	Student will be able to perform physical exercises like spine exercises, massage and acupressure.		
2.0	To understand the importance of value system and ethics.	**2.1**	Student will be able to learn the human values, ethics, time management and the importance of introspection.		
3.0	To know the life philosophy of yogis and maharishis.	**3.1**	Student will be able to analyze various life philosophies of yogi's and rishis.		
4.0	To understand the nature laws, cause and effect theory.	**4.1**	Student will be able to understand life lessons and nature laws.		
5.0	To inculcate knowledge about different types of Asanas and their benefits.	**5.1**	Students will be able to demonstrate different types of yoga Asanas and improve their personal fitness.		

UNIT I – PHYSICAL EXCERCISES (PART-II)	**(3)**
Breathing Exercises – Kapalapathi – Maharasanam (Spine Exerices) – Massage and Acupressure.	
UNIT II – HUMAN VALUE	**(3)**
Divine power – Life force (Bio magnetism) – Importance of Introspection – Time management – Punctuality – self confidence – mind control.	
UNIT III – PHILOSOPHY OF LIFE	**(3)**
Basic needs for life – Hunger and thirst – climatic/weather changes – Body wastes – pressure of excretory organs – safety measures – protection from natural disaster – protection from enmity – protection from accidents – ethics – morality – duty – charity – Wisdom of perfection stages – faith – understanding – realization.	
UNIT IV – NATURE'S LAW OF CAUSE AND EFFECT	**(3)**
Food transformation into seven minerals – Natural actions – pattern – precision – regularity – Required skills – planned work – awareness – introspection.	
UNIT V – ASANAS (PART-II)	**(3)**
Ustrasana – Vakrasana –Komugasana – Padmasana – Vajrasana – Sukhasana – Yogamudra – mahamudra.	
TOTAL (P:15) : 15 PERIODS	

TEXT BOOKS/REFERENCES:
Light On Yoga by B.K.S. Iyengar.

Mapping of Course Outcomes (COs) with

Programme Outcomes (POs) / Programme Specific Outcomes (PSOs)

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						1	2	3	3	2	1	3		
2						1	2	3	3	2	1	3		
3						1	2	3	3	2	1	3		
4						1	2	3	3	2	1	3		
5						1	2	3	3	2	1	3		
CO (WA)						1	**2**	**3**	**3**	**2**	1	**3**		

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22MYBO5 DISCRETE MATHEMATICS *(Common to CSE, IT, AI&DS, CSE(IOT and CSE(CS) Branches)*					
		L	**T**	**P**	**C**
		3	**I**	**0**	**4**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To understand the basic concepts of logic and their applications.	**1.1**	The students will be able to rephrase real world statements as logical propositions and demonstrate whether the proposition is satisfy, tautology or a contradiction.		
2.0	To gain knowledge about these discrete structures including logic, predicate calculus.	**2.1**	The students will be able to infer whether a logical argument is valid from the given set of premises by applying the inference rules of predicate calculus.		
3.0	To get exposed to concepts and properties of set theory and functions.	**3.1**	The students will be able to reason out mathematical reasoning and arrive at conclusions about sets and relations.		
4.0	To acquire ideas about the general counting methods involving permutations and combinations. These methods are very useful in constructing computer programs and in mastering many theoretical topics of computer science.	**4.1**	The students will be able to construct the number of arrangements and selections using the principles of counting.		
5.0	To understand the concepts of Lattices and its properties.	**5.1**	The students will be able to utilize the concept of Lattices and its properties.		

UNIT I - PROPOSITIONAL CALCULUS	**(9+3)**
Propositions-Logical Connectives-Compound Propositions-Conditional and biconditional propositions-Truth Tables-Tautologies and Contradictions-Logical Equivalences and implications – De morgan 's Laws-Normal forms-Rules of inference-Arguments-Validity of arguments.	
UNIT II - PREDICATE CALCULUS	**(9+3)**
Predicates-Statement Function-Variables-free and bound variables-Quantifiers-Universe of discourse-Logical equivalences and implications for quantified statements-Theory of inference-The rules of universal specification and generalization-Validity of arguments.	
UNIT III - SET THEORY AND FUNCTIONS	**(9+3)**
Set Operations-Properties-Power set-Relations-Graph and matrix of a relation-Partial Ordering-Equivalence Relation-Functions-Types of functions-Composition of relation and functions-Inverse functions.	
UNIT IV COMBINATORICS	**(9+3)**
Basics of counting - Counting arguments - Pigeonhole Principle - Permutations and Combinations-Recursion and recurrence relations - Generating Functions - Mathematical Induction – Inclusion and Exclusion.	
UNIT V - LATTICES	**(9+3)**
Posets-Lattices as posets-Properties of lattices-Lattices as Algebraic systems – Sub lattices - Direct product and Homomorphism.	
TOTAL (L:45+L:15) : 60 PERIODS	

TEXT BOOK:

1. Tremblay J.P and Manohar R, Discrete Mathematical Structures with Applications to Computer Science‖, Tata McGraw-Hill, New Delhi, Reprint 2010.
2. Veerarajan.T, —Discrete Mathematics with Graph Theory and Combinatorics, 4th ed., Tata McGraw Hill, New Delhi, 2008.
3. Kenneth H.Rosen, —Discrete Mathematics and its Applications‖, 5th ed., Tata McGraw- Hill publications, New Delhi 2007.

REFERENCES:

1. Venkatraman M.K.,Discrete Mathematics, the National Publishing Company, Chennai, 2007.
2. S.Santha, Discrete Mathematics with Combinatorics and Graph Theory, 2010 Cengag Learning India Pvt. Ltd.
1. Swapan Kumar Sarkar,A Text Book of Discrete Mathematics,S. Chand & Company Ltd., New Delhi.

WEB REFERENCES:

1.https://archive.nptel.ac.in/courses/106/108/106108227/

2. https://www.youtube.com/watch?v=dK8iaQYcbms

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1	1					1		2		
2	3	2	1	1	1					1		2		
3	3	1	1	1	1				1	1		2		
4	3	2	1	1	1					1		2		
5	3	1	1	1	1					1	2	2		
CO (W.A)	**3**	**2**	**1**	**1**	**1**				**1**	**1**	**2**	**2**		

22AIC04 - JAVA PROGRAMMING *(Common to 22CSC07, 22CCC0 ,22CIC06 and 22ITC06)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To understand Object oriented programming concepts and characteristics of Java	**1.1**	The students will be able to develop Java programs using OOP principles		
2.0	To know the principles of Inheritance, abstraction and interfaces	**2.1**	The students will be able to develop Java programs with the concepts of inheritance		
3.0	To define exceptions and use I/O streams	**3.1**	The students will be able to construct applications with exception handling.		
4.0	To understand threads concepts	**4.1**	The students will be able to develop Java applications using threads		
5.0	To design and build simple GUI programs using AWT and Swings.	**5.1**	The students will be able to develop interactive Java applications using GUI components.		

UNIT I - INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	**(9)**
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 – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Strings, Packages - JavaDoc comments.	
UNIT II - INHERITANCE AND INTERFACES	**(9)**
Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods-Keywords: Static-final-this- final methods and classes – Method overloading-Method Overriding-Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces	
UNIT – III EXCEPTION HANDLING AND I/O	**(9)**
Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing File	
UNIT – IV –THREADS	**(9)**
Java Thread Model – Main Thread – Creating a Thread – Creating Multiple Threads — Thread Priorities – Synchronization – Inter thread Communication – Suspending, Resuming, and Stopping Threads – Using Multithreading.	
UNIT – V EVENT DRIVEN PROGRAMMING	**(9)**
Graphics programming - Frame – Components Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields, Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019 for Units I, II, III, IV. **2.** Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015 for Unit V.
REFERENCES:
1. Cay. S. Horstmann, Gary Cornell, "Core Java-JAVA Fundamentals", Prentice Hall, 10th ed., 2016. 2. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.3. SCJP Sun Certified Programmer for Java 6 Study Guide. 6th edition, McGrawHill.

-														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	1	-	1	-	-	-	1	-	-	1	3	3
2	3	1	1	-	1	-	-	-	1	-	-	1	3	3
3	3	1	1	-	1	-	-	-	2	-	-	1	3	3
4	3	2	1	-	1	-	-	-	2	-	-	2	3	3
5	3	2	2	2	1	-	-	-	3	1	3	-	3	3
CO (W.A)	**3**	**1.6**	**1.2**	**2.0**	**1.0**	**-**	**-**	**-**	**1.8**	**1.0**	**3**	**1.25**	**3.0**	**3.0**

22AIC05-ARTIFICIAL INTELLIGENCE					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL					

Course Objectives		**Course Outcomes**	
1.0	To learn the basic concepts of Artificial Intelligence.	**1.1**	The students will be able to Explain intelligent agent frameworks
2.0	To develop general purpose problem solving agents.	**2.1**	The students will be able to Apply problem solving techniques
3.0	To apply real time searching to the given problem.	**3.1**	The students will be able to Apply game playing and CSP techniques
4.0	To analyze the agent activities based on knowledge and logical aspects.	**4.1**	The students will be able to Perform logical reasoning
5.0	To perform probabilistic reasoning.	**5.1**	The student will be able to Perform probabilistic reasoning under uncertainty

UNIT I - INTELLIGENT AGENTS	**(9)**
Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.	
UNIT II - PROBLEM SOLVING	**(9)**
Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments	
UNIT III - GAME PLAYING AND CSP	**(9)**
Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.	
UNIT IV - LOGICAL REASONING	**(9)**
Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.	
UNIT V - PROBABILISTIC REASONING	**(9)**
Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.

REFERENCES:

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education,2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013.
5. 5. http://nptel.ac.in/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	3	3	-	-	-	-	2	3	3	1	2	3
2	2	2	1	1	1	-	-	-	2	2	3	1	3	2
3	2	1	2	1	-	-	-	-	2	1	1	3	2	2
4	2	1	2	2	-	-	-	-	2	1	2	2	2	3
5	3	2	2	1	1	-	-	-	3	2	1	2	2	2
CO (W. A)	**2.4**	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2.4**

22AIC06-ALGORITHMS *(Common to 22CSC05,22CCC04,22CIC04 and 22ITC04)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : 22CSC01					
Course Objectives		**Course Outcomes**			
1.0	To know the fundamental concepts and Techniques for problem solving and algorithm design.	**1.1**	The students will be able to analyze worst, best and average case running times of algorithms using asymptotic notations.		
2.0	To learn the different sorting algorithms and the strategy followed.	**2.1**	The students will be able to use different sorting techniques and strategies.		
3.0	To be familiar with dynamic and greedy algorithm design techniques	**3.1**	The students will be able to design dynamic-programming and greedy algorithms and apply them to test for optimality.		
4.0	To learn the different kinds of iterative improvement and limitations of algorithm power	**4.1**	The students will be able to analyze the notion of tractable and intractable problems.		
5.0	To understand backtracking, Branch bound techniques.	**5.1**	The students will be able to Use the state space tree method for solving problems.		

UNIT I - INTRODUCTION	**(9)**
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.	
UNIT II - BRUTE FORCE AND DIVIDE-AND-CONQUER	**(9)**
Brute Force – Computing an – String Matching - Selection Sort and Bubble Sort – Sequential Search - Closest-Pair and Convex-Hull Problems - Exhaustive Search: Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort –Closest-Pair and Convex - Hull Problems.	
UNIT III - DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	**(9)**
Dynamic Programming : Computing a Binomial coefficient – Warshall's and Floyd's Algorithm – Optimal Binary Search trees - 0/1 Knapsack Problem. Greedy Technique: Prim's algorithm and Kruskal's Algorithm - Huffman Trees.	
UNIT IV - ITERATIVE IMPROVEMENT AND LIMITATIONS OF ALGORITHM POWER	**(9)**
Iterative Improvement - The Simplex Method - The Maximum-Flow Problem- Maximum Matching in Bipartite Graphs. Limitations of Algorithm Power: Lower bound arguments – Decision trees – P, NP and NP complete Problems.	

UNIT V - STATE SPACE SEARCH ALGORITHMS	(9)
Backtracking: N Queen's problem – Hamiltonian Circuit problem – Subset problem - Graph colouring problem. Branch and Bound: Solving 15-Puzzle problem - Assignment problem – Knapsack Problem – Travelling Salesman Problem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 3rd ed.., 2017.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran "Computer Algorithms/C++" Orient Blackswan, 2nd Edition, 2019.
2. S. Sridhar, "Design and Analysis of Algorithms ", Oxford university press, 2014.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	-	-	-	1	-	-	-	-	-	3	2
2	3	3	2	-	-	-	-	-	-	-	-	-	3	2
3	3	2	1	1	-	-	1	-	-	-	-	-	3	1
4	3	2	1	1	-	-		-	-	-	-	-	3	2
5	3	2	1	1	-	-	1	-	-	-	-	-	3	2
CO (W.A)	**3**	**2.4**	**1.4**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**1.8**

22AIC07-DATA EXPLORATION AND VISUALIZATION					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To outline an overview of exploratory data analysis	**1.1**	The Student will be able to Understand the fundamentals of exploratory data analysis.		
2.0	To implement data visualization using Matplotlib.	**2.1**	The Student will be able to Implement the data visualization using Matplotlib.		
3.0	To perform univariate data exploration and analysis.	**3.1**	The Student will be able to perform univariate data exploration and analysis.		
4.0	To apply bivariate data exploration and analysis.	**4.1**	The Student will be able to apply bivariate data exploration and analysis.		
5.0	To use Data exploration and visualization techniques for multivariate and time series data.	**5.1**	The Student will be able to use data exploration and visualization techniques for multivariate and time series data.		

UNIT I - EXPLORATORY DATA ANALYSIS	**(9)**
EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.	
UNIT II – VISUALIZING USING MATPLOTLIB	**(9)**
Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.	
UNIT III - UNIVARIATE ANALYSIS	**(9)**
Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.	
UNIT IV - BIVARIATE ANALYSIS	**(9)**
Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations.	
UNIT V - MULTIVARIATE AND TIME SERIES ANALYSIS	**(9)**
Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.	

LIST OF EXPERIMENTS:

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Working with Numpy arrays, Pandas data frames , Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

HARDWARE:

Standalone Desktops with Linux OS

SOFTWARE:

Python

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

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2)
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCE BOOKS:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	1	3	3		-	-	-	2	3	3	3	2	2
2	2	2	2	1	1	-	-	-	3	2	3	1	3	1
3	2	1	2	1	1	-	-	-	3	2	1	2	2	2
4	2	2	2	1		-	-	-	1	2	1	3	1	3
5	3	1	1	2	1	-	-	-	3	2	1	2	2	2
CO (W.A)	**2**	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**

*22AIP03-*JAVA PROGRAMMING LABORATORY *(Common to 22CSP06, 22CCP05 22CIP05 and* 22ITP04*)*			
L	T	P	C
0	0	4	2

PRE REQUISITE: NIL

Course Objectives		Course Outcomes	
1.0	To impart fundamental concepts of OOP using java	**1.1**	The students will be able to createsimple java programs using basic programming elements in java
2.0	To gain exposure about inheritance, packages and Interfaces	**2.1**	The students will be able to develop applications using inheritance, packages and interfaces.
3.0	To explore about the exception handling mechanism	**3.1**	The students will be able to construct applications with exception handling.
4.0	To understand threads concepts	**4.1**	The students will be able to build applications using threads and collection framework
5.0	To know about Event handling using swing components.	**5.1**	The students will be able to create GUIs and event driven programming applications for real world problems.

LIST OF EXPERIMENTS:

1. Write simple Java programs using operators, arrays and control statement
2. Programs using Static, final and this keywords.
3. Demonstrate the concepts of inheritance
4. Programs illustrating overloading and overriding methods in Java
5. Programs to use packages and Interfaces in Java.
6. Implement exception handling and creation of user defined exception.
7. Implement program to demonstrate multithreading and inter thread communication.
8. Write a program to perform file operations.
9. Develop applications using swing layouts

HARDWARE OR SOFTWARE REQUIREMENT:

HARDWARE:

1. LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
2. Printers – 3 Nos.

SOFTWARE:

1. Java / Equivalent Compiler

TOTAL L:60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3			2		3	2	2	2	3	3	1	3
2	2	2	3	3	3	1	3	3	2	2	3	3	1	3
3	2	2	3	3	3	1	3	3	2	2	3	3	1	3
4	2	2	3	3	3	1	3	3	2	2	3	3	1	3
5	2	2	3	3	3	2	3	3	2	2	3	3	1	3
CO (W.A)	**2.2**	**2.2**	**3**	**3**	**2.8**	**1**	**3**	**2.8**	**2**	**2**	**3**	**3**	**1**	**3**

22AIP04-ARTIFICIAL INTELLIGENCE LABORATORY					
		L	T	P	C
		0	0	4	2
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To design and implement search strategies.	**1.1**	The student will be able to Design and implement search strategies.		
2.0	To apply appropriate algorithms for solving given AI problems.	**2.1**	The students will be able to develop programs to solve the given AI problems.		
3.0	To Design and implement CSP Techniques.	**3.1**	The student will be able to Implement game playing and CSP techniques.		
4.0	To Design and implement logical reasoning agents.	**4.1**	The student will be able to Develop logical reasoning systems.		
5.0	To develop systems with probabilistic reasoning.	**5.1**	The student will be able to Develop probabilistic reasoning systems.		

LIST OF EXPERIMENTS

1. Implement basic search strategies – 8-Puzzle, 8 - Queens problem.
2. Implement A* and memory bounded A* algorithms
3. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
4. Implement simulated annealing algorithms for AI tasks
5. Implement backtracking algorithms for CSP
6. Implement local search algorithms for CSP
7. Build naïve Bayes models
8. Implement Bayesian networks and perform inferences
9. Mini-Project

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.

Software:

- Python or Java.

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	2	1	3	3	-	-	-	-	1	1	2	1	2	3
2	1	2	3	3	2	-	-	-	3	2	3	3	3	2
3	3	1	3	3	1	-	-	-	1	3	1	2	2	3
4	2	1	1	1	1	-	-	-	2	3	1	2	2	3
5	3	1	1	1	1	-	-	-	1	3	3	3	2	3
CO (W. A)	**2.2**	**1.2**	**2.2**	**2.2**	**1.25**	**-**	**-**	-	1.6	2.4	**2**	**2.2**	**2.2**	**2.8**

22AIP05-ALGORITHMS LABORATORY

(Common to 22CSP04, 22CCP03, 22CIP03 and 22ITP03)

L	T	P	C
0	0	4	2

PREREQUISITE : 22CSP01

	Course Objectives		Course Outcomes
1.0	To make the use of programs using Brute force technique.	**1.1**	The students will be able to implement programs using Brute force technique.
2.0	To gain exposure about the concept of divide and conquer design techniques.	**2.1**	The students will be able to Make use of algorithm design techniques like divide and conquer.
3.0	To understand the dynamic programming technique.	**3.1**	The students will be able to apply dynamic programming to solve problems
4.0	To explore knowledge about greedy techniques.	**4.1**	The students will be able to apply greedy techniques to solve problems
5.0	To understand the knowledge on Backtracking techniques.	**5.1**	The students will be able to apply Backtracking techniques to solve problems

LIST OF EXPERIMENTS:

1. Given a text txt [0...n-1] and a pattern pat [0...m-1], write a function search (char pat [ ], char txt [ ]) that prints all occurrences of pat [ ] in txt [ ]. You may assume that n > m.
2. Sort a given set of elements using the Insertion sort, Selection sort and Bubble sort
3. Implementation of Linear Search.
4. Implementation of Recursive Binary Search
5. Develop a program to find out the maximum and minimum numbers in a given list of n numbers using the divide and conquer technique.
6. Develop a program to sort the numbers using Merge and Quick sort .
7. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
8. Compute the transitive closure of a given directed graph using Warshall's algorithm.
9. Find the minimum cost spanning tree of a given undirected graph using Prim's algorithm.
10. Implement N Queens problem using Backtracking.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

LAN System with 30 nodes (OR) Standalone PCs – 30 Nos,.

Software:

C/C++/JAVA/ Python

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
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	2
3	3	2	1	1	-	-	1	-	-	-	-	-	3	1
4	3	2	1	1	-	-	1	-	-	-	-	-	3	1
5	3	2	1	1	-	-	1	-	-	-	-	-	3	2
CO (W.A)	**3**	**2.4**	**1.4**	**1**	**-**	**-**	**1**	**-**		**-**	**-**	**-**	**3**	**1.6**

22MAN07– SOFT / ANALYTICAL SKILLS - III *(Common to All Branches)*				
	L	**T**	**P**	**C**
	1	**0**	**2**	**0**
PRE REQUISITE : 22 MAN04				

Course Objectives		**Course Outcomes**	
1.0	Improving overall language proficiency for personal or professional reasons	**1.1**	The students will be able to enhance their writing skills
2.0	To develop problem solving skills across all levels	**2.1**	The students will be able to develop problem solving skills across all levels
3.0	To develop students to workout solutions for problems that involving general reasoning.	**3.1**	The students will be able to solve reasoning problems with ease.

UNIT I – Verbal Competency	**(5+10)**
Sentence Selection-Paragraph Formation- Sentence Correction- Spellings.	
UNIT II - Aptitude	**(5+10)**
Clocks, Calendar, Age Problems-Problem on Trains- Problems on Numbers - Partnerships.	
UNIT III – Logical & Reasoning	**(5+10)**
Coding and Decoding - Logical Equivalent- Venn Diagram Problem.	
TOTAL (L:15, P:30) : 45 PERIODS	

REFERENCES:

1. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", Fourth Edition, Cambridge University, 2012.

Mapping of COs with POs / PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	3	2	2	-	-	1	-	2	-	-	3	2	-
3	-	3	2	2	-	-	1	-	2	-	-	3	2	-
CO (W.A)	-	2	1.3	1.3	-	-	0.6	-	2.3	1	-	2.6	1.3	0.3

22MAN09 INDIAN CONSTITUTION (Common to All Branches)					
		L	**T**	**P**	**C**
		1	**0**	**0**	**0**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To educate students to learn about the Constitutional Law of India.	**1.1**	The students will be able to Gain Knowledge about the Constitutional Law of India.		
2.0	To motivate students to Understand the role of Union Government.	**2.1**	The students will be able to know the Union Government and role of President and Prime Minister.		
3.0	To make students to understand about State Government.	**3.1**	The students will be able to acquire knowledge about State Government and role of Governor, Chief Minister.		
4.0	To understand about District Administration, Municipal Coporation and Zila Panchayat.	**4.1**	The students will be able to understand the District Administration, Municipal Coporation and Zila Panchayat.		
5.0	To encourage students to Understand about the election commission.	**5.1**	The students will be able to understand the role and function of election commission.		

Module I: The Constitution - Introduction	**(3)**
• The History of the Making of the Indian Constitution • Preamble and the Basic Structure, and its interpretation • Fundamental Rights and Duties and their interpretation • State Policy Principles	
Module II – Union Government	**(3)**
• Structure of the Indian Union • President – Role and Power • Prime Minister and Council of Ministers • Lok Sabha and Rajya Sabha	
Module III – State Government	**(3)**
• Governor – Role and Power • Chief Minister and Council of Ministers • State Secretariat	
Module IV – Local Administration	**(3)**
• District Administration • Municipal Corporation • Zila Panchayat	
Module V – Election Commission	**(3)**
• Role and Functioning • Chief Election Commissioner • State Election Commission	
TOTAL (L:15) : 15 PERIODS	

TEXT BOOK:

1. Rajeev Bhargava, Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008.
2. B.L. Fadia, The Constitution of India, Sahitya Bhawan; New edition (2017).
3. DD Basu, Introduction to the Constitution of India, Lexis Nexis; Twenty-Third 2018 edition.

REFERENCES:

1. Steve Blank and Bob Dorf, The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company", K & S Ranch ISBN – 978-0984999392
2. Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" , Penguin UK ISBN – 978-0670921607
3. Adrian J. Slywotzky with Karl Weber, Demand: Creating What People Love Before They Know They Want It, Headline Book Publishing ISBN – 978-0755388974
4. Clayton M. Christensen, The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Harvard business ISBN: 978-142219602.

REFERENCES: Web link

1. https://www.fundable.com/learn/resources/guides/startup
2. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
3. https://www.finder.com/small-business-finance-tips
4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						3		3		2		3		
2						3		3		2		3		
3						3		3		2		3		
4						3		3		2		3		
5						3		3		2		3		
CO (W.A)						**3**		**3**		**2**		**3**		

22MYBO8– PROBABILITY AND STATISTICS					
		L	T	P	C
		3	1	0	4
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To acquire knowledge of the random variable and moments &moments generating functions.	**1.1**	The students will be able to infer expectation, variance, standard deviation moments and moment generating function for discrete and continuous random variables.		
2.0	To aware the knowledge of applications of discrete &continuous distributions.	**2.1**	The students will be able to apply the concept of expectation and moment generating functions to discrete and Continuous distributions and find the probability values for the defined distributions.		
3.0	To provide the knowledge of transformation of random variables.	**3.1**	The students will be able to acquire skills in handling situations involving more than one random variable and functions of random variables.		
4.0	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems	**4.1**	The students will be able to apply the concepts of testing of hypothesis for small and large samples in real life problems		
5.0	To introduce the basic concepts of classifications of design of experiment which plays very important roles in the field of agriculture and statistical quality control?	**5.1**	The students will be able to apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.		

UNIT I - PROBABILITY AND RANDOM VARIABLES	**(9+3)**
Probability: Random variable – Probability mass function – Probability density functions -Properties-Moments-Moments generating functions.	
UNIT II - STANDARD DISTRIBUTIONS	**(9+3)**
Discrete distributions: Binomial, Poisson and Geometric- Continuous distribution: Uniform, Exponential and normal distributions.	
UNIT III- TWO-DIMENSIONAL RANDOM VARIABLES	**(9+3)**
Joint distributions-Marginal and conditional distributions-Covariance-Correlation and linear regression.	
UNIT IV –ESTIMATION THEORY AND NON-PARAMETRIC TESTS	**(9+3)**
Differences between means, variations and ratio of two variances- Non-parametric Tests: Introduction-The sign test-The signed – Rank test- Rank-sum tests-The U test-The H test.	
UNIT V – STATISTICAL QUALITY CONTROL	**(9+3)**
Control charts for measurements ($\overline{X}$ and R-charts)-Control charts for attributes(p,c and np charts)-Tolerance limits-Acceptance sampling.	
TOTAL (L:45+T:15) : 60 PERIODS	

TEXT BOOK:

1. Veerarajan.T, "Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks",4ed. ,Tata McGraw-Hill, New Delhi 2018.
2. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", 12th edition,Sultan Chand & Sons, New Delhi- 2020.
3. Johnson.R.A., Miller.I.R andFreud.J.E,"Miller and Freund's Probability and Statistics for Engineers",Pearson Education,Asia,9 th edition,2016.

REFERENCES:

1. Allen, 0. Arnold, "Probability, Statistics and Queuing Theory with Computer Applications ", 2nd ed., Elsevier, New Delhi, 1990.
2. Taha, H.A., "Operations Research -An Introduction", 8th ed., Pearson Education, New Delhi, 2008.
3. Trivedi, S.K, "Probability and Statistics with Reliability, Queuing and Computer Science applications", 2nd Ed. John Wiley & Sons, New Delhi, 2016.

Web References:

1. https://www.investopedia.com/terms/r/random-variable.asp
2. https://library2.lincoln.ac.nz/documents/Normal-Binomial-Poisson.pdf
3. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2018/TwoDimensionalRandomVariable-Unit-2.pdf
4. https://byjus.com/maths/non-parametric-test/
5. https://towardsdatascience.com/quality-control-charts-x-bar-chart-r-chart-and-process-capability-analysis-96caa9d9233e

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3			1				1			2		
2	3	3			1				1			2		
3	3	3			1				1			2		
4	3	3	2	2					1			2		
5	3	3	2	1					1			2		
CO (W.A)	3	3	2	2	1				1			2		

22CYB07 ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to AIDS, CSE, CSE(CS), CSE(IOT) and IT Branches)				
	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To recognize the basic concepts of environment, ecosystems and biodiversity.	**1.1**	The students will be able to know the importance of environment and functions ecosystems and biodiversity
2.0	To impart knowledge on the causes, effects and control measures of environmental pollution.	**2.1**	The students will be able to identify the causes, effects of environmental pollution and contribute the preventive measures to the society.
3.0	To make the students conversant with the global and Indian scenario of renewable resources, causes of their degradation and measures to preserve them.	**3.1**	The students will be able to identify and understand the renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
4.0	To familiarize the e–waste, recognize and analyze the challenges of environmental management.	**4.1**	The students will be able to recognize the different methods of management of e-waste and apply them for suitable technological advancement and societal development.
5.0	To impart knowledge on the e-waste and its recycling methods of cell phone, battery, laptop and PCB.	**5.1**	The students will be able to demonstrate the recycling of battery, cell phone , laptop and PCB

UNIT I - ENVIRONMENT AND BIODIVERSITY	**(9)**
Environment - scope and importance - Eco-system- Structure and function of an ecosystem-types of biodiversity- genetic - species and ecosystem diversity– Values of biodiversity - India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity - habitat loss - poaching of wildlife - man-wildlife conflicts – endangered and endemic species of India – Conservation of biodiversity - In-situ and ex-situ.	
UNIT II - ENVIRONMENTAL POLLUTION	**(9)**
Pollution – Causes - Effects and Preventive measures of Water – Soil - Air - Noise Pollution - Solid waste management - methods of disposal of solid waste – various steps of Hazardous waste management - E-Waste management - Environmental protection – Air acts – water acts.	
UNIT III - RENEWABLE SOURCES OF ENERGY	**(9)**
Energy management and conservation -New Energy Sources - Different types new energy sources – Hydrogen energy – Geothermal energy - Solar energy – wind energy – biomass energy - Applications of Hydrogen energy - Ocean energy resources -Tidal energy conversion.	

UNIT IV – E- WASTE AND ITS MANAGEMENT	**(9)**
E-waste – sources of e-waste – hazardous substance in e-waste – chlorinated compounds – heavy metals - need for e-waste management – management of e-waste –Inventory management – production process – modification- Disposal treatment of e –waste – Incineration –acid baths – landfills.	

UNIT V – BATTERIES AND RECYCLING OF E-WASTE	(9)
Battery – types – Lifecycle - Mobile battery life cycle – Laptop battery life cycle – battery maintenance – process of recycling battery – lead acid battery – lithium ion battery – benefits of recycling battery – recycling of computing devices - mobile phones - PCB and servers.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Dr. A.Ravikrishan, Envrionmental Science and Engineering., Sri Krishna Hitech Publishing co. Pvt.Ltd., Chennai,15thEdition, 2023.
2. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers , 2018.

REFERENCES:

1. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

WEB LINK :

1. http://www.jnkvv.org/PDF/08042020215128Amit1.pdf
2. https://www.conserve-energy-future.com/types-of-renewable-sources-of-energy.php
3. https://ugreen.io/sustainability-engineering-addressing-environmental-social-and-economic-issues/
4. https://www.researchgate.net/publication/326090368_E-_Waste_and_Its_Management
5. https://www.ewaste1.com/how-to-reduce-e-waste/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	2			3	3	2	1			2		
2	2	2	2			3	3	2	1			2		
3	2	2	2			3	3	2	1			2		
4	2	2	2			3	3	2	1			2		
5	2	2	2			3	3	2	1			2		
CO (W.A)	**2**	**2**	**2**			**3**	**3**	**2**	**1**			**2**		

22AIC08-OPERATING SYSTEMS *(Common to 22CSC08,22CIC07 AND 22ITC05)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE REQUISITE: NIL					
Course Objectives		**Course Outcomes**			
1.0	To learn about the basics of operating system and system calls.	**1.1**	The students will be able to perceive knowledge on the systematic approach of the Operating system.		
2.0	To impart the knowledge about how the process scheduling work together to perform computing tasks.	**2.1**	The students will be able to apply the concepts of CPU scheduling		
3.0	To Learn about the process synchronization and Deadlock concepts.	**3.1**	The students will be able to use various synchronization and deadlock handling methods.		
4.0	To learn the importance of memory management in the operating system.	**4.1**	The students will be able to apply page replacement policies to address demand paging		
5.0	To explore the disk and files management of operating systems	**5.1**	The students will be able to work with file and disk organizations for a real time applications.		

UNIT I - FUNDAMENTALS	**(9)**
Introduction - System Architecture - Operating System Structure - Operations - Process Management - Memory Management - Storage Management - System Structure - User Operating System Interface - System Calls - Types - System Programs - Operating System Design and Implementation - Virtual machines.	
UNIT II - PROCESS MANAGEMENT	**(9)**
Process Concept - Process Scheduling - Operations on Processes- Inter Process Communication - Shared Memory and Message Passing Systems - CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Threads Overview - Thread Scheduling.	
UNIT III - PROCESS SYNCHRONIZATION	**(9)**
Synchronization: The Critical-Section Problem - Peterson's solution - Hardware support for Synchronization - Mutex – Semaphores - Deadlocks: Deadlock Characterization - Methods for handling deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.	
UNIT IV - MEMORY MANAGEMENT	**(9)**
Main Memory - Swapping - Contiguous Memory Allocation - Paging - Segmentation - Virtual Memory - Demand Paging - Copy on Write - Page Replacement - Allocation of Frames - Thrashing,	

UNIT V - SECONDARY STORAGE MANAGEMENT	(9)
Secondary Storage Structure - Disk Structure - Disk Attachment - Disk Scheduling - Disk Management - Swap Space Management - File System - File Concepts: Access Methods - Directory Structure - File System Mounting - File System Implementation - Structure – Implementation - Directory Implementation - Allocation Methods -Free Space Management - I/O Systems - I/O Hardware - Application I/O Interface - Kernel I/O Subsystem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

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

REFERENCES:

1. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
2. Andrew S. Tanenbaum, "Modern Operating Systems", 4th Edition, Prentice Hall of India Pvt., 2016.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	2	-	-	-	-	3	2	-	1	3	1
2	2	2	3	1	1	-	-	-	2	1	-	2	3	1
3	1	3	2	2	1	-	-	-	2	2	-	1	3	1
4	1	3	2	2	1	-	-	-	2	2	-	1	3	1
5	1	3	3	3	-	-	-	-	1	2	-	2	3	1
CO (W.A)	**1.6**	**2.4**	**2.4**	**2**	**1**	**-**	**-**	**-**	**2**	**1.8**	**-**	**1.4**	**3**	**1**

22AIC09-DATABASE DESIGN AND MANAGMENT

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To learn the fundamentals of data models, relational algebra and SQL	**1.1**	The students will be able to understand the database development life cycle and apply conceptual modeling
2.0	To learn SQL for data definition, manipulation and querying a database	**2.1**	The students will be able to apply SQL and programming in SQL to create, manipulate and query the database
3.0	To learn relational database design using normalization	**3.1**	The students will be able to apply the normalization to design relational database
4.0	To understand the fundamental concepts of transaction, concurrency and recovery processing	**4.1**	The students will be able to Construct queries to handle transaction processing and maintain consistency of the database
5.0	To learn data model and querying in object-relational and No-SQL databases	**5.1**	The students will be able to apply the data model and querying in Object-relational and No-SQL databases.

UNIT I - DATABASE SYSTEM CONCEPT	**(9)**
Purpose of Database System – Views of data – Data Models – Database System Architecture – Entity-Relationship model – E-R Diagrams – Enhanced-ER Model.	
UNIT II- RELATIONAL DATABASE	**(9)**
Introduction to relational databases-Integrity constraints-Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL–Dynamic SQL-Triggers.	
UNIT III - DATABASE DESIGN	**(9)**
Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.	
UNIT IV - TRANSACTION MANAGEMENT	**(9)**
Transaction concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Two-phase locking techniques. Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm.	
UNIT V - OBJECT RELATIONAL AND NO-SQL DATABASES	**(9)**
Overview- Complex Data Types- Object-Identity and Reference Types in SQL- Object-Oriented versus Object-Relational-Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model; Column-based: Hbase data model.	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2017.

REFERENCES:

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems – A Practical Approach to Design, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING AND DESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
3. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:The Complete Book", 2nd edition, Pearson.
5. Raghu Ramakrishnan, "Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	3	3					3	1	2	1	2	3
2	2	3	1	3	1				1	2	2	1	3	3
3	2	2	2	1	1				2	3	1	2	2	2
4	2	2	3	1					1	2	1	2	2	2
5	3	1	3	2	1				1	3	1	1	2	2
CO (W.A)	**2.2**	**2**	**2.4**	**2**	**1**				**1.6**	**2.2**	**1.4**	**1.4**	**2.2**	**2.4**

22AIC10 MACHINE LEARNING

L	T	P	C
3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the basic concepts of machine learning	**1.1**	The students will be able to explain the basic concepts of machine learning.
2.0	To understand and build supervised learning models.	**2.1**	The students will be able to construct supervised learning models.
3.0	To understand and build unsupervised learning models.	**3.1**	The students will be able to construct unsupervised learning algorithms.
4.0	To evaluate the algorithms based on corresponding metrics identified	**4.1**	The students will be able to evaluate and compare different models
5.0	To design and analyze machine learning experiments.	**5.1**	The student will be able to analyze machine learning experiments.

UNIT I - INTRODUCTION TO MACHINE LEARNING	**(9)**
Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.	
UNIT II - SUPERVISED LEARNING	**(9)**
Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes,– Support vector machine, Decision Tree, Random Forests	
UNIT III - UNSUPERVISED LEARNING	**(9)**
Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.	
UNIT IV - ENSEMBLE TECHNIQUES AND NEURAL NETWORKS	**(9)**
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Multilayer perceptron, activation functions, network training – gradient descent optimization – error back propagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.	
UNIT V - DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS	**(9)**
Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS
1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020. 2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.
REFERENCES
1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006. 2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997. 3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2012, 2018. 4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016 5. Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing, 3rd Edition, 2019. C

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	2	1	-	-	-	-	3	3	2	2	2	1
2	1	3	3	1	2	-	-	-	2	2	3	1	1	1
3	2	1	3	3	2	-	-	-	1	1	1	1	2	1
4	2	3	3	2	1	-	-	-	3	2	3	2	2	1
5	1	1	3	3	1	-	-	-	3	1	1	3	3	2
CO (W.A)	**1.6**	**1.6**	**2.8**	**2**	**1.5**	**-**	**-**	**-**	**2.4**	**1.8**	**2**	**1.8**	**2**	**1.5**

22AIC11- FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To study the basic inferential statistics and sampling distribution	**1.1**	The students will be able to understand the concept of basic inferential statistics and sampling distribution		
2.0	To understand the concept of estimation of parameters using fundamental tests and testing of hypotheses.	**2.1**	The students will be able to apply the knowledge to derive hypotheses for given data		
3.0	To perform a case study with any available sample data sets.	**3.1**	The students will be able to perform a case study with any available sample data sets.		
4.0	To understand the techniques of analysis of variance.	**4.1**	The students will be able to understand the techniques of analysis of variance.		
5.0	To gain knowledge in predictive analytics techniques	**5.1**	The students will be able to gain knowledge in predictive analytics techniques		

UNIT I INFERENTIAL STATISTICS I	**(9)**
Populations – samples – random sampling – probability and statistics Sampling distribution – creating a sampling distribution – mean of all sample means – standard error of the mean – other sampling distributions Hypothesis testing – z-test – z-test procedure – statement of the problem – null hypothesis – alternate hypotheses – decision rule – calculations – decisions - interpretations	
UNIT II INFERENTIAL STATISTICS II	**(9)**
Why hypothesis tests? – Strong or weak decisions – one-tailed and two-tailed tests – case studies Influence of sample size – power and sample sizeEstimation – point estimate – confidence interval – level of confidence – effect of sample size	
UNIT III - T-TEST	**(9)**
t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies t-test for two independent samples – statistical hypotheses – sampling distribution – test procedure – p-value – statistical significance – estimating effect size – meta analysis t-test for two related samples	
UNIT IV - ANALYSIS OF VARIANCE	**(9)**
F-test – ANOVA – estimating effect size – multiple comparisons – case studies Analysis of variance with repeated measures Two-factor experiments – three f-tests – two-factor ANOVA – other types of ANOVA Introduction to chi-square tests	

UNIT V -PREDICTIVE ANALYTICS	(9)
Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy Time series analysis – moving averages – missing values – serial correlation – autocorrelation Introduction to survival analysis	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014. [Unit V]

REFERENCES :

1. David Spiegelhalter, "The Art of Statistics: Learning from Data", Pelican Books, 2020.
2. Peter Bruce, Andrew Bruce, and Peter Gedek, "Practical Statistics for Data Scientists", Second Edition, O'Reilly Publishers, 2020.
3. Charles R. Severance, "Python for Everybody: Exploring Data in Python 3", Shroff Publishers, 2017.
4. Bradley Efron and Trevor Hastie, "Computer Age Statistical Inference", Cambridge University Press, 2016.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1					1	2	2	1	2	1
2	3	3	2	1	1				2	1	1	2	2	1
3	3	2	1	1	1				1	1	1	2		1
4	3	2	3	1	1				1	2	2	1		
5	3	1	2	1	1				2	1	1	2	2	1
CO (W.A)	**3**	**2**	**2..5**	**1**	**1**				**1.4**	**1.4**	**1.4**	**1.6**	**2**	**1**

22AIP06 - DATABASE DESIGN AND MANAGEMENT LABORATORY

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To learn and implement important commands in SQL.	**1.1**	The students will be able to create databases with different types of key constraints.
2.0	To learn the usage of nested and joint queries.	**2.1**	The students will be able to construct simple and complex SQL queries using DML and DCL commands.
3.0	To understand functions, procedures and procedural extensions of databases.	**3.1**	The students will be able to use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
4.0	To understand design and implementation of typical database applications.	**4.1**	The students will be able to create and manipulate data using NOSQL database.
5.0	To be familiar with the use of a front end tool for GUI based application development	**5.1**	The students will be able to develop a database applications for real-time problems

LIST OF EXPERIMENTS

1. Database design using Conceptual modeling (ER-EER) – top-down approach
2. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
3. Create a set of tables, add foreign key constraints and incorporate referential integrity.
4. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
5. Query the database tables and explore sub queries and simple join operations.
6. Write user defined functions and stored procedures in SQL.
7. Database design using Normalization - Bottom-up approach
8. Create Document and column based data using NOSQL database tools.
9. Write SQL Triggers for insert, delete, and update operations in a database table.
10. Case Study using any of the real life database applications from the following list
    a) Inventory Management for a EMart Grocery Shop
    b) Society Financial Management
    c) Cop Friendly App – Eseva
    d) Property Management – eMall
    e) Star Small and Medium Banking and Finance
    - Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
    - Apply Normalization rules in designing the tables in scope.
    - Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
    - Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
11. Develop a simple GUI based database application and incorporate all the above-mentioned features

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
Hardware: • LAN System with 33 nodes (OR) Standalone PCs – 33 Nos. **Software:** • MYSQL / SQL : 30 Users
TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	3	-	-	-	-	3	1	3	2	2	2
2	2	2	3	2	2	-	-	-	1	2	3	3	1	1
3	3	3	2	1	1	-	-	-	1	1	1	3	2	1
4	3	2	1	1	1	-	-	-	2	2	3	1	2	1
5	2	2	3	1	-	-	-	-	2	3	2	1	3	3
CO (W.A)	**2.6**	**2.4**	**2.4**	**1.6**	**1.3**	**-**	**-**	**-**	**1.8**	**1.8**	**2.4**	**2**	**2**	**1.6**

22AIP07 - MACHINE LEARNING LABORATORY

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.	**1.1**	The students will be able to Apply suitable algorithms for selecting the appropriate features for analysis.
2.0	To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.	**2.1**	The students will be able to Implement supervised machine learning algorithms on standard datasets and evaluate the performance.
3.0	To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.	**3.1**	The students will be able to Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.
4.0	To build the graph based learning models for standard data sets.	**4.1**	The students will be able to Build the graph based learning models for standard data sets.
5.0	To compare the performance of different ML algorithms and select the suitable one based on the application.	**5.1**	The student will be able to Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS:

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw graphs.
3. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
4. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
7. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
8. Write a program to construct a Bayesian network to diagnose CORONA infection using standard WHO Data Set.
9. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

TOTAL:60 PERIODS

List of Equipments:(30 Students per Batch)

The programs can be implemented in either Python or R.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	2	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	2	1	-	-	-	-	1	2	3	3	3	2
2	2	2	1	3	2	-	-	-	3	2	3	2	3	1
3	2	2	1	1	2	-	-	-	1	1	1	1	2	3
4	2	2	3	3	2	-	-	-	1	2	1	1	1	2
5	2	2	3	1	2	-	-	-	3	1	1	1	2	1
CO (W.A)	**2**	**1.8**	2	**1.8**	**2**	**-**	**-**	**-**	**1.8**	**1.6**	**1.8**	**1.6**	**2.2**	**1.8**

22AIPO8 - DATA SCIENCE AND ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To develop data analytic code in python	**1.1**	The students will be able to write python programs to handle data using NumPy and pandas
2.0	To be able to use python libraries for handling data	**2.1**	The students will be able to perform descriptive analytics
3.0	To develop analytical applications using python	**3.1**	The students will be able to perform data exploration using Matplotlib.
4.0	To perform data visualization using plots	**4.1**	The students will be able to perform inferential data analytics
5.0	To build models of predictive analytics	**5.1**	The students will be able to build models of predictive analytics

LIST OF EXPERIMENTS:

1. Working with NumPy arrays
2. Working with Pandas data frames
3. Frequency distributions, Averages,. Variability
4. Normal curves, Correlation and scatter plots
5. Regression
6. Random Sampling
7. Z-test case study
8. T-test case studies
9. ANOVA case studies
10. Logistic Regression
11. Time series Analysis

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos, Printers – 3Nos.

Software:

Tools: Python, NumPy, SciPy, Matplotlib, Pandas, statsmodels, Seaborn, Plotly, Bokeh

TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	2	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1						2			3	2
2	3	3		1									3	3
3	3	3	2	1					1	1			3	3
4	3	3	2	1					1		1	1	3	3
5	3	2	1	1							1		3	2
CO (W.A)	**3**	**2.6**	1.2	**1**	**-**	**-**	**-**	**-**	**1**	**1.5**	**1**	**1**	**3**	**2.6**

22MAN08 – SOFT / ANALYTICAL SKILLS - IV *(Common to all Branches)*				
	L	**T**	**P**	**C**
	1	**0**	**2**	**0**
PRE REQUISITE : 22MAN07				

Course Objectives		**Course Outcomes**	
1.0	To recollect the functional understanding of basic grammar and its structure	**1.1**	The students will be able to apply the knowledge of basic grammar to construct the sentences.
2.0	To develop students to workout solution for problems that involves mathematics aptitude.	**2.1**	The students will be able to solve aptitude problems with ease
3.0	To enrich their knowledge and to develop their logical reasoning ability	**3.1**	The students will be able to solve reasoning problems with ease.

UNIT I - VERBAL	**(5+10)**
Articles -Fill in the blanks - Grammatical Error - Sentence improvement	
UNIT II – APTITUDE	**(5+10)**
Speed and Distance -Time and Work-Mixture And Alligations-Permutation and Combinations	
UNIT III - LOGICAL AND REASONING	**(5+10)**
Seating Arrangement- Directions and Distance- Non verbal Reasoning	
TOTAL (L:15, P:30) : 45 PERIODS	

REFERENCES:

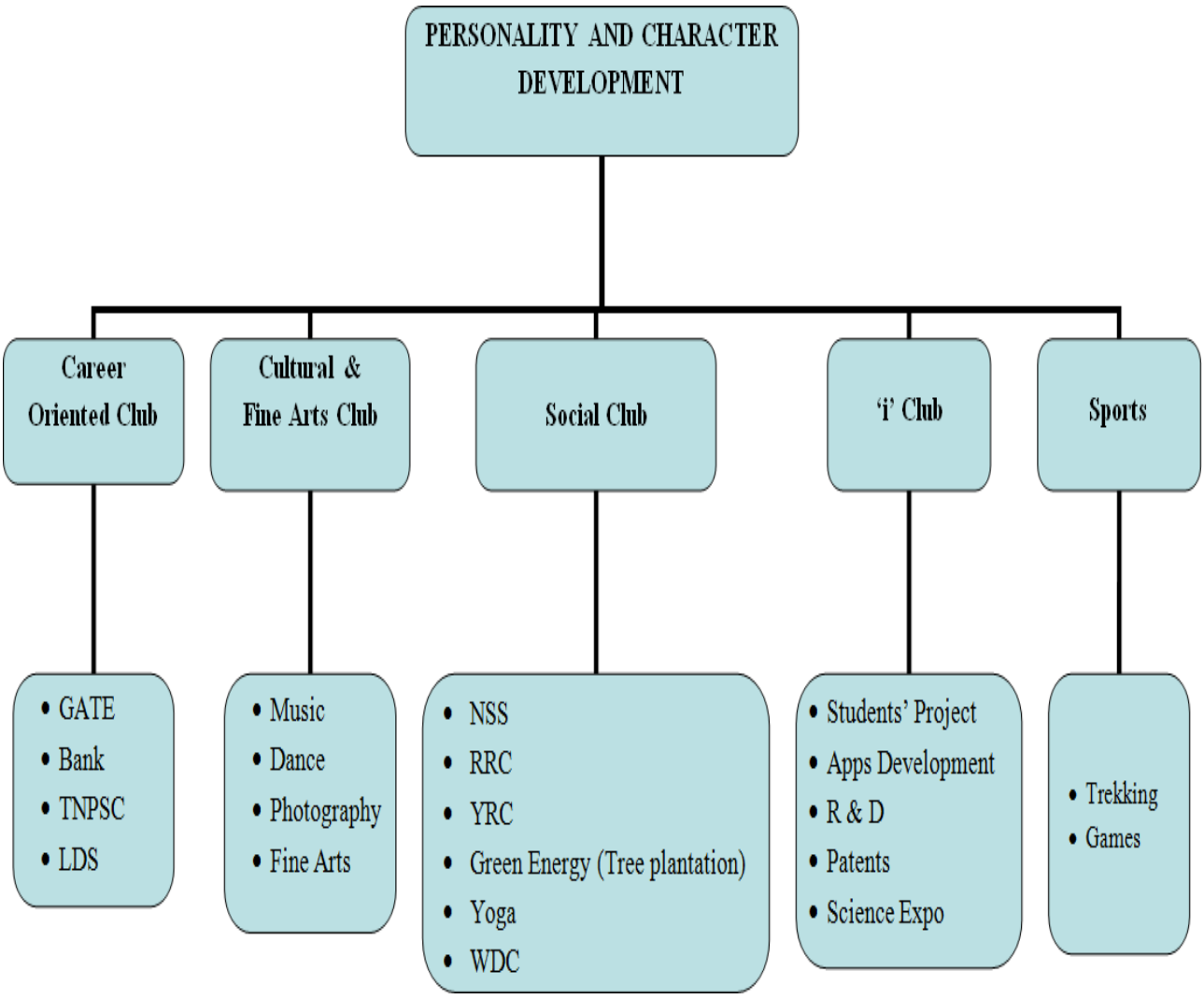
1. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", Fourth Edition, Cambridge University, 2012.

Mapping of COs with POs / PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	3	2	2	-	-	1	-	2	-	-	3	2	-
3	-	3	2	2	-	-	1	-	2	-	-	3	2	-
CO (W.A)	-	2	1.3	1.3	-	-	0.6	-	2.3	1	-	2.6	1.3	0.3

22GED01 PERSONALITY AND CHARACTER DEVELOPMENT

L	T	P	C
0	0	I	0



OBJECTIVES :				
Career Oriented Club	**Cultural & Fine Arts Club**	**Social Club**	**'i' club**	**Sports**
• To provide support for identifying specific career field of interests and career path • To provide support for preparing for competitive exams	• To bring out the hidden talent of students in music, dance and other fine arts. • To promote photography skill among the students • To develop and enhance the performance of students by participating in various events • To inculcate managerial capabilities such as event management and stage organization	• To create social awareness and develop a sense of social and civic responsibility • To inculcate socially and environmentally sound practices and be aware of the benefits • To encourage the students to work along with the peoplein rural areas, thereby developing their character, social consciousness, commitment, discipline and beinghelpful towards thecommunity.	• To inculcate the basic concepts of innovation • To foster the networking between students, build teams, exchange ideas, do projects and discuss entrepreneurial opportunities • To enrich the academic experience, build competencies and relationships beyond the classroom	• To provide opportunities to excel at sports • To promote an understanding of physical and mental well-being through an appreciation of stress, rest and relaxation. • To develop an ability to observe, analyze and judge the performance of self and peers in sporting activities. • To develop leadership skills and nurture the team building qualities. **Trekking:** • To provide opportunities to explore nature and educating about the purityof nature • To improve physical and mental health.

OUTCOMES : At the end of this course, the students will be able to				
• Find a better career of their interest. • Make use of their knowledge during competitive exams and interviews.	• Take part in various events • Develop team spirit, leadership and managerial qualities	• Develop socially responsive qualities by applying acquired knowledge • Build character, social consciousness, commitment and discipline	• Apply the acquired knowledge in creating better solutions that meet new requirements and market needs • Develop skills on transforming new knowledge or new technology into viable products and services on commercial markets as a team	• Demonstrate positive leadership skills that contribute to the organizational effectiveness • Take part an active role in their personal wellness (emotional, physical, and spiritual) that supports a healthy lifestyle • Create inclination towards outdoor activity like nature study and Adventure.

TOTAL [2 x (P: 15)]: 30 PERIODS
(Cumulatively for Two Semesters)

22GYA01 HERITAGE OF TAMILS *(For Common To All Branches)*				
	L	**T**	**P**	**C**
	I	**0**	**0**	**I**
PRE REQUISITE : NIL				

UNIT I - LANGUAGE AND LITERATURE	**(3)**
Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	
UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	**(3)**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	
UNIT III - FOLK AND MARTIAL ARTS	**(3)**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	
UNIT IV - THINAI CONCEPT OF TAMILS	**(3)**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	
UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	**(3)**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22GYA01 தமிழர் மரபு (அனைத்து பாடப்பிரிவினருக்கும்)				
	L	T	P	C
	1	0	0	1
முன் தேவை: இல்லை				

அலகு 1 மொழி மற்றும் இலக்கியம்	(3)
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை– சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	
அலகு 2 மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை:	**(3)**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்– தேர் செய்யும் கலை– சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	
அலகு 3 நாட்டுப்பறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:	**(3)**
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டாம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	
அலகு 4 தமிழர்களின் திணைக் கோட்பாடுகள்:	**(3)**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளின் சோழர்களின் வெற்றி.	
அலகு 5 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:	**(3)**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் –இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ் புத்தக்களின் அச்சு வரலாறு.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22GYA02 TAMILS AND TECHNOLOGY *(For Common To All Branches)*				
	L	**T**	**P**	**C**
	I	**0**	**0**	**I**
PRE REQUISITE : NIL				

UNIT I - WEAVING AND CERAMIC TECHNOLOGY	**(3)**
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	
UNIT II - DESIGN AND CONSTRUCTION TECHNOLOGY	**(3)**
Designing and Structural construction House & Designs n household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	
UNIT III - MANUFACTURING TECHNOLOGY	**(3)**
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.	
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY	**(3)**
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	
UNIT V - SCIENTIFIC TAMIL & TAMIL COMPUTING	**(3)**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

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9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
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11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22GYA02 தமிழரும் தொழில்நுட்பமும் (அனைத்து பாடப்பிரிவினருக்கும்)				
	L	T	P	C
	I	0	0	I
முன் தேவை: இல்லை				

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்:	(3)
சங்ககாலத்தில் நெசவுத்தொழில் – பானைத் தொழிலநுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.	
அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:	**(3)**
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ–சாரோசெனிக் கட்டிடக் கலை.	
அலகு 3 உற்பத்தி தொழில் நுட்பம்:	**(3)**
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எக்கு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.	
அலகு 4 வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்:	**(3)**
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.	
அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:	**(3)**
அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.	
TOTAL (L:15) : 15 PERIODS	

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