S.A. ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University)

B.E. COMPUTER SCEINCE AND ENGINEERING

(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING PROGRAMME)

CHOICE BASED CREDIT SYSTEM [CBCS]

CURRICULUM AND SYLLABUS

REGULATIONS 2020A

S.A. ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

REGULATIONS - 2020A

CHOICE BASED CREDIT SYSTEM CURRICULUM AND SYLLABUS

VISION OF THE COLLEGE

To transform our institution into quality technical education center imparting updated technical knowledge with character building.

MISSION OF THE COLLEGE

M1: To create an excellent teaching and learning environment for our staff and students to realize their full potential thus enabling them to contribute positively to the community.

M2: To significantly enhance the self-confidence level for developing creative skills of staff and students.

VISION OF THE DEPARTMENT

To be a premier centre of excellence in producing professionals in Artificial Intelligence and Machine Learning through excellence in education and positive contribution to the organizations and society.

MISSION OF THE DEPARTMENT

M1: To provide a conducive atmosphere to master the students in problem solving and analytical skills to enhance their expertise in the field of Artificial Intelligence and Machine Learning through innovation and socially responsible with ethical values.

M2: To impart high quality professional training to get expertise in modern software tools and technologies to cater to the real time requirements of the industry.

M3: To encourage students all-round professional growth, with up-to-date knowledge in AI&ML, team spirit, leadership abilities and creativity.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. Graduates shall have professional competency in the field of Computer Science and Engineering for pursuing higher education, research or as entrepreneurs.
2. Graduates shall work in a business environment with ethical standards, leadership qualities and communication necessary for engineering principles.
3. Graduates shall adapt to emerging technologies and respond to the challenges of the environment and society forever.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO-1: Graduates should be able to develop computational knowledge and project development skills and apply practical competency using innovative tools and techniques to solve problems in the field of artificial intelligence for efficient design of intelligent systems of varying complexity.

PSO-2: Graduates should be able to contribute productive ideas and innovative solutions for interdisciplinary problems through acquired programming knowledge in the respective domains complying with real-time constraints.

PSO-3: Graduates should be self-motivated and enhance self-learning as well as capability to adapt to construct systems by applying AI/ML methods, to derive software systems of high quality

Mapping of POs/PSOs to PEOs

Contribution 1: Reasonable 2: Significant 3: Strong

	PEOs		
POs	Graduates shall have professional competency in the field of Computer Science and Engineering for pursuing higher education, research or as entrepreneurs.	Graduates shall work in a business environment with ethical standards, leadership qualities and communication necessary for engineering principles.	Graduates shall adapt to emerging technologies and respond to the challenges of the environment and society forever.
1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	2	3
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	3	2	3

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	2	3
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	3	3	3
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	2	3
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	2	2	1
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	2	1	3
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	3	3	1
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	3	3	2

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	3	3	3
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	2	3	2
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	3	2	3

PSOs			
1. Graduates should be able to develop computational knowledge and project development skills and apply practical competency using innovative tools and techniques to solve problems in the field of artificial intelligence for efficient design of intelligent systems of varying complexity.	3	1	2
2. Graduates should be able to contribute productive ideas and innovative solutions for interdisciplinary problems through acquired programming knowledge in the respective domains complying with real-time constraints.	2	1	3
3. Graduates should be self-motivated and enhance self-learning as well as capability to adapt to construct systems by applying AI/ML methods, to derive software systems of high quality	2	2	3

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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

		Course Title	PROGRAMME OUTCOME(PO)											
			1	2	3	4	5	6	7	8	9	10	11	12
Engineering	√	√	√		√			√	√	√				√
		Calculus and its Applications	√	√	√						√			
		Applied Physics	√	√	√									
		Engineering Chemistry	√	√	√									
		Problem Solving and Python Programming	√	√	√									
		Tamilar Marabu/ Heritage of Tamils												
		Physics and Chemistry Laboratory	√	√	√					√	√	√		√
		Problem Solving and Python Programming Laboratory	√	√	√						√	√		√
		Engineering Practices Laboratory	√	√	√		√			√	√	√		√
		Indian Constitution												
	SEMESTER-II	English for Communication								√	√	√		√
		Complex Variables and Transforms	√	√	√						√			
		Material Science	√	√	√									
		Basic Electrical, Electronics and Measurement Engineering	√	√	√									
		Engineering Graphics	√	√	√		√			√	√	√		√
		Data Structures Using C	√	√	√						√	√		√
		Tamilar Marabu/ Heritage of Tamils												
		Data Structure Using C Laboratory	√	√	√	√	√				√	√	√	√
		Environmental Science and Engineering	√	√	√	√	√	√		√	√	√		√

			PROGRAMME OUTCOME(PO)											
		COURSE TITLE	1	2	3	4	5	6	7	8	9	10	11	12
YEAR-II	SEMESTER-III	Discrete Mathematics	√	√	√						√			
		Algorithms	√	√	√	√	√				√	√	√	√
		Foundations of Data Science	√	√	√	√	√				√	√	√	√
		Digital Logic Design	√	√	√									
		Object Oriented Programming	√	√	√	√	√				√	√	√	√
		தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	√	√	√						√	√		√
		Algorithms Laboratory	√	√	√						√	√		√
		Object Oriented Programming Laboratory	√	√	√						√	√		√
		Interpersonal Skills Laboratory								√	√	√		√
	SEMESTER-IV	Linear Algebra and Optimization Techniques	√	√	√						√			√
		Artificial Intelligence	√	√	√	√	√				√	√	√	√
		Principles of Operating Systems	√	√	√	√	√				√	√	√	√
		Computer Organization and Architecture	√	√	√						√	√		√
		Database Management Systems	√	√	√	√	√				√	√	√	√
		Universal Human Values	√	√	√			√						
		Database Management Systems Laboratory	√	√	√						√	√		√
		Employability And Soft Skills Laboratory	√	√	√					√	√	√		√

			PROGRAMME OUTCOME(PO)											
		COURSE TITLE	1	2	3	4	5	6	7	8	9	10	11	12
YEAR -III	SEMESTER-V	Data Communication and Computer Networks	√	√	√						√			
		Automata and Compiler		√			√					√		
		Object Oriented Software Engineering	√	√	√	√	√				√	√	√	√
		Fundamentals of Machine Learning	√	√	√	√	√				√	√	√	√
		Fundamentals of Machine Learning Laboratory	√	√	√	√	√				√	√	√	√
	SEMESTER-VI	Cloud and Big Data Analytics	√	√	√	√	√				√	√	√	√
		Cryptography and Cyber Security	√	√	√	√	√				√	√	√	√
		Embedded Systems and IoT	√	√	√	√	√				√	√	√	√
		Image Processing and Computer Vision	√	√	√	√	√				√	√	√	√
		Cloud and Big Data Analytics Laboratory	√	√	√	√	√				√	√	√	√

			PROGRAMME OUTCOME(PO)											
		COURSE TITLE	1	2	3	4	5	6	7	8	9	10	11	12
YEAR -IV	SEMESTER -VII	Optimization Techniques for Machine Learning	√	√	√	√	√				√	√	√	√
		Essentials of Deep Learning	√	√	√	√	√				√	√	√	√
		Natural Language Processing	√	√	√	√	√	√	√	√	√	√	√	√
		Deep Learning Laboratory	√	√	√						√	√		√
		Mini Project	√	√	√	√	√	√	√	√	√	√	√	√
		Design Thinking	√	√	√						√	√		√
		Industrial Training / Internship	√	√	√	√	√	√	√	√	√	√	√	√
	SEMESTER – VIII	Professional Elective III												
		Professional Elective IV												
		Project Work	√	√	√	√	√	√	√	√	√	√	√	√

PROFESSIONAL ELECTIVES

SEM	COURSE TITLE	PROGRAMME OUTCOME(PO)											
		1	2	3	4	5	6	7	8	9	10	11	12
V	Introduction To Ar/Vr/Mr/Xr	√	√	√	√	√	√		√				
	Digital Marketing	√	√	√		√				√	√	√	
	Human Computer Interaction	√	√	√								√	
	User Experience Design	√	√	√									
	Software Testing and automation	√	√	√									
VI	Data Engineering And Knowledge Discovery	√	√	√									
	Neural Networks and Deep Learning	√	√	√								√	
	Recommender Systems	√	√	√									
	Exploratory Data Analysis	√	√	√									
	Machine Learning for Data Science	√	√	√		√				√	√		
VII	Cryptocurrency and Blockchain Technologies	√	√	√									
	Business Analytics	√	√	√									
	Image And Video Analytics	√	√	√	√	√				√	√	√	√
	Data Analytics & Visualization	√	√	√									
	Statistical Thinking For Data Science	√	√	√	√	√				√			√
VIII (1)	Text And Speech Analysis	√	√	√	√	√	√			√	√	√	√
	Reinforcement Learning						√	√	√	√	√		√
	Soft Computing	√	√	√		√				√	√		
	Cognitive Science & Analytics	√	√	√									√
	Data And Visual Analytics	√	√	√	√	√				√	√	√	√
VIII (2)	Game Development	√	√	√	√	√				√	√	√	√
	Quantum Computing	√	√	√									
	Data Stream Mining	√	√	√									
	Robotics & AI	√	√	√									
	Ethics and AI	√	√	√	√	√				√	√	√	√

HUMANITIES AND SOCIAL SCIENCES (HS)

	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS1101A	Technical English	HS	3	3	0	0	3
2.	HS1201A	English for Communication	HS	3	3	0	0	3

(HSM)

	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	TA1101A	தமிழர் மரபு Tamizhar Marabu	HSM	1	0	0	1	1
2.	TA1101A	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSM	1	0	0	1	1

BASIC SCIENCES (BS)

Sl.NO	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA1101A	Calculus and its Applications	BS	4	3	1	0	4
2.	PH1101A	Applied Physics	BS	3	3	0	0	3
3.	CY1101A	Engineering Chemistry	BS	3	3	0	0	3
4.	BS1101A	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	MA1201A	Complex Variables and Transforms	BS	4	3	1	0	4
6.	PH1201A	Material Science	BS	3	3	0	0	3
7.	MA1305A	Graph Theory and its Applications	BS	4	3	1	0	4
8.	MA1405A	Linear Algebra and Optimization Techniques	BS	4	3	1	0	4

ENGINEERING SCIENCES (ES)

Sl.NO	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS110A	Problem Solving and Python Programming	ES	3	3	0	0	3
2.	CS1102A	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
3.	GE1101A	Engineering Practices Laboratory	ES	4	2	0	2	3

4.	EE1202A	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
5.	ME1201A	Engineering Graphics	ES	4	2	0	2	3
6.	HV1401A	Universal Human Values	ES	3	2	1	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS1301A	Interpersonal Skills Laboratory	EEC	2	0	0	2	1
2.	HS1401A	Employability And Soft Skills Laboratory	EEC	2	0	0	2	1
3.		Summer Internship	EEC					3

PROFESSIONAL CORE (PC)

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	AM1201A	Data Structures Using C	PC	3	3	0	0	3
2.	AM1202A	Data Structures Using C Laboratory	PC	4	0	0	4	2
3.	AM1301A	Algorithms	PC	3	3	0	0	3
4.	AM1302A	Foundations of Data Science	PC	5	3	0	2	4
5.	AM1303A	Digital Logic Design	PC	5	3	0	2	4
6.	IT1301A	Object Oriented Programming	PC	3	3	0	0	3
7.	AM1304A	Algorithms Laboratory	PC	4	0	0	4	2
8.	IT1302A	Object Oriented Programming Laboratory	PC	4	0	0	4	2
9.	AM1401A	Artificial Intelligence	PC	5	3	0	2	4
10.	AM1402A	Principles of Operating Systems	PC	5	3	0	2	4

11.	AM1403A	Computer Organization and Architecture	PC	3	3	0	0	3
12.	IT1401A	Database Management Systems	PC	3	3	0	0	3
13.	IT1402A	Database Management Systems Laboratory	PC	4	0	0	4	2
14.	AM1501A	Data Communication and Computer Networks	PC	5	3	0	2	4
15.	AM1502A	Automata and Compiler	PC	5	3	0	2	4
16.	AM1503A	Object Oriented Software Engineering	PC	5	3	0	2	4
17.	AM1504A	Fundamentals of Machine Learning	PC	3	3	0	0	3
18.	AM1506A	Fundamentals of Machine Learning Laboratory	PC	4	0	0	4	2
19.	AM1601A	Cloud and Big Data Analytics	PC	3	3	0	0	3
20.	AM1602A	Cryptography and Cyber Security	PC	5	3	0	0	3
21.	AM1603A	Embedded Systems and IoT	PC	5	3	0	2	4
22.	AM1604A	Image Processing and Computer Vision	PC	3	3	0	2	4
23.	AM1606A	Cloud and Big Data Analytics Laboratory	PC	4	0	0	4	2
24.	AM1701A	Optimization Techniques for Machine Learning	PC	3	3	0	0	3
25.	AM3702A	Essentials of Deep Learning	PC	3	3	0	0	3
26.	AM1703A	Natural Language Processing	PC	3	3	0	0	3
27.	AM1704A	Deep Learning Laboratory	PC	4	0	0	4	2
28.	AM1706A	Design Thinking	PC	2	0	0	2	1

SEMESTER- I

S. No	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS1101A	Technical English	HS	3	3	0	0	3
2.	MA1101A	Calculus and its applications	BS	4	3	1	0	4
3.	PH1101A	Applied Physics	BS	3	3	0	0	3
4.	CY1101A	Engineering Chemistry	BS	3	3	0	0	3
5.	CS1101A	Problem Solving and Python Programming	ES	3	3	0	0	3
PRACTICALS								
6.	BS1101A	Physics and Chemistry Laboratory	BS	4	0	0	4	2
7.	CS1102A	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	GE1101A	Engineering Practices Laboratory	ES	4	0	0	4	2
MANDATORY COURSE								
9.	CI1101A	Indian Constitution	MC	2	2	0	0	0
TOTAL				30	17	1	12	22

SEMESTER-II

S. No	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS1201A	English for Communication	HS	3	3	0	0	3
2.	MA1201A	Complex Variables and Transforms	BS	4	3	1	0	4
3.	PH1201A	Material Science	BS	3	3	0	0	3
4.	EE1202A	Basic Electrical and Electronics Measurement Engineering	ES	3	3	0	0	3
5.	ME1201A	Engineering Graphics	ES	4	2	0	2	3
6.	AM1201A	Data Structures Using C	PC	3	3	0	0	3
7.	TA1201A	தமிழர் மரபு / Tamizhar Marabu	HS	1	1	0	0	1
PRACTICALS								
8.	AM1202A	Data Structures Using C Laboratory	PC	4	0	0	4	2
MANDATORY COURSE								
9.	CY1201A	Environmental Science and Engineering	AC	2	2	0	0	0
	TOTAL			27	20	1	6	22

SEMESTER –III

S.NO	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA1305A	Graph Theory and its Applications	BS	4	3	1	0	4
2.	AM1301A	Algorithms	PC	3	3	0	0	3
3.	AM1302A	Foundations of Data Science	PC	5	3	0	2	4
4.	AM1303A	Digital Logic Design	PC	5	3	0	2	4
5.	IT1301A	Object Oriented Programming	PC	3	3	0	0	3
6.	TA1101A	□□□□□□□□ □□□□□□□□□□□□□□□□/ Tamils and Technology	HSM	1	1	0	0	1
PRACTICALS								
7.	AM1304A	Algorithms Laboratory	PC	4	0	0	4	2
8.	IT1302A	Object Oriented Programming Laboratory	PC	4	0	0	4	2
9.	HS1301A	Interpersonal Skills Laboratory	EEC	2	0	0	2	1
TOTAL				31	16	1	14	24

SEMESTER-IV

S.N	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA1405A	Linear Algebra and Optimization Techniques	BS	4	3	1	0	4
2.	AM1401A	Artificial Intelligence	PC	5	3	0	2	4
3.	AM1402A	Principles of Operating Systems	PC	5	3	0	2	4
4.	AM1403A	Computer Organization and Architecture	PC	3	3	0	0	3
5.	IT1401A	Database Management Systems	PC	3	3	0	0	3
6.	HV1401A	Universal Human Values	ES	3	3	0	0	3
PRACTICALS								
7.	IT1402A	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	HS1401A	Employability and Soft Skills Lab	EEC	2	0	0	2	1
	TOTAL			29	18	1	10	24

SEMESTER-V

S.NO	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AM1501A	Data Communication and Computer Networks	PC	5	3	0	2	4
2.	AM1502A	Automata and Compiler	PC	5	3	0	2	4
3.	AM1503A	Object Oriented Software Engineering	PC	5	3	0	2	4
4.	AM1504A	Fundamentals of Machine Learning	PC	3	3	0	0	3
5.		Open Elective - I	OE	3	3	0	0	3
6.		Professional Elective - I	PE	3	3	0	0	3
PRACTICAL								
7.	AM1505A	Fundamentals of Machine Learning Laboratory	PC	4	0	0	4	2
	TOTAL			28	18	0	10	23

SEMESTER -VI

S.NO	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AM1601A	Cloud and Big Data Analytics	PC	3	3	0	0	3
2.	AM1602A	Cryptography and Cyber Security	PC	3	3	0	0	3
3.	AM1603A	Embedded Systems and IoT	PC	5	3	0	2	4
4.	AM1604A	Image Processing and Computer Vision	PC	5	3	0	2	4
5.		Professional Elective - II	PE	3	3	0	0	3
PRACTICAL								
6.	AM1606A	Cloud and Big Data Analytics Laboratory	PC	4	0	0	4	2
	TOTAL			23	15	0	8	19

SEMESTER-VII

S.NO	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AM1701A	Optimization Techniques for Machine Learning	PC	3	3	0	0	3
2.	AM1702A	Essentials of Deep Learning	PC	3	3	0	0	3
2.	AM1703A	Natural Language Processing	PC	3	3	0	0	3
3.		Open Elective - II	OE	3	3	0	0	3
4.		Professional Elective - III	PE	3	3	0	0	3
PRACTICAL								
5.	AM1704A	Deep Learning Laboratory	PC	4	0	0	4	2
6.	AM1705A	Mini Project	EEC	4	0	0	4	2
7.	AM1706A	Design Thinking	PC	2	0	0	2	1
8.		Industrial Training / Internship						3
TOTAL				26	15	0	10	23

SEMESTER-VIII

S.NO	SUBJECT CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective - IV	PE	3	3	0	0	3
2.		Professional Elective - V	PE	3	3	0	0	3
PRACTICAL								
3.	AM1801A	Project Work	EEC	20	0	0	0	10
TOTAL				26	6	0	0	16

TOTAL NO. OF CREDITS: 173

SEMESTER – I

HS1101A **TECHNICAL ENGLISH** **L-T-P- C**

3- 0-0-3

Prerequisites: Basic Language Proficiency.

Objective:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Nurture their ability in technical writing like to prepare professional job applications and effective reports.

Develop their speaking skills by participating in various speaking activities.
Strengthen their listening skill to comprehend lectures and talks in their areas of specialization. Improve their ability to explicit their excellence in all modes of technical communication.

Course Outcomes:
The Students will be able to
CO1: Read technical texts and write area- specific texts effortlessly.
CO2: Listen and comprehend lectures and talks in their area of specialization successfully.
CO3: Speak appropriately and effectively in varied formal and informal contexts.
CO4: Write correctly, clearly and concisely with coherence and cohesion.
CO5: Prepare job applications and resume in an inspiring manner.

UNIT – 1 **9 Periods**

Reading- Reading short texts Listening- Listening to different formal / informal conversations Writing- Instructions, Jumbled sentences Speaking- Self introduction Language development- Parts of speech, Prepositions Vocabulary development- Word formation- root words from foreign language and their use in English.

UNIT – 2 **9 Periods**

Reading-Skimming and Scanning to find specific information Listening- Listening to INK talks Writing- Job Application – cover letter, resume writing Speaking- Asking and Giving directions Language development- Conjunctions, Types of Nouns Vocabulary development- Prefixes and Suffixes.

UNIT – 3 **9 Periods**

Reading- Reading for predicting the content Listening- Listening to situational short talks Writing- Types of paragraphs- Descriptive/Analytical/ compare and contrast Speaking- Mini presentations, Expressing greeting and thanks Language development- Adjectives, Numerical Adjectives, Conditional Clauses Vocabulary development- Homophones, Homonyms.

UNIT – 4 **9 Periods**

Reading- Practice in speed reading Listening- Listening to short texts and fill the data Writing- Interpretation of Graphics / Information, Note making Speaking-Contributing for Group Discussion Language development- Active, Passive, Impersonal passive voice Vocabulary development- Definitions, Nominal Compounds.

UNIT – 5 **9 Periods**

Reading- Reading short stories Listening- Listening for note taking Writing- Report writing, E-mail Writing Speaking- Picture descriptions, Speaking in familiar situations Language development- Tenses Vocabulary development- British and American Vocabulary.

TOTAL PERIODS: 45

Text Books

- Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.
- Board of editors.Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016.

Extensive Reading

- Khera, Shiv. You can Win, Macmillan, 2000.

Reference

- Bailey, Stephen. Academic Writing: A practical guide for students. New York:Rutledge,2011.
- Comfort, Jeremy, et al. Speaking Effectively : Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
- Darlene Smith-Worthington, Sue Jefferson, Technical writing for Success, South- Western Cengage Learning,USA-2011
- Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007
- Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice.Oxford University Press: New Delhi, 2014
- Swan Michael, Practical English Usage. Oxford University Press, Eighth impression 2002.

Recommended Websites

bbc.co.uk/1learning english oxfordonlineenglish.com/ cambridgeenglish.org
inktalks.com/talks/ manageyourwriting.com

MA1101A **CALCULUS AND ITS APPLICATIONS** **L T P C**
3 1 0 4

OBJECTIVES:

1. To understand the concepts of limits, continuity, differentiation and use it to find maxima and minima of functions of one variable.
2. To make the student acquire sound knowledge of techniques in solving ordinary differential equations of first and second order that model in various engineering problems.
3. To familiarize the student with functions of several variables that is needed in many branches of engineering.
4. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS 9+3

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

UNIT II ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER WITH APPLICATIONS 9+3

Basic concepts- Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations - Bernoulli's equation - Geometric Applications- Orthogonal trajectories - Physical Applications - Simple electronic circuits-Newton law of cooling-Heat flow-Rate of decay of radioactive materials-Chemical reaction and solutions.

UNIT III DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS 9+3

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

TOTAL PERIODS:60

COURSE OUTCOMES:

After completing this course, students should demonstrate competency in the following

skills:

- Use both the limit definition and rules of differentiation to differentiate functions. apply differentiation to solve maxima and minima problems.
- The subject helps the students to develop the fundamentals and basic concepts in ODE
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

TEXTBOOKS:

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.

2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.

REFERENCE BOOKS:

1. Bali,N.P.,Goyal,M.,Watkins,C.,Advanced Engineering Mathematics,Laxmi Publications Pvt. Limited, 2007.
2. Boyce,W.E.,and DiPrima,R.C.,Elementary Differential Equationsand Boundary Value Problems, Wiley India, 2012.
3. O'Neil. P. V., "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4. T.Veerarajan , Engineering Mathematics , Mc Grawhill Publications , New Delhi 2017.

PH1101A **APPLIED PHYSICS** **L T P C**

3 0 0 3

OBJECTIVES:

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

UNIT-1 PROPERTIES OF MATTER 9

Elasticity- plasticity – Different Types of Stress and Strain- concept of stress-strain diagram and its application - three types of modulus of elasticity- Poisson's Ratio – Bending of beams- Expression for bending moment –- young's modulus uniform and Non uniform bending : Theory and Experiment – I Shape girders – **Torsional oscillation Theory and Experiment-** Application of Elastic Materials.

UNIT-2 APPLIED OPTICS 9

Laser : characteristics of laser - Principle of spontaneous emission and stimulated emission – Laser action – Einstein A & B coefficients - Population inversion - Pumping – Basic requirement of laser – Types of laser : Nd-YAG and CO2 – Applications : Welding , Drilling & Cutting – Medical field

Fiber optics: **Introduction**- Principle and propagation of light – Numerical aperture and acceptance angle – classification of optical fibers – **Losses in optical fibers(Qualitative) –** Fiber optics communication system (Block Diagram) – Advantages with fiber optic communication system.

UNIT-3 THERMAL PHYSICS 9

Modes of heat transfer- thermal conduction, convection and radiation – Specific heat capacity- thermal conductivity- Newton's law of cooling - **Searle's** and Lee's disc methods: theory and experiment - conduction through compound media (series and parallel) – **thermal expansion of solids, liquids and gases** - Applications: heat exchangers, refrigerators and solar water

heaters.

UNIT-4 WAVE AND PARTICLE PHYSICS 9

Inadequacy of Classical Mechanics - Development of quantum theory- **Planck's Black body radiation and Distribution Laws(Qualitative) – Compton Effect (Derivation)** - De Broglie wavelength – properties of matter waves – Experimental Verification (G.P Thomson experiment) – Heisenberg's uncertainty principle - Schrodinger's wave equation – time dependent – time independent wave equations – physical significance of Wave function – applications: particle in a one dimensional potential box.

UNIT-5 CRYSTALOGRAPHY 9

Single crystalline, polycrystalline and amorphous materials Lattice - unit cell- Crystal systems-Bravais lattices- Lattice planes- Miller indices- Interplanar- d- Spacing in cubic Lattice- calculation of number of atoms per unit cell – atomic radius – packing factor for SC, BCC, FCC and HCP structures- Crystal Defects – types.

Total Periods : 45

OUTCOMES:

At the end of this course,

1. The students will gain knowledge on the basics of properties of matter and its applications
2. Use the concepts of waves and optical devices and their applications in Laser and fiber optics
3. The students will understand the properties of thermal materials and its applications
4. The students will get knowledge on advanced physics concepts of quantum theory and its application in one dimensional box.
5. The students will understand the different types of crystals structures and different crystal growth techniques.

TEXT BOOKS:

1. Gupta S.L. and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publishers, 2015.
2. R. K. Gaur and S.C. Gupta, Engineering Physics, Dhanpat Rai Publication (P) Ltd, New Delhi, 2014.
3. Bhattacharya, D.K. and Poonam, T. Engineering Physics, Oxford University Press, 2015.

REFERENCES:

1. C. Kittel, Introduction to Solid State Physics 8th Edition, Wiley Eastern Ltd,2004.
2. Halliday, D., Resnick, R. and Walker, J. Principles of Physics. Wiley, 2015.
3. Tipler, P.A. and Mosca, G. Physics for Scientists and Engineers with Modern Physics, W. H. Freeman, 2007.
4. Einstein coefficient calculation, https://youtu.be/TvfiZHXUtXg (Video lecture)
5. Lattice structures, https://youtu.be/Rm-i1c7zr6Q (Video lecture)

CY1101A **ENGINEERING CHEMISTRY** **L T P C**
3 0 0 3

OURSE OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- It enables the students to gain information about Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells
- It deals with the information about the types of fuels, calorific value calculations and manufacture of solid, liquid and gaseous fuels.
- To impart knowledge about the nanomaterials synthesis, properties and applications

UNIT I **WATER TREATMENT AND TECHNOLOGY** **(9)**

Introduction – characteristics, Water quality parameters -hardness– types, Determination-EDTA method, Alkalinity ,boiler feed water requirements-boiler troubles – scale & sludge - Caustic Embrittlement , boiler explosion -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (phosphate, calgon, carbonate and colloidal conditioning methods)
– desalination of brackish water –reverse osmosis.

UNIT II **PHASE RULE AND ALLOYS** **(9)**

Phase rule: Introduction, definition of terms with examples, One Component System- water system,Sulphur,CO2 system, Thermal Analysis and cooling curves, Reduced phase rule - Two Component Systems- classification – lead-silver system-problems. Alloys: Introduction-Definition- Properties of alloys- Significance of alloying,Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel.

UNIT III **ENERGY SOURCES AND STORAGE DEVICES** **(9)**

Energy – Types – Non-renewable energy - Nuclear energy -renewable energy - solar energy conversion - solar cells. Introduction to Electrochemistry, Nernst Equation-Electrochemical cells – reversible and irreversible cells –Cell construction and representation - Batteries - types of batteries – characteristics – construction and working of primary battery (dry cell) - secondary battery (lithium-ion-battery) - fuel cells (H2-O2).

UNIT IV **FUELS AND COMBUSTION** **(9)**

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values-coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) – petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number – diesel oil- cetane number – natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas. Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value-ignition temperature- explosive range – flue gas analysis (ORSAT Method).

UNIT V NANOCHEMISTRY (9)

Basics - distinction between nanoparticles and bulk materials; size-dependent properties; nano cluster, nano rod, nanotube (CNT)-Types of CNT and nanowire. Synthesis: precipitation, thermolysis, chemical vapour deposition, Properties, Characterization and applications.

TOTAL PERIODS:45

COURSE OUTCOMES:

- The knowledge gained on water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
- With the help of phase rule, they could understand the various phase diagrams and able to predict the low melting alloys.
- Students can get knowledge about various fuels and its applications based on its calorific value.
- It provides the students to understand about conventional and non-conventional energy sources and its applications
- Students gain an insight about the recent trends in nano materials.

TEXT BOOKS

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

REFERENCES

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

CS1101A PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROLFLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V FILES, MODULES, PACKAGES & TURTLE 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file- **Case study: Simple Graphics using Turtle**: Draw a Random Pattern of Circle, Square and Rectangle; Draw a Pattern of Straight Lines, **Plotting Graphs in Python**: Menu Driven Program to Create Mathematical 3D Objects.

TOTAL PERIODS: 45

OUTCOMES:

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems.
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TEXT BOOKS:

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

REFERENCES:

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

BS1101A PHYSICS AND CHEMISTRY LABORATORY **L T P C**
0 0 4 2

PHYSICS LABORATORY

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

OUTCOMES:

- Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY

OBJECTIVES:

To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.

LIST OF EXPERIMENTS (**Any seven experiments to be conducted)**

1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of TDS of water sample.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Conductometric titration of strong acid vs strong base.

TOTAL PERIODS: 30

OUTCOMES:

The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

CS1102A PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

Objectives:

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

LIST OF EXPERIMENTS:

1. Write a program to display the largest number among threenumbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform Linear search and Binary search.
7. Write a program to perform Selection sort, Insertion sort, Merge sort
8. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate bouncing ball using Pygame

TOTAL PERIODS: 60

Course Outcomes:

Design simple programs using conditionals and loops.

- Write functions to solve mathematical problems
- Use strings for structuring Python programs.

- Represent compound data using Python lists, tuples, dictionaries.
- Identify to read and write data from and to files in python.

GE 1201A ENGINEERING PRACTICES LABORATORY L T P C

0 0 4 2

OBJECTIVES:

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 13

Buildings:

a. Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

Study of pipeline joints, its location and functions: valves, taps, couplings, Unions, reducers, elbows in household fittings.

a. Study of pipe connections requirements for pumps and turbines.

b.Preparation of plumbing line sketches for water supply and sewage works.

c.Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – pipe connections with different joining components.

d. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

a. Study of the joints in roofs, doors, windows and furniture.

b. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 18

Welding:

a. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
b. Gas welding practice Basic Machining:
a. Simple Turning and Taper turning
b. Drilling Practice Sheet Metal Work:
a. Forming & Bending:
b. Model making – Trays and funnels.
c. Different type of joints. Machine assembly practice:
a. Study of centrifugal pump

b. Study of air conditioner Demonstration on:

a. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.

b. Foundry operations like mould preparation for gear and step cone pulley.

c. Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP -B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE **13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.

2. Fluorescent lamp wiring.

3. Stair case wiring

4. Measurement of electrical quantities – voltage, current, power & power factor RLC in circuit.

5. Measurement of energy using single phase energy meter.

6. Measurement of resistance to earth of electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE **16**

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC Signal parameter (peak-peak, rms period, frequency) using CR.

2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL PERIODS: 60

OUTCOMES:

On successful completion of this course, the student will be able to

1. Fabricate carpentry components and pipe connections including plumbing works.
2. Use welding equipments to join the structures.
3. Carry out the basic machining operations
4. Make the models using sheet metal works
5. Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
6. Carry out basic home electrical works and appliances
7. Measure the electrical quantities
8. Elaborate on the components, gates, soldering practices.

CI1101A **INDIAN CONSTITUTION** **L-T-P C**
2 -0-0 0

Prerequisites: Basic law.

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368,
however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive
concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England,
America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India

13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

SEMESTER -II

HS1201A **ENGLISH FOR COMMUNICATION** **L T P C**
3 0 0 3

OBJECTIVES:

The Course enables the second semester Engineering and Technology students to:

- Improve their language ability to improve the four basic skills of communication (LSRW).
- Enhance the skills and methods to enrich their reading and comprehending ability.
- Strengthen their skills to listen to the lectures and talks related to their fields of studies.
- Foster their ability to write effectively in all contexts.
- Cultivate their oral presentation skills through technical presentations and contribution in group discussions.

Course Outcomes:

At the end of the course the students will be able to:
CO1: Read for comprehending and responding in general and professional settings.
CO2: Demonstrate the communication skills (LSRW) in academic, professional and social Environment.
CO3: Participate effectively in formal and informal conversations and express findings and opinions with proper language ability.
CO4: Comprehend conversations and short talks delivered in English.
CO5: Use the language effectively to write with clarity and accuracy in general and technical contexts.

UNIT – 1 **9 Periods**

Reading- Reading for detailed comparison **Listening**- Listening to interviews **Writing**- Developing hints, summarizing **Speaking**- Talk about future plans, arrangements intensions **Language development**- Sentence structures **Vocabulary development-** Synonyms, Antonyms, Adverbs

UNIT – 2 **9 Periods**

Reading-Extended reading **Listening**- Listening to telephonic conversations **Writing**- Formal Letter Writing - Letters for bona fide certificate - to the principal for permission for in plant training, industrial visit, paper presentations, inter college events, Letter to the Editor, Recommendations **Speaking**- Formal conversation **Language development**-Use of Punctuation, Modal verbs **Vocabulary development-** One word substitutes, Common Phrasal verbs

UNIT – 3 **9 Periods**

Reading- Identify topic sentences by reading a short story **Listening**- Listening to TED talks **Writing**- Process/product description **Speaking**- Formal Conversations **Language development**- Relative Clauses, Concord, Error correction **Vocabulary development**- Idioms & Phrases, Minimal pairs

UNIT – 4 **9 Periods**

Reading- Reading newspaper articles **Listening**- Listening to inspirational speeches **Writing**- Essays, Checklist **Speaking**- Technical Presentations **Language development**- Degrees of Comparison **Vocabulary development**- Articles, Cause and Effect Expressions

UNIT – 5 **9 Periods**

Reading- Close reading **Listening**- Listening for summarizing **Writing**- Dialogue conversations **Speaking**- Movie/ Book Review **Language development**- Wh Questions, Yes/ no Questions **Vocabulary development**- Foreign Expressions and its applications, Reference words

TOTAL PERIODS: 45

Extensive Reading:

- Kalam, Abdul Dr.A.P.J. - The Wings of Fire, Universities press: 1999

Reference:

- Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014
- Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
- Kumar, Suresh. E. Engineering English. Orient Black swan: Hyderabad,2015
- Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
- Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning, USA: 2007.

Recommended websites:

- TED.com
- learningenglish.voanews.com
- islcollective.com
- examenglish.com
- englishclass101.com

MA1201A COMPLEX VARIABLES AND TRANSFORMS L T P C
3 1 0 4

OBJECTIVES

- Understand the concept of Divergence and curl and use it in evaluating Line, Surface and

Volume integrals.

- Understand C-R equations and use it in the construction of Analytic Functions.
- Understand the methods of Complex Integration using Cauchy's Integral Formula and Cauchy Residue theorem, finding Taylor's and Laurent's Series expansions.
- Find the Laplace Transforms of standard Functions and to find the Inverse Laplace Transform of a function and use it in solving Differential Equations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform

techniques
for discrete time systems

UNIT I VECTOR CALCULUS. (9 + 3)

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals-simple applications involving cubes and rectangular parallelopipeds.

UNIT II ANALYTIC FUNCTIONS (9 + 3)

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions ($w = 1\ z$, $w = z^2$, $w = e^z$, $w = \sinh z$, $w =$ coshz
) – Bilinear transformation.

UNIT III COMPLEX INTEGRATION (9 + 3)

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour. **UNIT IV LAPLACE TRANSFORMS (9 + 3)**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT V Z TRANSFORMS AND DIFFERENCE EQUATIONS (9 + 3)

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL PERIODS: 60

OUTCOMES

On successful completion of this course, the student will be able to

- Solve problems using divergence and curl and evaluate line, Surface and Volume integrals.
- Solve problems in Analytic functions and construction of analytic functions using C- R Equations.
- Evaluate problems using Cauchy's integral formula and Cauchy residue theorem and find Taylor's and Laurent's series expansion of a given function.
- Obtain the Laplace Transforms of standard functions.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXTBOOKS

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.

REFERENCE BOOKS

1. Bali,N.P.,Goyal,M.,Watkins,C.,Advanced Engineering Mathematics,Laxmi Publications Pvt. Limited, 2007.
2. Boyce, W.E., and DiPrima, R. C., ElementaryDifferentialEquationsandBoundary Value Problems, Wiley India, 2012.
3. O'Neil. P. V. "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4. T. Veerarajan, Engineering Mathematics, Tata Mcgraw Hill publications co. ltd, New Delhi.2017.

MA1201A	**MATERIAL SCIENCE**	**L T P C**
		3 0 0 3

OBJECTIVES:

To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states –carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination –Elemental and Compound Semiconductors – **N-type and P-type semiconductor (Qualitative)** – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism –Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials –Ferrites and its applications. **Electro static Discharge (ESD)-** Superconductivity: properties – Type I and Type II superconductors–BCS theory of superconductivity (Qualitative) - High Tc superconductors – Electrical, medical, magnetic and computer application of superconductors.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientation and space charge polarization – frequency and temperature dependence of polarization – **Clausius mosotti relation -** dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer).

UNIT V ADVANCED ENGINEERING MATERIALS 9

Metallic glasses - melt spinning process, applications - shape memory alloys: Ni-Ti alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications- Bio materials – introduction- properties of bio materials-examples- medical applications- Ophthalmology- bio sensors- characteristics.

Total Periods: 45

OUTCOMES:

At the end of this course,

- The students will gain knowledge of conducting materials and variation of its properties with temperature.
- Acquire knowledge on basics of semiconductor physics and its applications in various devices.
- Get knowledge on magnetic and superconducting materials properties and their various applications.
- The students will understand the basics of dielectric materials, properties and applications of dielectric materials.
- The students will get knowledge about new engineering materials and its applications in social applications.

TEXT BOOKS:

1. S. Mohan, Principles of Materials Science, MJP Publishers, 2018.
2. Jasprit Singh, Semiconductor Devices, Basic Principles, Wiley 2012.
3. Umesh K Mishra and Jasprit Singh, Semiconductor Device Physics and Design‖, Springer, 2008.

REFERENCES:

1. Wahab, M.A. Solid State Physics: Structure and Properties of Materials‖, Narosa Publishing House, 2009.
2. William D. Callister Jr, David G. Rethwisch, Materials Science and Engineering, An Introduction, Wiley India (P) Ltd., 8th Edition, 2009.
3. Pillai S.O., Solid State Physics, New Age International (P) Ltd., Publishers, 2009.
4. Semiconductor Introduction, https://youtu.be/k6ZxP9Yr02E (Video lecture)
5. Superconductivity, https://youtu.be/D-9M3GWOBrw (Video lecture)

EE 1202A BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To explain the basic Quantities and different components used in Electrical circuits
- To explain the operations of electrical machines.
- To explain the working principles of measuring instruments, transducers and calibration for instruments.
- To explain the fundamentals of Electronics
- To impart knowledge of communication.
-

UNIT I FUNDAMENTALS OF ELECTRICALCIRCUITS 9

Basic Electrical Quantities , Circuit components ,Fundamental laws of electric circuits– Steady State Solution of DC Circuits- Nodal analysis and Mesh analysis-Introduction of AC Circuits- Sinusoidal Steady State Analysis, Power and Power Factor-Current and Voltage equations for Three Phase Balanced Circuits

.

UNIT II ELECTRICAL MACHINES 9

Construction, Principle of Operation and Basic Equations of DC Generator, DCMotor, Single Phase Transformer and Single phase induction Motor.

UNIT III MEASURING INSTRUMENTS AND TRANSDUCERS 9

Introduction to Measuring instruments –Operating principles of PMMC, Voltmeter, Ammeter and Dynamometer type Wattmeter & Energy Meter, Introduction to transducers – Stain Gauge, LVDT and RTD-Principles of Calibration.

UNIT IV ELECTRONICS 9

Introduction to Analog electronics–Characteristics of PN Junction Diode and Zener Diode - Half Wave &Full Wave Rectifiers.Bipolar Junction Transistor and its Characteristics. Introduction to Digital electronics:Number systems -Boolean algebra theorems–Logic Gates-Adder-Multiplexer and Demultiplexer Basics of sequentialCircuits– Flip-Flops – Shift Registers-4 bit Ripple Counter – R-2R ladder type D/A and Successive approximation type A/D Conversion.

UNIT V FUNDAMENTALS OF COMMUNICATION SYSTEMS 9

Introduction – Elements of Communication Systems–Principles of Amplitude and Frequency Modulations. Basic of digital Communication –ASK, PSK and FSK- Communication Systems: Radio, Antenna, TV, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only) and Comparison of 2G,3G and 4G in mobile communications.

TOTAL PERIODS: 45

OUTCOMES:

Ability to

- Understand electric circuits and fundamental analysis of circuits.
- Understand working principles of electrical machines
- Choose appropriate instruments for electrical measurement and transducers for a specific application.
- Understand the concepts of Analog electronics and Digital electronics.
- Understand and Gain knowledge of types communication systems

TEXT BOOKS:

1. D.P.Kothari and I.J. Nagarath –"Basic Electrical & Electronics Engineering", c.Grawhill publications, 1st Edition, 2014. (All Units)
2. Mehta V K, "Principles of Electronics", S.Chand& Company Ltd, 1994.
3. Gary S. Rogers, " An Introduction to Wireless Technology", Pearson Education, 2008

REFERENCE BOOKS:

1. Vincent Del Toro, Electrical Engineering Fundamentals, Prentice Hall, 2006.
2. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
3. V.K.Mehta&Rohit Mehta, Principles of Electrical Engineering, S.Chand publications, 2nd Edition, 2003.
4. Simon Haykin, ―Communication Systems‖, 4th Edition, Wiley, 2014.

ME1201A ENGINEERING GRAPHICS LT P C

OBJECTIVES:

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

CONCEPTS AND CONVENTIONS (Not for Examination) 1

Importance of graphics in engineering applications –Use of drafting instruments – BIS conventions and specifications – Size and layout of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND ORTHOGRAPHIC PROJECTIONS 6+6

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views(Free Hand Sketching) from pictorial views of objects-Principal planes-Projection of points- Demo using CAD software for above topics.

UNIT II PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES 6+6

Orthographic projections-principles-Principal planes-First angle projection- Projection of points- Projection of straight lines (only First angle projections) inclined to one of the principal planes - Determination of true lengths and true inclinations - Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes - Demo using CAD software for above topics.

UNIT III PROJECTION OF SOLIDS 6+6

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method-Demo using CAD software for above topics.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENTOF SURFACES 6+6

Sectioning of above solids in simple vertical position - the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones-Demo using CAD software for above topics.

UNITV ISOMETRIC ANDPERSPECTIVEPROJECTIONS 6+6

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions –Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method- Demo using CAD software for above topics.

TOTAL PERIODS:61

OUTCOMES:

On successful completion of this course, the student will be able to

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

TEXT BOOK:

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

REFERENCES:

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

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation–Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making atotalof100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to

fit solution withinA3size.

4. The examination will be conducted in appropriate sessions on the same day

AM1201A DATA STRUCTURES USING C **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.
-

UNIT I C PROGRAMMING FUNDAMENTALS 9

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays.

UNIT II C PROGRAMMING - ADVANCED FEATURES 9

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and

Functions – File Handling – Preprocessor Directives

UNIT III LINEAR DATA STRUCTURES 9

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Singly Linked Lists-Doubly Linked Lists – Stack ADT – Implementation of Stack – Applications – Queue ADT – Queue Implementation – Applications.

UNIT IV NON-LINEAR DATA STRUCTURES 9

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – AVL Tree-Multi way Search Tree-B-Tree-B+ Tree-Application of trees. Graphs- Representation of Graph –Graph Traversal Algorithms-Topological sorting-Shortest Path Algorithms-Application of Graphs.

UNIT V SORTING AND SEARCHING TECHNIQUES 9

Linear Search – Binary Search-Insertion Sort – Bubble Sort-Quick Sort – Merge Sort. Hashing – Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Develop C programs for any real world/technical application.
CO2: Apply advanced features of C in solving problems.
CO3: Write functions to implement linear and non–linear data structure operations.
CO4: Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.
CO5: Appropriately use sort and search algorithms for a given application.
CO6: Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second

Edition, Pearson Education, 1997.
2. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.

REFERENCES:

1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999.
2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education,1983.
4. Ellis Horowitz, SartajSahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008.

TA1201A HERITAGE OF TAMILS L T P C
1 0 0 1

UNIT I LANGUAGE AND LITERATURE 3

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

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

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

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, 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: 15 PERIODS

TEXT - CUM- REFERENCE BOOKS

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.
Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
7. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
8. 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)
9. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
10. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
11. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

AM1202A DATA STRUCTURES USING C LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To develop applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS

1. Practice of C programming using statements, expressions, decision making and iterativeStatements.
2. Practice of C programming using Functions and Arrays

3. Implement C programs using Pointers and Structures

4. Implement C programs using Files

5. Array implementation of List ADT

6. Array implementation of Stack and Queue ADTs

7. Linked list implementation of List, Stack and Queue ADTs

8. Applications of List, Stack and Queue ADTs

9. Implementation of Binary Trees and operations of Binary Trees

10. Implementation of Binary Search Trees

11. Implementation of Graph Traversal Algorithms.

12. Implementation of shortest path algorithms.

13. Implementation of searching techniques

14. Implementation of sorting algorithms Insertion Sort, Bubble Sort, Quick Sort, Merge Sort

15. Implementation of Hashing – any two collision techniques

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Use different constructs of C and develop applications

CO2: Write functions to implement linear and non-linear data structure operations

CO3: Suggest and use the appropriate linear / non-linear data structure operations for a given problem
CO4: Implement Sorting and searching algorithms for a given application.
CO5: Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

CY1201A ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

2 0 0 0

COURSE OBJECTIVES

- To understand nature and the facts about the environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of major ecosystem – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity – Biodiversity at global, national and local levels – India as a mega- diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water – Mineral resources: environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – 12 Principles of Green chemistry, role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act –- central and state pollution control boards.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS

- women and child welfare – role of information technology in environment and human health.

TOTAL PERIODS: 45

OUTCOMES

- Students will be able to understand the functions of ecosystems and appreciate the bio diversity.
- Students will be able to know the measures to control environmental pollution.
- Students will be able to understand the usage as well as the effects of over exploitation of natural resources.
- Students will have knowledge about finding technological, economic and political solutions to environmental problems with various Environmental Protection Act in mind.
- Students will be able to understand the interrelationship between population explosion and the environment and also role of IT in environment and human health.
- Students will be able to understand that Environmental problems can only be solved by Public participation in all aspects and cannot be solved by mere laws.

TEXT BOOKS

Environmental Science and Engineering by Anubha Kaushik and C.P.Kaushik-New Age International Publishers. New Delhi, 2017.

REFERENCES

1. Benny Joseph , Environmental Studies, Tata mcgraw-Hill Publishing Company, Ltd., New Delhi, 2006.
2. Dr.B.S.Chauhan Environmental Studies , University Science Press, New Delhi, 2011.

SEMESTER III

MA1305A GRAPH THEORY AND ITS APPLICATIONS L T P C
3 1 0 4

OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.
- Be exposed to the techniques of proofs and analysis

UNIT -I INTRODUCTION (12)

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT-II TREES -CONNECTIVITY (12)

Trees -Properties- Distance and Centres - Types - Rooted Tree-Enumeration- Labelled Tree - Unlabelled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT-III PLANAR AND DIRECTED GRAPH (12)

Network Flows - Planar Graph - Representation - Related Theorems -Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness.

UNIT-IV PERMUTATIONS & COMBINATIONS (12)

Fundamental principles of counting – Permutations and combinations – Binomial theorem – Combinations with repetition – Combinatorial numbers – Principle of inclusion and exclusion – Derangement – Arrangements with forbidden positions

UNIT-V GENERATING FUNCTIONS (12)

Generating functions – Partitions of integers – Exponential generating function – Summation operator – Recurrence relations – First order and second order – Non-homogeneous recurrence relations – Method of generating functions.

TOTAL: 60 PERIODS

OUTCOMES:

- Upon completion of this course, the students should be able to
- Write precise and accurate mathematical definitions of objects in graph theory.
- Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.
- Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.
- Validate and critically assess a mathematical proof.
- Reason from definitions to construct mathematical proofs

TEXT BOOKS:

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. Grimaldi R.P. “Discrete and Combinatorial Mathematics: An Applied Introduction”, Addison Wesley, 1994.

REFERENCES:

1. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
2. West, D. B., ―Introduction to Graph Theory‖, Pearson Education, 2011.
3. John Clark, Derek Allan Holton, ―A First Look at Graph Theory‖, World Scientific Publishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill , 2007

AM1301A	ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

• To critically analyze the efficiency of alternative algorithmic solutions for the same problem
• To critically analyze the efficiency of graph algorithms
• To understand different algorithm design techniques
• To solve programming problems using state space tree
• To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms.

UNIT 1 INTRODUCTION 9

Notion of Algorithm-Fundamentals of Algorithmic problem Solving- Important problem types, Fundamentals of the Analysis Framework- and Basic Efficiency Classes- Asymptotic Notations and their properties-Mathematical analysis of non-recursive algorithms. Mathematical analysis of recursive algorithm.

UNIT II GRAPH ALGORITHMS 9

Graph algorithms: Representations of graphs - Graph traversal: DFS – BFS - applications - Connectivity, strong connectivity, bi-connectivity - Minimum spanning tree: Kruskal's and Prim's algorithm- Shortest path: Bellman-Ford algorithm - Dijkstra's algorithm - Floyd-Warshall algorithm Network flow: Flow networks - Ford-Fulkerson method – Matching: Maximum bipartite matching

UNIT III ALGORITHM DESIGN TECHNIQUES 9

Divide and Conquer methodology: Finding maximum and minimum - Merge sort - Quick sort Dynamic programming: Elements of dynamic programming — Matrix-chain multiplication - Multi stage graph — Optimal Binary Search Trees. Greedy Technique: Elements of the greedy strategy - Activity-selection problem –- Optimal Merge pattern — Huffman Trees.

UNIT IV STATE SPACE SEARCH ALGORITHMS 9

Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem

UNIT V NP-COMPLETE AND APPROXIMATION ALGORITHM 9

Tractable and intractable problems: Polynomial time algorithms – Venn diagram representation - NP-algorithms - NP-hardness and NP-completeness – Bin Packing problem - Problem reduction: TSP – 3-CNF problem. Approximation Algorithms: TSP - Randomized Algorithms: concept and application - primality testing - randomized quick sort - Finding kth smallest number

COURSE OUTCOMES:

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

CO1: Analyze the efficiency of algorithms mathematically.

CO2: Apply graph algorithms to solve problems and analyze their efficiency.

CO3: Make use of algorithm design techniques like divide and conquer, dynamic programming and greedy techniques to solve problems

CO4: Use the state space tree method for solving problems.

CO5: Solve problems using approximation algorithms and randomized algorithms

Text Books:

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

2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.

3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran "Computer Algorithms/C++" Orient Blackswan, 2nd Edition, 2019.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006.

2. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

AM1302A	FOUNDATIONS OF DATA SCIENCE	L T PC 3 0 2 4

UNIT 1 INTRODUCTION TO DATA SCIENCE 8

Importance of Data Science - Need for Data Science - What is Data Science - Data Science Process - Business Intelligence and Data Science - Prerequisite for Data Scientist - Components of Data Science - Tools and Skills Need – Data Types- Variable Types- Sampling Techniques and Probability- -Basic Statistics –Use cases

UNIT 2 DATABASES FOR DATA SCIENCE 9

Structured Query Language (SQL)- Data Munging- Filtering, Joins, Aggregation, Window Functions, Ordered Data, preparing No-SQL: Document Databases, Wide-column Databases and Graphical Databases - Cloud Databases

UNIT 3 DATA MODELLING 10

Data Science Methodology: Analytics for Data Science; Data Analytics Life Cycle- Data Science Methods and Machine learning: Types of Machine Learning, Train-Test split, Regression Analysis: Linear Regression - Logistic Regression - Multinomial Logistic Regression - Time Series Models - Machine Learning: Decision Trees: Entropy and Information Gain - Nave Bayes - Support Vector Machines - Nearest Neighbour learning – Clustering - Confusion Matrix: Performance metrics

UNIT 4 DATA ANALYTICS AND TEXT MINING 8

Text Mining - Major Text Mining Areas - Text Analytics - Text Analysis Subtasks - Basic Text Analysis Steps - Natural Language Processing - Major Components of NLP - Stages of NLP - Statistical Processing of Natural Language - Applications of NLP- Neural Networks

UNIT 5 PLATFORMS FOR DATA SCIENCE 10

Data Science Tool Python : Python libraries: Data Frame Manipulation with Pandas, Numpy - Data Analysis Exploration With Python - Clustering with Python - Python IDEs for Data Science ; Data Science Tool: R; Reading and Getting Data into R - Ordered and Unordered Factors - Lists and Data Frames - Statistical Models in R- Data Visualization using Tableau - Introduction to Data Visualization - Tableau Basics - Dimensions, Measures and Descriptive Statistics - Basic Charts - Integrate Tableau with Google Sheets

COURSE OUTCOMES:

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

1. Understand fundamental knowledge on data science.
2. Demonstrate proficiency in data analytics by querying the dataset.
3. Understand the various data science methodology to do data analytics.
4. Build machine learning models and mathematical operations to solve real time applications.
5. Understand various types of data and extract them through Natural Language Processing techniques for knowledge representation.
6. Demonstrate numerous open-source data science tools to visualize and solve various real-world problems.

TEXT BOOK:

1. Sanjeev Wagh, Manisha Bhende, Anuradha Thakare, 'Fundamentals of Data Science, CRC Press, 1stEdition, 2022.

REFERENCE :

1. Avrim Blum, John Hopcroft, Ravindran Kannan, "Foundations of Data Science", Cambridge University Press, First Edition,2020.
2. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 1stEdition, 2015.
3. Ani Adhikari and John DeNero, 'Computational and Inferential Thinking: The Foundations of Data Science', GitBook, 2019.
4. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

PRACTICAL:

SOFTWARE REQUIREMENTS

Pycharm, Jupyter, Spyder, Numpy, Pandas

Prerequisites: Download, install and explore the features of python IDE's: Jupyter, Google Colab, Spyder, Pycharm

LIST OF EXPERIMENTS

1. Write a python program for n-th Fibonacci number.
2. Write a python program using List, Tuple, Set, Dictionary.
3. Write a python program to create arrays using Numpy library.
4. Explore SQL commands python and write a basic queries using it.
5. Write a python program using Pandas library.
6. Write an R program to perform Mean and Median operation for iris dataset.
7. Build and implement a linear regression model using python programming for stock prediction.
8. Build and implement a logistic regression model using python programming for spam classification.
9. Write a python program to perform Exploratory Data Analysis (EDA) for iris dataset.
10. Write a python program to implement different performance metrics for iris dataset.
11. Write a SQL query to find the maximum and minimum temperature in a day.
12. Write a SQL query to identify the time difference between consecutive rows.

TOTAL:75 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

- Develop relevant programming abilities.
- Exhibit proficiency to build and assess data-based models.
- Demonstrate skill in Data management & processing tasks using Python.
- Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.
- Develop a machine learning regression and classification using python packages.
- Analyze the performance of the models.

REFERENCES:

•Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
•Sanjeev Wagh, Manisha Bhende, Anuradha Thakare, 'Fundamentals of Data Science, CRC Press, 1stEdition, 2022.
•Data Analysis and Visualization Using Python, Analyze Data to Create Visualizations for BI Systems — Dr. Ossama Embara.

AM1303A DIGITAL LOGIC DESIGN L T P C
3 0 2 4

COURSE OBJECTIVES:

•To understand Boolean algebra, number systems and logic gates.
•To understand the design of combinational logic circuits.
•To analyze the sequential logic circuits.
•To understand the memory and programmable logic devices.
•To introduce digital simulation for development of application oriented digital circuits.
•To understand the concepts of memory management and cache memories.

UNIT 1 BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems -Arithmetic Operations -Binary Codes-Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra -Boolean Functions -Canonical and Standard Forms -Simplification of Boolean Functions using Karnaugh Map -Logic Gates.

UNIT 2 COMBINATIONAL LOGIC 9

Combinational Circuits –Analysis and Design Procedures -Binary Adder-Subtractor - Decimal Adder-Binary Multiplier -Magnitude Comparator-Decoders–Encoders – Multiplexers - De Multiplexers.

UNIT 3 SEQUENTIAL LOGIC 9

Sequential Circuits -Storage Elements: Latches, Flip-Flops -Analysis of Clocked Sequential Circuits -State Reduction and Assignment-Design Procedure –Registers and Counters – Hazards.

UNIT 4 MEMORY AND PROGRAMMABLE LOGIC 9

RAM – ROM - Memory Decoding – Error Detection and Correction -Programmable Logic Array –Programmable Array Logic –Sequential Programmable Devices (FPGA, CPLD).

UNIT 5 VERILOG HDL 9

Introduction to HDL – HDL Models of Combinational circuits(Half adder, Full adder, Half Subtractor, Full Subtractor, Logic Gates) - HDL Models of Sequential Circuits (JKFF, DFF, SRFF, TFF)

Text Books:

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

2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

References

1.Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.
2. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
3. Samir Palnitkar, "Verilog HDL", Second Edition.

PRACTICAL EXERCISES:

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of BCD adder, encoder and decoder circuits
5. Implementation of functions using Multiplexers.
6. Implementation of the synchronous counters
7. Implementation of a Universal Shift register.

Total Periods:75

COURSE COTCOMES:

The Students will be able to

CO1. State the fundamentals of Boolean algebra, number systems and logic circuits.. CO2. Design combinational digital circuits.

CO3. Design sequential circuits and analyze the design procedures for shift register and counter.

CO4. State the fundamentals of memory and programmable logic devices CO5. Identify the digital simulation for digital logic Circuits.

CO6. Identify the concepts of memory management and cache memories

IT1301A OBJECT ORIENTED PROGRAMMING L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

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 –Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods - access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance–Superclasses-subclasses–Protectedmembers–constructors in subclasses-the Object class–abstract classes and methods –final methods and classes–Interfaces–defining an interface, implementing interface, differences between classes and interfaces and extending interfaces-Object cloning-inner classes, Array Lists-Strings

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 Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 9

Understanding Threads, Thread Priorities, Synchronizing Threads, Thread lifecycle, Inter-thread communication. Generic Programming–Generic classes–generic methods–Bounded Types–Restrictions and Limitations-Introduction to JDBC, JDBC Drivers and Architecture, Accessing Database with JDBC.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes -actions - mouse events - Introduction to Swing –Swing GUI Components – Text Fields , Text Areas – Buttons- Check Boxes –Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes. Swing packages-Swing Control classes and Methods.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Develop Java programs using OOP principles
- Develop Java programs with the concepts of inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Design problems solutions using Generic Collections and Exception Handling
- Create a Database connectivity and manipulate database using JDBC
- Develop interactive Java programs using swings

TEXT BOOKS:

1. Herbert Schildt, Java The complete reference, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, Core Java Volume–I Fundamentals, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, Java SE8 for programmers, 3rd Edition, Pearson, 2015.
2. Steven Holzner, Java2Blackbook, Dream tech press, 2011.
3. Timothy Budd, Understanding Object-oriented programming with Java Updated Edition, Pearson Education, 2000.

TA1301A TAMILS AND TECHNOLOGY

L	T	P	C
1	0	0	1

UNIT I WEAVING AND CERAMIC TECHNOLOGY **3**

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY **3**

Designing and Structural construction House & Designs in household materials 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: 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1.Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
2.Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
3.The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
4.Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

5. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
6. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
7. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

TA1201A TAMILS AND TECHNOLOGY L T P C
1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials 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: 15
PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மக்களும் பண் பொடும் – கக.கக. பிள்ளள (வளியீடு: தமிழ்நொடு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித ் தமிழ் – முளனவர ்இல. சுந்தரம் . (விகடன் பிரசுரம்).
3. கீழடி – ளவளக நதிக்களரயில் சங்ககொல நகர நொகரிகம் (தொல்லியல் துளற தவளியீடு)
4. பொருளந – ஆற்றங்களர நொகரிகம். (தொல்லியல் துளற வளியீடு)
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 C ivilization 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.

TA1201A தமிழரும் தொழில்நுட்பமும் **L T P C**
1 0 0 1

அலகு I மநசவு மற்றும் பொறனத் மதொழில்நுட்பம்: 3
சங்க கொலத்தில் தநசவுத் ததொழில் – பொளனத் ததொழில்நுட்பம் - கருப்பு சிவப்பு பொண் டங்கள் – பொண் டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவறமப்பு மற்றும் கட்டிடத் மதொழில்நுட்பம்: 3

சங்க கொலத்தில் வடிவளமப்பு மற்றும் கட்டுமொனங்கள் & சங்க கொலத்தில் வீட்டுப் தபொருட்களில் வடிவளமப்பு- சங்க கொலத்தில் கட்டுமொன தபொருட்களும் நடுகல்லும் – சிலப்பதிகொரத்தில் கமளட அளமப்பு பற்றிய விவரங்கள் - மொமல்லபுரச ◌் சிற்பங்களும் , ககொவில்களும் – கசொழர ◌் கொலத்துப் தபருங்ககொயில்கள் மற்றும் பிற வழிபொட் டுத ◌் தலங்கள் – நொயக்கர ◌் கொலக் ககொயில்கள் - மொதிரி கட்டளமப்புகள்பற்றி அறிதல் , மதுளர மீனொட் சிஅம்மன் ஆலயம் மற்றும் திருமளல நொயக்கர ◌் மஹொல் – தசட்டிநொட்டு வீடுகள் – பிரிட்டிஷ் கொலத்தில் தசன்ளனயில் இந்கதொ- சொகரொதசனிக் கட்டிடக் களல.

அலகு III உற்பத்தித் தொழில் நுட்பம்: 3

கப்பல் கட்டும் களல – உகலொகவியல் – இரும்புத் ததொழிற்சொளல – இரும்ளப உருக்குதல் , எஃகு – வரலொற்றுச ◌் சொன்றுகளொக தசம்பு மற்றும் தங்க நொணயங்கள் – நொணயங்கள் அச் சடித்தல் – மணி உருவொக்கும் ததொழிற்சொளலகள் – கல்மணிகள் , கண் ணொடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண் டுகள் – ததொல்லியல் சொன்றுகள் – சிலப்பதிகொரத்தில் மணிகளின் வளககள்.

அலகு IV கவளொ◌ை◌ ◌் றம மற்றும் நீர்ப்பொசனத் மதொழில் நுட்பம்: 3
அளண, ஏரி, குளங்கள் , மதகு – கசொழர் கொலக் குமுழித ◌் தூம்பின் முக்கியத்துவம் – கொல்நளட பரொமரிப்பு – கொல்நளடகளுக்கொக வடிவளமக்கப்பட்ட கிணறுகள் – கவளொண் ளம மற்றும் கவளொண் ளமச ◌் சொர் ந்த தசயல்பொடுகள் – கடல்சொர ◌்அறிவு – மீன்வளம் – முத்து

மற்றும் முத்துக்குளித்தல் – தபருங்கடல் குறித்த பண் ளடய அறிவு – அறிவுசொர ் சமூகம் .

அலகு V அறிவியல் தமிழ் மற்றும் கைித்தமிழ்: 3

அறிவியல் தமிழின் வளர் ச் சி–கணித்தமிழ் வளர் ச் சி- தமிழ் நூல்களள மின்பதிப்பு தசய்தல் – தமிழ் தமன்தபொருட்கள் உருவொக்கம் – தமிழ் இளணயக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இளணயத்தில் தமிழ் அகரொதிகள் – தசொற்குளவத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மக்களும் பண் பொடும் – கக.கக. பிள்ளள (தவளியீடு: தமிழ்நொடு பொடநூல் மற்றும்
கல்வியியல் பணிகள் கழகம்).
2. கணினித ் தமிழ் – முளனவர ்இல. சுந்தரம் . (விகடன் பிரசுரம்).
3. கீழடி – ளவளக நதிக்களரயில் சங்ககொல நகர நொகரிகம் (ததொல்லியல் துளற தவளியீடு)
4. தபொருளந – ஆற்றங்களர நொகரிகம். (ததொல்லியல் துளற தவளியீடு)
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 C ivilization 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) Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

AM1304A ALGORITHMS LABORATORY L T P C

0 0 4 2

1. Implement recursive and non-recursive algorithms.
2. Develop a program to implement graph traversal using Breadth First Search
3. Develop a program to implement graph traversal using Depth First Search
4. From a given vertex in a weighted connected graph, develop a program to find the shortest paths to other vertices using Dijkstra's algorithm.
5. Find the minimum cost spanning tree of a given undirected graph using Prim's algorithm.
6. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
7. Compute the transitive closure of a given directed graph using Warshall's algorithm
8. Develop a program to find out the maximum and minimum numbers in a given list of n numbers using the divide and conquer technique.
9. Implement Merge sort and Quick sort methods to sort an array of elements and determine the time required to sort. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
10. Implement N Queens problem using Backtracking
11. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
12. Implement randomized algorithms for finding the kth smallest number.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C++30 Nos.

TOTAL :60 PERIODS

IT1302A OBJECT ORIENTED PROGRAMMING LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES

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

LIST OF EXPERIMENTS

1. Develop a java application using classes & objects
2. Develop a java application using packages.
3. Develop a java application using Inheritance.
4. Design a Java interface for ADT Stack. Provide necessary exception handling.
5. Write a program to perform string operations using Array List. Write functions for the following
a. Append-add at end
b. Insert–add at particular index
c. Search
d. List all string starts with given letter.
6. Write a Java Program to create an abstract class named and demonstrate polymorphism.
7. Write a Java program to implement user defined exception handling.

Write a Java program that reads a filename from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

8. Write a java program that implement multi-threading.
9. Write a java program to create generic function.
10. Design a calculator using event-driven programming paradigm of Java with the following options.
a) Decimal manipulations
b) Scientific manipulations

11. Develop a simple student database management system using event-driven and concurrent programming paradigms of Java. Use JDBC to connect a back-end database.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with java 30 Nos. (Or)
Server with java supporting 30 terminals or more.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java Programs with Array list.
- Develop and implement Java programs with exception handling and multithreading.
- Design applications using file processing, generic programming and event handling.
- Ability to solve real world problems using features of Object Oriented Programming
- Ability to write, debug and document well-structured Java Applications

HS1301A INTERPERSONAL SKILLS LABORATORY L T P C
0 0 2 1

OBJECTIVES:

The Course will enable learners to:

• Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.

• Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.

• Improve general and academic listening skills.

• Make effective presentation.

UNIT I COMMUNICATION 6

Listening As A Key Skill- Its Importance- Speaking- Give Personal Information- Ask For Personal Information- Improving Pronunciation- Pronunciation Basics- Taking Lecture Notes- Preparing To Listen To A Lecture- Listen to TED/INK Talks - Articulate A Complete Idea.

UNIT II INTERPERSONAL SKILLS 6

Interpersonal Skills- Nurturing- Empathetic- Self-Control- Patient- Sociability-Warmth- Social SkillsTeam Work-Work Ethic- Willing To Work- Initiative- Self-Motivated - Integrity.

UNIT III SPEAKING LANGUAGE 6

Factors Influence Fluency- Deliver A Five-Minute Informal Talk- Greet- Respond To Greetings- Describe Health And Symptoms-Invite And Offer- Accept- Decline- Take Leave- Listen For And Follow The GistListen For Detail – Book/ Movie/Newspaper Articles Review

UNIT IV GROUP DISCUSSION 6

Being An Active Listener: Giving Verbal And Non-Verbal Feedback- Participating In A Group Discussion- Asking And Getting Clarifications-Summarizing Academic Readings And LecturesConversational Speech- Listening To And Participating In Conversations- Persuade.

UNIT V PRESENTATIONS 6

Formal And Informal Talk- Listen To Follow And Respond To Explanations, Directions And Instructions In Academic And Business Contexts- Strategies For Formal Presentations And Interactive Communication- Group/Pair Presentations.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

• Listen and respond appropriately.

• Participate in group discussions

• Make effective presentations

• Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS.

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4
Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford
University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for
Engineers and Professionals.
Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom.
Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013

SEMESTER - IV

MA1405A LINEAR ALGEBRA AND OPTIMIZATION TECHNIQUES L T P C
3 1 0 4

COURSE OBJECTIVES:

- To test the consistency and solve system of linear equations also to find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigen values and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.
- Obtain solution to network problems using CPM and PERT techniques and able to optimize the function subject to the constraints

UNIT I SYSTEM OF LINEAR EQUATIONS AND VECTOR SPACE 12

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method. Real and Complex fields - Vector spaces over Real and Complex fields - Subspace - Linear space- Linear independence and dependence - Basis and dimension.

UNIT II LINEAR TRANSFORMATION 12

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation.

UNIT III INNER PRODUCT SPACES 12

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt ortho normalization process - Least square approximation.

UNIT IV EIGEN VALUE PROBLEMS AND MATRIX DECOMPOSITION 12

Eigen value Problems: Power method, Jacobi rotation method - Singular value decomposition - QR decomposition

UNIT V CLASSICAL OPTIMISATION THEORY AND PROJECT SCHEDULING **12**

Unconstrained problems – necessary and sufficient conditions - Newton- Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After the completion of the course the student will be able to

- Test the consistency and solve system of linear equations and find the basis and dimension of vector space
- Obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- Find orthonormal basis of inner product space and find least square approximation
- Find eigenvalues of a matrix using numerical techniques and perform matrix decomposition
- Obtain solution to network problems using CPM and PERT techniques able to optimize the function subject to the constraints

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, Linear Algebra, Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., Numerical Methods, Brooks/Cole (Thomson Publications), New Delhi,2002.
3. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017 REFERENCES:
1. Kumaresan S, Linear Algebra - A geometric approach, Prentice Hall of India, New Delhi, Reprint, 2010.
2. Strang G, Linear Algebra and its applications, Thomson (Brooks / Cole) New Delhi, 2005.
3. Gerald C.F. and Wheatley P.O, Applied Numerical Analysis, Pearson Educations, New Delhi, 2002.
4. Sundarapandian V, Numerical Linear Algebra, Prentice Hall of India, New Delhi, 2008.
5. Richard Branson, Matrix Operations, Schaum's outline series, 1989.
6. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012 7.Ravindran A., Philip D.T., and Solberg J.J., Operations Research, John Wiley, 2nd Edition, 2007.

AM1401A ARTIFICIAL INTELLIGENCE **L T P C**
3 0 2 4

Course Objectives:

- To study the fundamental concepts of AI agents and environments.
- To learn the methods of problem solving in AI using various search strategies.
- To understand the concepts of knowledge representation and inference using logic.
- To understand the concepts of knowledge representation and inference under uncertainty.
- To learn some applications in text and robotics.

Course Outcomes:

The Students will be able to

CO1. Explain different types of environments and agents. **CO2.**Analyze and solve AI problems using search techniques. **CO3.**Solve AI problems using logics and inference techniques.

CO4. Solve AI problems using uncertain knowledge and probabilistic reasoning.

CO5. Explain the concepts of Natural Language Processing and Robotics and assess the importance of AI using a suitable application

UNIT 1 INTRODUCTION AND INTELLIGENT AGENTS 9

Introduction: What is AI? - The Foundations of Artificial Intelligence - The History of Artificial Intelligence - The State of the Art - Risks and Benefits of AI; **Intelligent Agents:** Agents and Environments – Good Behavior – The Nature of Environments – The Structure of Agents; Philosophy, Ethics, and Safety of AI: The Limits of AI - Can Machines Really Think? - The Ethics of AI, The Future of AI: AI Components - AI Architectures.

9

UNIT 2 PROBLEM SOLVING

Solving Problems by Searching: Problem Solving Agents – Example Problems – Search Algorithms – Uninformed Search Strategies – Informed (Heuristic) Search Strategies – Heuristic Functions; Search in Complex Environments: Local Search Algorithms and Optimization Problems.

UNIT 3 GAME PLAYING AND CSP 9

Game Theory – Optimal Decisions in Games - Heuristic Alpha--Beta Tree Search - Monte Carlo Tree Search - Stochastic Games - Partially Observable Games; Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems - Constraint Propagation: Inference in CSPs - Backtracking Search for CSPs - Local Search for CSPs - The Structure of Problems.

UNIT 4 LOGICAL REASONING 9

Logical Agents: Knowledge-Based Agents – Propositional Logic – Propositional Theorem Proving – Propositional Model Checking – Agents Based on Propositional Logic; First Order Logic: Syntax and Semantics for First Order Logic – Using First Order Logic – Knowledge Representation and Engineering; Inference in First Order Logic: Propositional Versus First Order Logic – Unification and First-Order Inference – Forward Chaining – Backward Chaining – Resolution.

UNIT 5 UNCERTAIN KNOWLEDGE AND REASONING 9

Quantifying Uncertainty: Acting Under Uncertainty – Basic Probability Notation – Inference Using Full Joint Distributions – Bayes' Rule & Its Use - Naive Bayes models; Probabilistic Reasoning: The Semantics of Bayesian Networks – Exact Inference in Bayesian Networks – Approximate Inference for Bayesian Networks - Causal Networks.

Total Periods 45

Text Books

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 4th Edition, Pearson Education / Prentice Hall of India, 2015.

2. Deepak Khemani "A First Course in Artificial Intelligence", McGraw Hill, 2014.

References

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003.

2. Dawn W Patterson, "Introduction to Artificial Intelligence and Expert Systems", 1st Edition, Pearson Education India, 2015.

3. Andreas Muller, Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly, 1st edition, 2016.

4. Prateek Joshi, "Artificial Intelligence with Python", 1st edition, Packt Publishing Limited, 2017.

5. David Poole, Alan Mackworth, "Artificial Intelligence: Foundation of Computational Agents", 2nd Edition, Cambridge University Press, 2017.

AM1402A PRINCIPLES OF OPERATING SYSTEMS

L	T	P	C
2	0	2	4

Course Objectives:

- Understand the basic concepts and functions of operating systems.
- Learn about processes, threads, and scheduling algorithms.
- Understand the principles of concurrency and deadlocks.
- Learn various memory management schemes.
- Understand I/O systems basics and various file systems

Course Outcomes:

The Students will be able to

CO1: Explain operating system services and operations.
CO2: Implement various scheduling algorithms.
CO3: Apply the principles of concurrency.
CO4: Compare and contrast various memory management schemes.
CO5: Analyze the various disk scheduling algorithms
CO6: Design and implement prototype file systems.

UNIT I OPERATING SYSTEMS OVERVIEW 9

Computer System Overview: Basic elements – Instruction execution – Interrupts – Memory hierarchy – Cache memory – Direct memory access – Multiprocessor and multicore organization; Operating System Overview: Objectives and functions – Evolution of operating system; Computer system organization; Operating System Structure and Operations: System calls – System programs – OS generation and system boot.

UNIT 2 PROCESS MANAGEMENT 9

Processes: Process concept – Process scheduling – Operations on processes – Interprocess communication; Threads: Overview – Multithreading models – Thread issues; CPU Scheduling: FCFS, SJF, Priority, Round robin, Rate Monotonic and EDF scheduling; Process Synchronization – Critical section problem – Mutex locks – Semaphores; Deadlocks – Avoidance – Prevention – Detection and Recovery.

UNIT 3 MEMORY MANAGEMENT 9

Main Memory: Contiguous memory allocation – Segmentation – Paging – 32 and 64 bit architecture Examples; Virtual Memory: Demand paging – Page replacement algorithms – Allocation of Frames – Thrashing.

UNIT 4 STORAGE MANAGEMENT 9

Mass Storage Structure: Overview – Disk scheduling and management; File System Storage: File concepts – Directory and disk structure – Sharing and protection; File System Implementation: File system structure – Directory structure – Allocation methods – Free space management.

UNIT 5 CASE STUDY 9

Linux Vs Windows: Design principles – Process management – Scheduling – Memory management – File systems; Mobile OS: iOS and Android – Introduction and architecture.

Total Periods 45

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, "Operating System Concepts", Tenth Edition, John Wiley and Sons Inc., 2018.
2. Brian L. Stuart, "Principles of Operating Systems: Design & Applications", First Edition, Thomson Learning, 2009.

References

1. William Stallings, "Operating Systems – Internals and Design Principles", Ninth Edition, Pearson, 2018.
2. Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems Design and Implementation", Third Edition, Prentice Hall, 2006.
3. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
4. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, "Operating Systems", Third Edition, Pearson Education, 2004.

5. Achyut S. Godbole, Atul Kahate, “Operating Systems”, Third Edition, McGraw Hill Education, 2017.

IT1401A	DATABASE MANAGEMENT SYSTEMS	L T P C 3 0 0 3

Course Objectives :

- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models

Course Outcomes:
The Students will be able to

CO6. Model an application's data requirements using conceptual modeling and design database Schemas based on the conceptual model.

CO7. Formulate solutions to a broad range of query problems using relational algebra/SQL.

CO8. Demonstrate an understanding of normalization theory and apply such knowledge to the 11 normalization of a database.

CO9. Run transactions and estimate the procedures for controlling the consequences of concurrent data access.

CO10. Explain basic database storage structures, access techniques and query processing.

CO11. Describe distributed, semi-structured and unstructured database systems.

UNIT I RELATIONAL DATABASE 9

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

UNIT 2 DATABASE DESIGN 9

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

UNIT 3 TRANSACTIONS 9

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

UNIT 4 IMPLEMENTATION TECHNIQUES 9

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

UNIT 5 ADVANCED TOPICS 9

Overview of Distributed Databases – Data Fragmentation – Replication — Introduction to Object-based Databases - Enhanced Data bases: Temporal Database –Spatial Database – Multimedia Database – XML

Databases: XML schema - NOSQL Database: Characteristics –Schema-less models– Applications – Current Trends

Total Periods 45

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.

2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2017.

3. DavidLoshin,"Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools,Techniques,NoSQL,andGraph",Morgan Kaufmann/El Sevier Publishers,2013.

References

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, ―Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

3. G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011. 3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.

4. Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design, Implementation and Management", Ninth Edition, Cengage Learning, 2011

AM1403A COMPUTER ORGANIZATION AND ARCHITECTURE L T P C
3 0 0 3

COURSE OBJECTIVE:

- Explain the basics structure of computers, operations and instructions.
- Design arithmetic and logic unit
- Explain pipelined execution and design its control unit.
- Explain parallel processing architectures.
- Design a multi-functional ALU by applying best practices of system design

UNIT 1 BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts – Performance; Instructions: Language of the computer – Operations, Operands – Instruction representation; Logical operations – Decision making; MIPS addressing.

.UNIT II ARITHMETIC FOR COMPUTERS 9

Addition and subtraction; Multiplication; Division; Floating Point Representation: Floating point operations.

UNIT III PROCESSOS AND CONTROL UNIT 9

A Basic MIPS implementation: Building a data path – Control implementation scheme; Pipelining: Pipelined data path and control – Handling data hazards & Control hazards – Exceptions – Issues in predictive branching: Spectre and Meltdown.

UNIT IV MEMORY & I/O SYSTEMS 9

Memory Hierarchy; Memory technologies; Cache Memory: Basics and cache mapping techniques; Measuring and improving cache performance; Virtual Memory: TLBs; Accessing I/O devices – Interrupts; Direct memory access; Bus structure – Bus operation – Arbitration; Interface circuits; USB.

UNIT V: PARALLEL PROCESSORS 9

Parallel processing challenges; Flynn's classification: SISD – MIMD – SIMD – SPMD and Vector Architectures; Hardware multithreading; Multi-core processors and other shared memory multiprocessors; Introduction to Graphics Processing Units.

TOTAL PERIODS:45

COURSE OUTCOMES:

After completion of course, students would be able to:

1. Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
2. Analyse different computer architectures and their applications.
3. Understand modern design structures of Pipelined and Multiprocessors systems.
4. Understand distributed computing architecture and high-performance computing.

TEXT BOOKS

1. David A Patterson, John L Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", 8th Edition, Pearson Education, 2010.
2. John P Hayes, "Computer Architecture and Organization", 3rd Edition, Tata McGraw Hill, 2012.
3. John L Hennessey, David A Patterson, "Architecture – A Quantitative Approach", 5th edition, Morgan Kaufmann, Elsevier, 2012 (Units I, III).
4. Morris Mano M, "Computer System Architecture", Revised 3rd Edition, Pearson Publication, 2017.
5. Chakraborty P, "Computer Architecture and Organization", JAICO Publishing House,2010.

IT1401A DATABASE MANAGEMENT SYSTEMS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models

UNIT I RELATIONAL DATABASES 9

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

UNIT II DATABASE DESIGN 9

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

UNIT III TRANSACTIONS 9

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

UNIT IV IMPLEMENTATION TECHNIQUES 9

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

UNIT V ADVANCED TOPICS 9

Overview of Distributed Databases – Data Fragmentation – Replication — Introduction to Object-based Databases - Enhanced Data bases: Temporal Database –Spatial Database – Multimedia Database - XML Databases: XML schema - NOSQL Database: Characteristics – Schema-less models– Applications – Current Trends.
TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students should be able to:
- Model an application's data requirements using conceptual modeling and design database schemas based on the conceptual model.
- Formulate solutions to a broad range of query problems using relational algebra/SQL.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Run transactions and estimate the procedures for controlling the consequences of concurrent data access.
- Explain basic database storage structures, access techniques and query processing.
- Describe distributed, semi-structured and unstructured database systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.
2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2017.
3. DavidLoshin,"Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools,Techniques,NoSQL,andGraph",Morgan Kaufmann/El Sevier Publishers,2013.
REFERENCES:
1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, ―Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015. 3. G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design, Implementation and Management", Ninth Edition, Cengage Learning, 2011.

HV1401A UNIVERSAL HUMAN VALUES L T P C
2 1 0 3

Universal Human Values: Understanding Harmony

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

COURSE TOPICS:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

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

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

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space
21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TOTAL: 45 PERIODS

READINGS:

Text Book
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,Excel Books, New Delhi, 2010

Reference Books
1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

IT1402A DATABASE MANAGEMENT SYSTEMS LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:
- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a frontend tool for GUI based application development

EXPERIMENTS:
1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins Views, Sequences, Synonyms

3. Database Programming: Implicit and Explicit Cursors
4. Procedures and Functions
5. Triggers
6. Exception Handling
7. Database Design using ER modeling, normalization and Implementation for any application
8. Create Document, column and graph based data using NOSQL database tools.
9. Develop a simple GUI based database application

COURSE OUTCOMES:

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

- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views
- Critically analyze the use of Tables, Views, Functions and Procedures
- Implement a GUI application that require a Front-end and Back end Tool
- Create and manipulate data using NOSQL database.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
HARDWARE: Standalone desktops 30 Nos.

(or)
Server supporting 30 terminals or more
SOFTWARE:
Front end: VB/VC ++/JAVA or Equivalent Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

HS1401A EMPLOYABILITY AND SOFT SKILLS LAB L T P C
0 0 2 1

COURSE OBJECTIVES:

• Strengthen the Employability skills of students and develop their personality towards placement and career advancement.
• Improve the listening, speaking, reading and writing skills for comprehending and responding in academic, general and professional contexts.
• Develop students' critical thinking skills.
• Provide more opportunities to develop their project and proposal writing skills.
• Enrich the Soft Skills of the students to interact with others harmoniously.

UNIT I SOFT SKILLS 6

Soft Skills- Interpersonal Skills - Professionalism- Courtesy-Manners - Workplace Etiquette- Business Etiquette-Flexibility- Positive Attitude- Responsibility-Teamwork- Time Management.

UNIT II EMPLOYABILITY SKILLS 6

Communication- Oral Presentation Practice - Writing Skill Development- Presentation Skills -Listening Practice– Listening to Longer Technical Talks And Completing Exercises Based On Them- Enhancing Elements of Effective Communication- Motivation and Initiative- Leadership- Reliability/Dependability/Adaptability- Patience- Problem-Solving- Negotiation

and Persuasion.

UNIT III WRITING 6

Writing-Plan before writing-Develop a paragraph: Topic sentence, Supporting Sentences, Concluding sentence- Coherence Markers-Writing Narrative, Descriptive, Expository, and Persuasive Paragraphs.

UNIT IV READING 6

Reading- Reading different Genres -Collection and Organization of Ideas- Review of Books/ Newspaper Articles, Reading General and Technical Passages Writing: Email, Resume, Job Application, Technical Articles, Projects and Proposals.

UNIT V VERBAL APTITUDE & LOGICAL REASONING 6

Aptitude- Verbal Analogy- Error Spotting, Sentence Completion for Preparation for Higher Studies and Placement- Logical Reasoning- Critical Reading and Thinking- Understanding How The Text Positions The Reader- Writing- Statement of Purpose- Letter of Recommendation- Vision Statement.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to

- Write for different purposes in general and technical context.
- Write formal job applications.
- Excel in Verbal aptitude, read and evaluate texts logically to solve the puzzles.
- Develop and demonstrate the employability and soft skills.
- Display critical thinking in various professional contexts.

TEXTBOOK:

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press:
Oxford, 2011
2. Debra Daise, Charl Norloff, and Paul Carne Reading and Writing (Level 4) Oxford University
Press: Oxford, 2011

SOFTWARE: Globearena (English Language Lab & Career Lab Software)

REFERENCES:

1. Davis, Jason and Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press:
Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black
swan: Hyderabad, 2012
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004

SEMESTER V

AM1501A DATA COMMUNICATION AND COMPUTER NETWORK L T P C

3 0 2 4

COURSE OBJECTIVES:

The objective of this course is to enable the students to
• Understand the division of network functionalities into layers
• Be familiar with the components required to build distinct types of networks
• Understand the required functionality at each layer
• Develop network applications

UNIT I INTRODUCTION TO NETWORKS 8

Network Introduction: Evolution of Computer Networks, Classification of computer Networks LAN, WAN, MAN, Network Topology: BUS, STAR, RING, MESH, OSI Layered Architecture, TCP/IP architecture

UNIT II PHYSICAL LAYER AND MEDIA ACCESS 10

Basic Communication: Modulation, Sampling, Quantization - ADC – DAC – Transmission media: Wired and Wireless, Medium Access Control Techniques: Random, Round Robin, Reservation: ALOHA Pure and Slotted, CSMA/CD-CSMA/CA- Ethernet-Token Ring-Token Bus-ARQ 3 Types, Data Link Layer design issues:**Framing**, Error Detection Codes, Parity Check, Checksum Error Correction Codes, Hamming codes, IEEE Standards: Bluetooth (802.15).

UNIT III NETWORK LAYER AND INTERNETWORKING 9

Network Devices: Router, Switch, HUB, Bridge, Routing: Static Routing, Introduction to dynamic routing, RIP v1 and RIP v2- OSPF-DSDV. Routing protocols: Shortest path, Flooding, Distance vector and Link state routing; Basic Internetworking: IP - CIDR - ARP - DHCP – ICMP; Network Address Translation (NAT)

UNIT IV TRANSPORT LAYER AND SOCKET PROGRAMMING 9

Overview of Transport layer: UDP - Reliable byte stream (TCP), Connection management: Flow control – Retransmission – TCP Congestion control, Congestion avoidance: DECbit – RED – Socket Programming: TCP, UDP.

UNIT V APPLICATION LAYER 9

Traditional applications – electronic mails (SMTP, POP3, IMAP, MIME)– HTTP – File transfer protocol – SSH – DNS – SNMP – Introduction to network security.

LABORATORY/ PRACTICALS:
1. Write a program for using TCP and UDP Sockets.
2. Write a simulation of sliding window protocols.
3. Write a simulation of Routing Protocols.
4. Configure given network topologies using any network simulator software.
5. Write a programs for error detecting codes.
6. Write a program for Client Server Communication.

TOTAL PERIODS:75

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

1. Identify the components required to build different types of networks.
2. Choose the required functionality at each layer for given application.
3. Identify solution for each functionality at each layer.
4. Ability to trace and interpret information flow in the network
5. Understand the functionalities of network application services

TEXTBOOKS:

1. Behrouz A Forouzan, "Data Communication and Networking", Fifth Edition, The McGraw Hills, 2013.

REFERENCES:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks – A systems Approach", Fifth Edition, Morgan Kaufmann, 2011.
2. James F Kurose, Keith W Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", 6th Edition, Pearson Education, 2013.
3. William Stallings, "Data and Computer Communication", 10th Edition, Pearson, 2014.
4. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", Fifth Edition, Pearson, 2013.
5. Nader F Mir, "Computer and Communication Networks", 2nd Edition, Prentice Hall, 2014.
6. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open-Source Approach", McGraw Hill Publisher, 2011.

AM1502A AUTOMATA AND COMPILER DESIGN **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

UNIT - I FINITE AUTOMATA **9**

Introduction: Basic Mathematical Notation and techniques - Finite State Systems - Basic Definitions, Finite Automaton: DFA – NDFA – with ε-moves, Regular Languages: Regular Expression Equivalence of NFA and DFA – Equivalence of finite Automaton and regular expressions – Minimization of DFA –pumping lemma.

UNIT - II GRAMMARS **9**

Grammar Introduction: Types of Grammar, Context Free Grammars and Languages, Derivations, Simplification of CFG: Elimination of Useless Symbols Simplification of CFG:

Unit productions, Null productions, Chomsky normal form, Greibach Normal form – Pushdown Automata-phases of a compiler – lexical analysis

UNIT - III LEXICAL AND SYNTAX ANALYSIS 9

Need and Role of the Parser –Top-Down parsing: Recursive Descent Parsing – Predictive Parsing - Bottom- up parsing: Shift Reduce Parsing, Operator Precedence Parsing, LR Parsers: Canonical LR Parser – LALR Parser - Error Handling and Recovery.

UNIT - IV CODE GENERATION AND TURING MACHINES 9

Intermediate Code Generation: Syntax Directed Definitions, Syntax Directed Translation Schemes – Three address code - Translation of Expressions- Code Generation: Issues in Design of a Code Generator, A Simple Code Generator Algorithm. Turing Machines: Introduction - Instantaneous descriptions, Turing Machine as Acceptors - Turing Machine for computing functions (Transducer) - Turing Machine Constructions

UNIT - V UNDECIDABILITY 9

Undecidability: Basic definitions – Decidable Problems – Examples of undecidable problems – Semi- decidability – Rice's Theorem, problems about Turing Machine – Post's Correspondence Problem – Properties of Recursive and Recursively enumerable languages.

TOTAL PERIODS:45

COURSE OUTCOMES

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

- Construct automata, regular expression for any pattern.
- Write Context free grammar for any construct.
- Build the different Phases of compiler and apply the various optimization techniques.
- Design Turing machine for a given language
- Explain decidability, semi-decidability, and undecidability

TEXT BOOKS:

1. John E Hopcroft and Jeffery D Ullman, Introduction to Automata Theory, Languages and Computations, Narosa Publishing House, 2002.
2. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, Compilers – Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS:

1. Michael Sipser, "Introduction of the Theory of Computation", Second Edition, Thomson Brokecole, 2006.
2. J. Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw Hill, 2003.
3. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010. 4. Muneeswaran. K, ―Compiler Design, Oxford University Press, 2012.

AM1503A OBJECT ORIENTED SOFTWARE ENGINEERING L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand Software Engineering Lifecycle Models
- To Perform software requirements analysis
- To gain knowledge of the System Analysis and Design concepts using UML.
- To understand software testing and maintenance approaches
- To work on project management scheduling using DevOps

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process -Extreme programming-XP Process- Case Study.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram- CASE TOOLS.

UNIT III SOFTWARE DESIGN 9

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design-Case Study.

UNIT IV SOFTWARE TESTING AND MAINTENANCE 9

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking- Case Study

UNIT V PROJECT MANAGEMENT 9

Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Overall Architecture Building and Testing-Deployment- Tools- Case Study

COURSE OUTCOMES:

CO1: Compare various Software Development Lifecycle Models
CO2: Evaluate project management approaches as well as cost and schedule estimation strategies.
CO3: Perform formal analysis on specifications.
CO4: Use UML diagrams for analysis and design.
CO5: Architect and design using architectural styles and design patterns, and test the system

45 PERIODS

PRACTICAL EXERCISES:30 PERIODS

LIST OF EXPERIMENTS:

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the usecase diagram
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios.

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank
3. Exam registration
4. Stock maintenance system.
5. Online course reservation system
6. Airline/Railway reservation system
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference management system
13. BPO management system
14. Library management system
15. Student information system

TOTAL:75
PERIODS TEXT
BOOKS

1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009.
2. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.

REFERENCES

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
3. Len Bass, Ingo Weber and Liming Zhu, ―DevOps: A Software Architect's Perspective‖, Pearson Education, 2016
4. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.
5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw-Hill, 2010.

AM 1504A FUNDAMENTALS OF MACHINE LEARNING L T P C
3 0 2 4

COURSE OBJECTIVES:

- To discuss the basics of Machine Learning and Supervised Algorithms.
- To understand the various classification algorithms.
- To study dimensionality reduction techniques.
- To elaborate on unsupervised learning techniques.
- To discuss various Graphical models and understand the basics of reinforcement learning.

UNIT I INTRODUCTION OF MACHINE LEARNING 8

What Is Machine Learning-The world of Machine Learning- How Do We Define Learning?- How Do We Evaluate Our Networks?- How Do We Learn Our Network?- What are datasets and how to handle them?- Feature sets- Dataset division: test, train and validation sets, cross validation- Applications of Machine Learning- Processes involved in Machine Learning- Types of Machine Learning-Real life examples of Machine Learning- Introduction to popular machine learning libraries and tools (e.g., scikit-learn, TensorFlow, PyTorch)

UNIT II SUPERVISED LEARNING 11

Introduction to Regression - Association between variables - Regression Techniques - Linear Regression - Relation between two variables – Steps – Evaluation – Logistic Regression – Decision Tree – Algorithms – Construction – Classification using Decision Tree – Issues – Rule-based Classification – Pruning the Rule Set – Support Vector Machines – Linear SVM – Optimal Hyperplane – Radial Basis Functions – Naïve Bayes Classifier – Bayesian Belief Networks.

UNIT III UNSUPERVISED LEARNING 9

Introduction to Unsupervised Learning - Types of Unsupervised Learning - Clustering – Types – Applications - Partitioning Methods – K-means Algorithm – K Medoids – Hierarchical methods – Density based methods DBSCAN – Finding patterns using Association Rules – Hidden Markov Model.

UNIT IV REINFORCEMENT LEARNING 9

Reinforcement Learning – Elements – Uses – Model based Learning – Temporal Difference Learning - Values: Q-Learning and Sarsa Algorithm – Generalization - Partially Observable States Example: The Tiger Problem, Getting Lost Problem - Markov Decision Processes - Back on Holiday: Using Reinforcement Learning

UNIT V NEURAL NETWORKS 9

Biological Neuron – Artificial Neuron – Types of Activation function – Implementations of ANN Architectures of Neural Networks – Learning Process in ANN – Back propagation – Deep Learning-Representation Learning – Active Learning – Instance based Learning – Association Rule Learning-Ensemble Learning Algorithm – Regularization Algorithm.

COURSE OUTCOMES:

CO1. Explain the basic concepts of machine learning.
CO2. Construct supervised learning models.
CO3. Construct unsupervised learning algorithms.
CO4. Analyse the various Reinforcement algorithms
CO5. Evaluate and compare different models.

TOTAL:45 PERIODS

TEXTBOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

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 Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing 3rd Edition, 2019.

AM1505A FUNDAMENTALS OF MACHINE LEARNING LABORATORY L T P C

0 0 4 2

LIST OF EXPERIMENTS

1. Implement the concept of decision trees with suitable data set from real world problem and classifythe data set to produce new sample.
2. Detecting Spam mails using Support vector machine.
3. Write a python program to implement the linear regression algorithm.
4. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points.Select appropriate data set for your experiment and draw graphs.
5. Write a python program to implement the optimal centroid locations using K Means Algorithm.
6. Write a program to implement the principal component analysis algorithm.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Write a python program to implement the random forest algorithm.
9. Write a python program to implement the logistic regression algorithm.
10. Write a python program to implement the k – means clustering algorithm.

TOTAL:45 PERIODS

COURSE OUTCOMES:

- Understand the implementation procedures for the machine learning algorithms.
- Design Python programs for various Learning algorithms.
- Apply appropriate Machine Learning algorithms to data sets
- Identify and apply Machine Learning algorithms to solve real world

problems. SOFTWARE: Python/Java with ML Package/R

HARDWARE: 50 terminals.

SEMESTER VI

AM1601A	**CLOUD AND BIG DATA ANALYTICS**	**L T P C**
		3 0 0 3

COURSE OBJECTIVES:

- To understand cloud computing and its systematic knowledge of the fundamental technologies, architecture and security.
- To expose frontier areas of Cloud Computing while providing sufficient foundations to enable further study and research.
- To study the basic technologies that constructs the foundations of Big Data.
- To examine the programming aspects of cloud computing with a view to rapid prototyping of complex applications.
- To work with map reduce applications

UNIT I CLOUD COMPUTING 9

Cloud origins and influences- Cloud characteristics- Cloud delivery models (IAAS, PAAS, SAAS)- Cloud deployment models- Cloud computing architecture- Cloud computing platforms (AWS, Azure, Google cloud)- Demonstrations

UNIT II CLOUD ENABLED TECHNOLOGIES 9

Data centre technology- Virtualization technology- Web technology- Multitenant technology- Service technology- Cloud Infrastructure mechanisms: Network perimeter- Virtual server- Cloud storage device- Cloud usage monitor- Resource replication

UNIT III CLOUD ARCHITECTURES 9

Workload distribution architecture- Resource pooling architecture- Dynamic scalability architecture- Elastic resource capacity architecture- Service load balancing architecture- Cloud bursting architecture- Elastic dark provisioning architecture- Redundant storage architecture- Cloud operation: Migration, Static and dynamic scheduling

UNIT IV UNDERSTANDING BIG DATA AND HADOOP 9

Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – - open source technologies – cloud and big data-mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics- introduction to Hadoop –Hadoop pipes – design of Hadoop distributed file system (HDFS)

UNIT V MAP REDUCE APPLICATIONS 9

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

COURSE OUTCOMES:

CO1.Understand the key technologies, strengths and limitations of cloud computing.
CO2.Identify problems and explain, analyse, evaluate various cloud computing solutions.
CO3.Understand the architecture and infrastructure of cloud computing.
CO3.Describe big data and use cases from selected business domains.
CO4.Perform map-reduce analytics using Hadoop.

TEXT BOOKS:

1. Mohammed Guller, "Big Data Analytics with Spark", 1st Edition, Apress,2019.
2. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.

REFERENCES:

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, "Cloud Computing: Concepts, Technology, Architecture", 1st Edition, PHI Publications, 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011. 3. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2

AM1602A CRYPTOGRAPHY AND CYBER SECURITY LT P C
3 0 0 3

UNIT I INTRODUCTION TO SECURITY 9

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

UNIT II SYMMETRIC CIPHERS 9

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

UNIT III ASYMMETRIC CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing Factorization – Euler's totient function, Fermat's and Euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange
-– Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT IV INTEGRITY AND AUTHENTICATION ALGORITHMS 9

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

UNIT V CYBER CRIMES AND CYBER SECURITY 9

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods –Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security

Text Books:

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

Reference Books:

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

AM1603A EMBEDDED SYSTEMS AND IOT L T P C

3 0 2 4

COURSE OBJECTIVES:

- To learn the internal architecture and programming of an embedded processor.
- To introduce interfacing I/O devices to the processor.
- To introduce the evolution of the Internet of Things (IoT).
- To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ openplatform.
- To apply the concept of Internet of Things in real world scenario.

UNIT I 8-BIT EMBEDDED PROCESSOR 9

8- Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

UNIT II EMBEDDED C PROGRAMMING 9

Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need for RTOS –Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNIT III IOT AND ARDUINO PROGRAMMING 9

Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators withArduino.

UNIT IV IOT COMMUNICATION AND OPEN PLATFORMS 9

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming –Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

UNIT V APPLICATIONS DEVELOPMENT 9

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation –Smart Agriculture – Smart Cities – Smart Healthcare.

45

PERIODS PRACTICAL EXERCISES:30 PERIODS

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Write Basic and arithmetic Programs Using Embedded C.
5. Introduction to Arduino platform and programming
6. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth)
7. Introduction to Raspberry PI platform and python programming
8. Interfacing sensors with Raspberry PI
9. Communicate between Arduino and Raspberry PI using any wireless medium
10. Setup a cloud platform to log the data
11. Log Data using Raspberry PI and upload to the cloud platform
12. Design an IOT based system

OUTCOMES:

CO1: Explain the architecture of embedded processors.
CO2: Write embedded C programs.
CO3: Design simple embedded applications.
CO4: Compare the communication models in IOT
CO5: Design IoT applications using Arduino/Raspberry Pi /open platform.

TOTAL:75 PERIODS

TEXTBOOKS

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontrollerand Embedded Systems", Pearson Education, Second Edition, 2014
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoTFundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.

REFERENCES

Michael J. Pont, "Embedded C", Pearson Education, 2007.
Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
Andrew N Sloss, D. Symes, C. Wright, "Arm System Developer's Guide", Morgan Kauffman/Elsevier, 2006.
Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", UniversitiesPress, 2015

AM1604A IMAGE PROCESSING AND COMPUTER VISION L T P C
3 0 2 4

COURSE OBJECTIVES

- Learn about the different techniques used for feature extraction
- Learn about the different techniques used for image segmentation.
- Know about the depth estimation and 3-D reconstruction.
- Study about the different deep learning model patterns and networks used in computer vision.

UNIT I IMAGE PROCESSING FOUNDATIONS 8

Image processing techniques - classical filtering operations - thresholding techniques - edge detection techniques - corner and interest point detection - mathematical morphology - texture.

UNIT II IMAGE FORMATION AND PROCESSING 10

Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine and Projective. Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT III FEATURE EXTRACTION 10

Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT IV IMAGE SEGMENTATION 7

Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

UNIT V PATTERN ANALYSIS 10

Clustering: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

TOTAL PERIODS : 45

LABORATORY COMPONENT: LIST OF EXPERIMENTS:

1. Implementation of Edge detection algorithms.
2. Implementation of image segmentation algorithms.
3. Implementation of feature extraction techniques.
4. Implementation of object detection.
5. Implementation of object recognition using different deep learning models.
6. Implementation of Activity recognition.

PRACTICAL: 30 HOURS TOTAL: 60
HOURS

TEXT BOOKS: 1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

COURSE OUTCOMES

CO1 : Understand the major concepts and techniques in computer vision and image processing.
CO2 : Demonstrate computer vision and image processing knowledge by designing and implementing algorithms to solve practical problem.
CO3: Apply the different techniques used for image segmentation.
CO4 : Gain knowledge in segmenting the image and perform Patten analysis.

TEXTBOOKS

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.

REFERENCES

1. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
2. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

AM1605A CLOUD AND BIG DATA ANALYTICS LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To learn the fundamentals of Cloud Computing and designing Private Cloud and Public Cloud Environment.
- To learn the basic ideas and principles of Virtualization Technology.
- To learn the dynamic programming models for Cloud.
- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data

LIST OF EXPERIMENTS :

1. Virtualization a. Find procedure to run the virtual machine of different configuration using virt-manager. 2. Public Cloud
a. Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix/GCC and launch it.
b. Test how a SaaS applications scales in response to demand. c. Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.
3. Private Cloud
a. Setup a Private Cloud by performing the procedure using a Single node Openstack/Opennebula implementation.
b. Perform Creation, Management and Termination of a CentOS instance in Openstack/Opennebula.
c. Show the virtual machine migration based on certain conditions from one node to the other.
4. Apply and explore various plotting functions on UCI data sets.
5. Hadoop, MapReduce, HDFS, Hive:
   a. Install and configure Hadoop in single node cluster.
   b. Performing a MapReduce Job for word search count.

COURSE OUTCOMES:

- On completion of this course, the students will be able to:
- The strength of virtualization and outline its role in enabling the cloud computing system mode
- Demonstrate the cloud, its characteristics, various delivery and deployment models.
- Install analytical tools and configure distributed file system
- Gain the knowledge in developing and executing analytical procedures in various distributed frameworks and databases.
- Develop, implement and deploy simple application on very large datasets.

LIST OF EQUIPMENT OF A BATCH OF 30 STUDENTS:
SOFTWARE: Windows OS, VMWareworkstation, CentOS, OpenNebula, C, java
HARDWARE: 30 Terminal

SEMESTER VII

AM1701A OPTIMIZATION TECHNIQUES FOR MACHINE LEARNING L T P C
3 0 0 3

OBJECTIVES:
The objective of this course is to enable the students

- Apply basic concepts of mathematics to formulate an optimization problem
- To find the optimal solution of an optimization problem.
- To understand the importance of optimization for a defined process management.
- Analyse the of performance measures for various optimization problems
- To graphically display interdependent relationships between groups' steps and tasks as they all impact a project.

UNIT I FORMATION OF OPTIMIZATION PROBLEMS 9

Introduction – formulation of linear programming model-Linear Programming Applications Classification of Non-Linear programming- Objective function; Constraints and Constraint surface; Formulation of design problems mathematical programming problems, Classification of optimization problem.

UNIT II CONSTRAINED AND UNCONSTRAINED OPTIMIZATION 9

Constrained Optimization: Lagrange theorem - Unconstrained optimization: Conjugate direction and Quasi-Newton methods - Gradient-based methods, One-dimensional search methods.

UNIT III DYNAMIC PROGRAMMING 9

Sequential optimization- Representation of multistage decision process- Types of multistage decision problems - Concept of sub optimization and the principle of optimality.

UNIT IV MODERN METHODS OF OPTIMIZATION 9

Simulated Annealing, Particle Swarm Optimization, Ant Colony Optimization, Multi-level optimization Evolutionary algorithms for optimization.

UNIT V PRACTICAL ASPECTS OF OPTIMIZATION 9

Genetic Algorithms, Optimization of Fuzzy Systems, Multi-objective Optimization.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1. Explain efficient computational procedures to solve optimization problems.

CO2. Apply engineering minima/maxima problems into optimization framework.

CO3. Apply the concept of Dynamic programming and its applications to project implementation.

CO4. Formulate optimization problems for bio inspired algorithm.

TEXT BOOKS:

1. Edwin P K Chong, Stainslaw Zak, An introduction to Optimization, Wiley Inter Science Publication, Second Edition, 2001

REFERENCES:

1. Dimitri Bertsekas, "Nonlinear Programming" Athena Scientific, Second Edition, 1999.
2. Dimitri Bertsekas, "Introduction to linear optimization" Athena Scientific, Second Edition, 1997.
3. Philip E Gill, “Practical optimization”, Emerald Group Publishing Limited, 1982.
4. Ravindran A and Reklaits G V, “Engineering optimization methods and applications”, Second Edition, Wiley, 2006.

Daniel N Wilke and Jan Snyman, “Practical Mathematical Optimization: Basic

Optimization Theory and Gradient-Based Algorithms”, Second Edition, Springer, 2018

AM1702A ESSENTIALS OF DEEP LEARNING L T P C

3 0 0 3

COURSE OBJECTIVES:

- To introduce the fundamentals of deep learning and the main research activities in this field.
- To learn architectures and optimization methods for deep neural network training.
- To learn Master Autoencoders and Regularization Methods.
- To explore Advanced Deep Learning Models.
- To apply Deep Learning to Real-World Applications.

UNIT I INTRODUCTION 9

History of Deep Learning, McCulloch Pitts Neuron, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feed Forward Neural Networks, Back propagation.

UNIT II ACTIVATION FUNCTIONS AND PARAMETERS 9

Gradient Descent (GD)- Momentum Based GD-Nesterov Accelerated GD-Stochastic GD Principal Component Analysis and its interpretations-Singular Value Decomposition Parameters v/s Hyper-parameters.

UNIT III AUTO-ENCODERS & REGULARIZATION 9

Auto encoders and relation to PCA, Regularization in auto encoders, Denoising auto encoders Sparse auto encoders-Regularization: Bias Variance Tradeoff- L2 regularization-Early stopping, Dataset augmentation- Encoder Decoder Models- Attention Mechanism- Attention over images- Batch Normalization.

UNIT IV DEEP LEARNING MODELS 9

Introduction to CNNs, Architecture, Convolution/pooling layers, CNN Applications-LeNet, AlexNet-ZF-Net-VGGNet-GoogLeNet-ResNet. Introduction to RNNs- Back propagation through time (BPTT)-Vanishing and Exploding Gradients-Truncated BPTT- GRU- LSTMs, Generative Adversarial Network (GAN).

UNIT V DEEP LEARNING APPLICATIONS 9

CNNs for Recognition, Verification, Detection, Segmentation: CNNs for Recognition and Verification (Siamese Networks, Triplet Loss, Contrastive Loss, Ranking Loss); CNNs for Detection: Background of Object Detection, R-CNN, Fast R-CNN. CNNs for Segmentation: FCN, SegNet. Recurrent Neural Networks (RNNs): Review of RNNs; CNN + RNN Models for Video Understanding: Spatio-temporal Models, Action/Activity Recognition

THEORY: 45 HOURS

COURSE OUTCOMES:

After completion of course, students would be able to:
CO1: Understand the fundamentals of deep learning and the main research activities in this field
CO2: Remember architectures and optimization methods for deep neural network training
CO3: Implement, apply and test relevant learning algorithms in TensorFlow
CO4: Critically evaluate the method's applicability in new contexts and construct new applications .
CO5: Competence in Applying Deep Learning to Real-World Problems.

TEXT BOOKS / SUGGESTED REFERENCES:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville. Deep Learning, the MIT press,2016Bengio, Yoshua.
2. " Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1, Now Publishers, 2009
3. Deep Learning, Rajiv Chopra, Khanna Book Publishing, Delhi 2020.
4. https://nptel.ac.in/courses/106/106/106106184/
5. https://www.coursera.org/specializations/deep-learning

AM1703A NATURAL LANGUAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:
The primary objective of this course is to make the student
• To understand the language models
• To analyze semantic embeddings
• To understand sequence labelling and word senses
• To implement different parsing techniques
• To understand logical representations of text

UNIT I OVERVIEW ANDLANGUAGEMODELING 9

Origins and challenges of NLP – Knowledge in Language Processing – NLP tasks – NLP Applications – Regular expressions, text normalization, edit distance – tokenization – stemmer – Language Modeling: Language and Grammar – Grammar-based Language Models – Statistical Language Models – N-gram Models, Smoothing Techniques

UNIT II SEMANTIC EMBEDDINGS 9

Semantic Analysis: Meaning Structure of Language, Slot-filler Representation, Lexical Semantics – Vector semantics – words and vectors – similarity measures – TF-IDF and PMI – word2vec – visualizing embeddings – analysis of embeddings.

UNIT III SEQUENCE LABELLING AND WORD SENSES 9

Word classes – PoS tagging – named entities – named entities tagging – HMM-based PoS tagging – conditional random fields (CRF) – evaluation of NER – word senses – wordnet – word sense disambiguation – improved embeddings – word sense induction

UNIT IV PARSING TECHNIQUES 9

Constituency grammars – context-free grammars – Tree banks– normal forms – lexicalized grammars –constituency parsing – ambiguity – CKY parsing – span-based neural constituency parsing – evaluating parsers – CCG parsing – dependency parsing – dependency relations and formalisms – dependency treebanks – transition-based dependency parsing – graph-based dependency parsing.

UNIT V LOGICAL REPRESENTATIONS AND SEMANTIC ROLE LABELLING 9

Computational Desiderata for Representations – model-theoretic semantics – first-order logic – event and state representations – description logics – Semantic roles – diathesis alternations – problems with thematic roles – proposition bank – frame net – SRL task – selectional restrictions – decomposition of predicates

THEORY: 45 HOURS

COURSE OUTCOMES:

After completing this course, students should be able to

1. Apply language models for NLP tasks
2. Understand word embeddings for NLP tasks
3. Apply basic NLP tasks such as PoS tagging, named entity recognition, and word sense disambiguation
4. Implement different parsing techniques for natural languages
5. Build logical representations for text.

TEXT BOOK:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022.

REFERENCES:

1. Christopher D. Manning and HinrichSchutze, Foundations of Statistical Natural Language Processing, MIT Press,1999.
2. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second Edition, CRC Press,2010.
3. Tanveer Siddiqui and Tiwary U S, Natural Language Processing and Information Retrieval, OxfordUniversity Press,2008.

4. NLTK – Natural Language Tool Kit -http://www.nltk.org/
5. Steven Bird, Ewan Klein, and Edward Loper, "Natural language processing with Python", O'RREILLY.

AM1704A DEEP LEARNING LABORATORY **L T P C**
0 0 4 2

COURSE OBJECTIVES:

1. To learn Deep Learning Frameworks (TensorFlow/Keras).
2. To implement Convolutional Neural Networks (CNNs)
3. To explore Recurrent Neural Networks (RNNs)
4. To apply Transfer Learning and Pre-trained Models
5. To enhance Model Performance through Hyperparameter Tuning

LIST OF EXPERIMENTS:

1. a) Implement simple vector addition in TensorFlow
b) Implement a regression model in Keras.
2. Implementation of following deep learning algorithms in Python using Tensor Flow: Convolution Neural Network
3. Implementation of following deep learning algorithms in Python using Tensor Flow: Recurrent Neural Network
4. CNN for Image classification and Segmentation
5. RNN for video processing
6. Implement a perceptron in TensorFlow/Keras Environment.
7. Implement a Feed-Forward Network in TensorFlow/Keras.
8. Improve the Deep learning model by fine tuning hyper parameters.
9. Implement a Transfer Learning concept in Image Classification.
10. Using a pre trained model on Keras for Transfer Learning
11. Implement an LSTM based Autoencoder in TensorFlow/Keras.
12. Image generation using GAN.

COURSE OUTCOMES:

After completing this course, students should be able to

1. Practical Knowledge of Deep Learning Libraries.
2. Skill in Building CNNs and RNNs**.**
3. Expertise in Transfer Learning.
4. Hyperparameter Optimization Expertise.
5. Hands-on Experience in Advanced Deep Learning Techniques.

LIST OF EQUIPMENT OF A BATCH OF 30 STUDENTS:
SOFTWARE: Windows OS, VMWareworkstation, CentOS, OpenNebula, C, java
HARDWARE: 30 Terminal

PROFESSIONAL ELECTIVE – I
SEMESTER-V

COURSE CODE	COURSE TITLE	L	T	P	C
PE1501A	INTRODUCTION TO AR/VR/MR/XR	3	0	0	3

OBJECTIVES:

- To understand the concept of virtual reality and augmented reality
- To study visual computation in virtual reality
- To provide an opportunity to explore the research issues in Augmented Reality and Virtual Reality (AR &VR).
- To know the basic concepts and framework of virtual reality.

UNIT I INTRODUCTION OF VIRTUAL REALITY 9

Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality. Multiple Models of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices.

UNIT II VISUAL COMPUTATION IN VIRTUAL REALITY 9

Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering. Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp.

UNIT III DEVELOPMENT TOOLS AND FRAMEWORKS IN VIRTUAL REALITY9

Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools

UNIT IV APPLICATION OF VR IN DIGITAL ENTERTAINMENT 9

VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

UNIT V AUGMENTED AND MIXED REALITY 9

Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems. 4.

TOTAL: 45 HOURS

TEXTBOOK:

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Alan B. Crai`g, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

REFERENCES:

1. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.

COURSE OUTCOMES:

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

1. Describe the concept of virtual reality and augmented reality.
2. Have an idea of VR and AR tools
3. Apply VR and AR concepts in real world applications.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1502A	DIGITAL MARKETING	2	0	2	3

COURSE OBJECTIVES:

- The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
- It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

UNIT I INTRODUCTION TO ONLINE MARKET 6

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNIT II SEARCH ENGINE OPTIMISATION 6

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement

UNIT III E- MAIL MARKETING 6

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting

UNIT IV SOCIAL MEDIA MARKETING 6

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT V DIGITAL TRANSFORMATION 6

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Subscribe to a weekly/quarterly newsletter and analyze how its content and structure aid with the branding of the company and how it aids its potential customer segments.
2. Perform keyword search for a skincare hospital website based on search volume and competition using Google keyword planner tool.
3. Demonstrate how to use the Google WebMasters Indexing API
4. Discuss an interesting case study regarding how an insurance company manages leads.
5. Discuss negative and positive impacts and ethical implications of using social media for political advertising.
6. Discuss how Predictive analytics is impacting marketing automation

COURSE OUTCOMES:

CO1: To examine and explore the role and importance of digital marketing in today's rapidly changing business environment..
CO2: To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.
CO3: To know the key elements of a digital marketing strategy.
CO4: To study how the effectiveness of a digital marketing campaign can be measured
CO5: To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

TOTAL:60 PERIODS

TEXT BOOKS

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education;
2. First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
3. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449
4. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
5. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
6. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.
7. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

COURSE CODE	COURSE TITLE	L	T	P	C
PE1503A	HUMAN COMPUTER INTERACTION	2	0	2	3

COURSE Objectives:

- Learn the foundations of Human Computer Interaction.
- Be familiar with the design technologies and software process.
- Learn human interaction models and theories
- Be aware of Design thinking concepts.
- Learn the guidelines of design thinking and apply it.

UNIT-I FOUNDATIONS OF HCI 6

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – Processing and networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity – Paradigms.

UNIT-II DESIGN & SOFTWARE PROCESS 6

Interactive Design basics – Process – Scenarios – Navigation – Screen design – Iteration and prototyping. HCI in software process – Software life cycle – Usability engineering – Prototyping in practice – Design rationale - Design rules – Principles, Standards, Guidelines, Rules – Universal Design.

UNIT-III MODELS AND THEORIES **6**

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models - Task Analysis.

UNIT-IV MOBILE HCI **6**

Mobile Ecosystem: Platforms–Application frameworks– Types of Mobile Applications: Widgets– Applications– Games– Mobile Information Architecture–Mobile 2.0.

UNIT-V WEB INTERFACE DESIGN **6**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages.

Contact Hours : 30

List of Experiments

1 Design a user interface for Welcome screen.
2 Design a user interface by applying design rules for assigning a grade to students based on the subject marks.
3 Design a user interface with Layouts for printing the numbers in ascending order and descending order.
4 Design a user interface by using task analysis for calculator.
5 Design a user interface with direct selection for registration of a student for admissions.
6 Design a user interface by using colours for displaying and changing of picture on the form.
7 Design a user interface with widgets for end semester exam registrations.

8 Design a user interface by using drag and drop for creating forms.
9 Design a user interface with Overlays and Inlays for menu-based program.
10 Mini Project.

Contact Hours : 30

Course Outcomes:

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

- Describe the foundations of Human Computer Interaction.
- Demonstrate with the design technologies and software process.
- Apply the concepts of human interaction models and theories .
- Design effective HCI for individuals and persons with disabilities.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.

Text Book(s):

1 Jeff Johnson, "Designing with the Mind in Mind. Simple Guide to Understanding User Interface Design Guidelines", Morgan Kaufmann, 2014.
2 Brian Fling, "Mobile Design and Development", First Edition, O„Reilly Media Inc., 2009.
3 Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O„Reilly, 2009.

COURSE CODE	COURSE TITLE	L T P C
PE1504A	USER EXPERIENCE DESIGN	3 0 0 3

OBJECTIVES

· To understand the goals and principles of interface design
· To study life cycle models and identify the requirements for interface design
· To learn effective prototypes for construction of user interface design
· To know about user testing
· To use tools to develop UI design for mobile app.

UNIT I FOUNDATIONS OF INTERACTION DESIGN **9**

Interaction design – Good and poor design – Goals of interaction design – Design and usability principles; Conceptual models – Interface metaphors – Interaction paradigms – From conceptual models to physical design.

UNIT II PROCESS AND REQUIREMENTS **9**

Activities of interaction design – Key characteristics of interaction design process – Lifecycle models; Establish requirements – Different kinds of requirements – Data gathering; Data interpretation and analysis – Task description – Task analysis.

UNIT III DESIGN AND CONSTRUCTION **9**

Prototyping and construction – Low-fidelity prototyping – High-fidelity prototyping – Compromises in prototyping – Construction: from design to implementation; Conceptual Design: Moving from requirements to first design – Perspectives for developing a conceptual model – Expanding the conceptual model – Scenarios and prototypes in conceptual design; User- centered approach – Ethnography in design.

UNIT IV EVALUATION AND TESTING **9**

What, why, and when to evaluate – Hutchworld case study; Evaluation paradigms and techniques; User testing – Experiments – Predictive models.

UNIT V MOBILE HCI **9**

Mobile Ecosystem: Platforms – Application frameworks; Types of Mobile Applications: Widgets – Applications – Games; Mobile Information Architecture – Mobile 2.0 – Mobile Design: Elements of Mobile Design– Tools.

TOTAL PERIODS: 45

COURSE OUTCOMES

On successful completion of this course, the student will be able to:

1. Explain the fundamentals of user interaction design (K2)
2. Identify the user requirements and interpret data (K3)
3. Develop an efficient prototype to communicate and model the design definitions. (K3)
4. Apply UX design in a case study. (K3)
5. Examine the customer experience. (K4)

TEXTBOOKS

1. Preece J, Rogers Y, Sharp H, "Interaction design: Beyond Human-Computer Interaction", 4th edition John Wiley & Sons Ltd, 2015. (Unit 1 to 4)
2. Brian Fling, "Mobile Design and Development", 1st Edition , O'Reilly Media Inc, 2009. (Unit 5)

REFERENCES

1. Preece J, Rogers Y, Sharp H, Baniyon D, Holland S and Carey T, "Human Computer Interaction", Addison-Wesley, 1994.
2. B. Shneiderman, "Designing the User Interface", Addison Wesley 2000 (Indian Reprint).
3. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004.
4. Bill Scott and Theresa Neil, "Designing Web Interfaces", 1st Edition, O'Reilly, 2009.

COURSE CODE	COURSE TITLE	L T P C
PE1505A	SOFTWARE TESTING AND AUTOMATION	3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

UNIT I FOUNDATIONS OF SOFTWARE TESTING **6**

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing

UNIT II TEST PLANNING **6**

The Goal of Test Planning, High Level Expectations,Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNIT III **TEST DESIGN AND EXECUTION** **6**

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNIT IV **ADVANCED TESTING CONCEPTS** **6**

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

UNIT V **TEST AUTOMATION AND TOOLS** **6**

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

1. Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in).
2. Design the test cases for testing the e-commerce application
3. Test the e-commerce application and report the defects in it.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and identify the defects.
6. Test the performance of the e-commerce application.
7. Automate the testing of e-commerce applications using Selenium.
8. Integrate TestNG with the above test automation.
9. Mini Project:
   a) Build a data-driven framework using Selenium and TestNG
   b) Build Page object Model using Selenium and TestNG
   c) Build BDD framework with Selenium, TestNG and Cucumber

COURSE OUTCOMES:

CO1: Understand the basic concepts of software testing and the need for software testing

CO2: Design Test planning and different activities involved in test planning

CO3: Design effective test cases that can uncover critical defects in the application

CO4: Carry out advanced types of testing

CO5: Automate the software testing using Selenium and TestNG

TOTAL:60 PERIODS

TEXTBOOKS

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - Second Edition 2018

REFERENCES

1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
3. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
4. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
6. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.
7. Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing.

PROFESSIONAL ELECTIVE – II
SEMESTER-VI

COURSE CODE	COURSE TITLE	L	T	P	C
AM1605A	DATA ENGINEERING AND KNOWLEDGE DISCOVERY	3	0	0	3

COURSE Objectives:

1. Study data warehouse principles and its working
2. Learn Data mining concepts and understand Association Rule Mining
3. Study Classification Algorithms
4. Gain knowledge of how data is grouped using clustering techniques.

UNIT-I FUNDAMENTALS OF DATA ENGINEERING & DATA WAREHOUSE 9

Data engineering: Introduction to data engineering and data types, data storage system. Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse architecture and its components, Extraction-Transformation-Loading, Logical (Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT-II KNOWLEDGE DISCOVERY 9

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration &Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III ASSOCIATION RULES 9

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-IV **CLASSIFICATION** **9**

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics. Prediction: Accuracy and Error measures, evaluating the accuracy of classifier or a predictor, Ensemble methods

UNIT-V **CLUSTERING** **9**

Clustering: Clustering Overview, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Partitioning Clustering-K-Means Algorithm, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

TOTAL - 45

TEXT BOOKS:

1) Data Mining- Concepts and -1.chniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
2) Introduction to Data Mining, Psng-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Educatior.

REFERENCE BOOKS:

1) Data Mining Techniques, Arun KPujari, 3rd Edition, Universities Press.
2) Data Warehousing Fundament's, Pualraj Ponnaiah, Wiley Student Edition.
3) The Data Warehouse Life CycleToolkit — Ralph Kimball, Wiley Student Edition.
4) Data Mining, Vikaram Pudi, P Rddha Krishna, Oxford University Press

Outcomes:

- Explain the functional differences between data warehouse and database systems
- Demonstrate the ability to preprocess data and apply appropriate mining techniques
- Analyze the association rules, classifications, and clusters in large data sets.
- Apply data mining techniques to solve real-world business and scientific problems
- Describe and analyze the roles of process managers and system managers in data workflows

COURSE CODE	COURSE TITLE	L	T	P	C
PE1602A	Neural Networks and Deep Learning	3	0	0	3

COURSE OBJECTIVES:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply autoencoders and generative models for suitable applications.

UNIT II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS **6**

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT III THIRD-GENERATION NEURAL NETWORKS **6**

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT IV DEEP FEEDFORWARD NETWORKS **6**

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT V RECURRENT NEURAL NETWORKS **6**

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

30

TOTAL: 60 PERIODS

LAB EXPERIMENTS:

1. Implement simple vector addition in TensorFlow.
2. Implement a regression model in Keras.
3. Implement a perceptron in TensorFlow/Keras Environment.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Improve the Deep learning model by fine tuning hyper parameters.
7. Implement a Transfer Learning concept in Image Classification.
8. Using a pre trained model on Keras for Transfer Learning
9. Perform Sentiment Analysis using RNN
10. Implement an LSTM based Autoencoder in TensorFlow/Keras.
11. Image generation using GAN

PERIODS

Additional Experiments:

12. Train a Deep learning model to classify a given image using pre trained model
13. Recommendation system from sales data using Deep Learning
14. Implement Object Detection using CNN
15. Implement any simple Reinforcement Algorithm for an NLP problem

COURSE OUTCOMES:

At the end of this course, the students will be able to: CO1: Apply Convolution Neural Network for image processing.

CO2: Understand the basics of associative memory and unsupervised learning networks.

CO3: Apply CNN and its variants for suitable applications.

CO4: Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.

CO5: Apply autoencoders and generative models for suitable applications.

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018.
4. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
6. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017.
7. S Rajasekaran, G A Vijayalakshmi Pai, "Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017.
8. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
9. James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1603A	Recommender Systems	2	0	2	3

COURSE OBJECTIVES:

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system.
- To learn collaborative filtering.

UNIT I INTRODUCTION 6

Introduction and basic taxonomy of recommender systems - Traditional and non- personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

Suggested Activities:

- Practical learning – Implement Data similarity measures.
- External Learning – Singular Value Decomposition (SVD) applications

Suggested Evaluation Methods:

- Quiz on Recommender systems.
- Quiz of python tools available for implementing Recommender systems

UNIT II CONTENT-BASED RECOMMENDATION SYSTEMS 6

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

Suggested Activities:

- Assignment on content-based recommendation systems
- Assignment of learning user profiles

Suggested Evaluation Methods:

- Quiz on similarity-based retrieval.
- Quiz of content-based filtering

UNIT III COLLABORATIVE FILTERING 6

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

Suggested Activities:

- Practical learning – Implement collaborative filtering concepts
- Assignment of security aspects of recommender systems

Suggested Evaluation Methods:

- Quiz on collaborative filtering
- Seminar on security measures of recommender systems

UNIT IV ATTACK-RESISTANT RECOMMENDER SYSTEMS 6

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

Suggested Activities:

- Group Discussion on attacks and their mitigation
- Study of the impact of group attacks
- External Learning – Use of CAPTCHAs

Suggested Evaluation Methods:

- Quiz on attacks on recommender systems
- Seminar on preventing attacks using the CAPTCHAs

UNIT V EVALUATING RECOMMENDER SYSTEMS **6**

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

Suggested Activities:

- Group Discussion on goals of evaluation design
- Study of accuracy metrics

Suggested Evaluation Methods:

- Quiz on evaluation design
- Problems on accuracy measures

30 PERIODS PRACTICAL EXERCISES

30 PERIODS

1. Implement Data similarity measures using Python
2. Implement dimension reduction techniques for recommender systems
3. Implement user profile learning
4. Implement content-based recommendation systems
5. Implement collaborative filter techniques
6. Create an attack for tampering with recommender systems
7. Implement accuracy metrics like Receiver Operated Characteristic curves

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the basic concepts of recommender systems.

CO2: Implement machine-learning and data-mining algorithms in recommender systems data sets.

CO3: Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.

CO4: Design and implement a simple recommender system.

CO5: Learn about advanced topics of recommender systems.

CO6: Learn about advanced topics of recommender systems applications

TEXTBOOKS:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1604A	EXPLORATORY DATA ANALYSIS	2	0	2	3

COURSE OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT I EXPLORATORY DATA ANALYSIS **6**

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.

UNIT II EDA USING PYTHON **6**

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations.

UNIT III UNIVARIATE ANALYSIS **6**

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread

- Scaling and Standardizing – Inequality.

UNIT IV BIVARIATE ANALYSIS **6**

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS **6**

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time- based indexing – Visualizing – Grouping – Resampling.

30 PERIODS

PRACTICAL EXERCISES:

30 PERIODS

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) 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.

COURSE OUTCOMES:

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

CO1: Understand the fundamentals of exploratory data analysis.

CO2: Implement the data visualization using Matplotlib.

CO3: Perform univariate data exploration and analysis. **CO4:** Apply bivariate data exploration and analysis.

CO5: Use Data exploration and visualization techniques for multivariate and time series data.

TOTAL: 60 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", First Edition, O Reilly, 2017. (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)

REFERENCES:

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.
4. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 1st ed, Springer (2011),
5. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1605A	Machine Learning for Data Science	2	0	2	3

Course Objective: The students will be able to derive practical solutions using predictive analytics. They will also understand the importance of various algorithms in Data Science. Detailed Contents:

Module 1: Introduction Algorithms and Machine Learning, Introduction to algorithms, Tools to analyze algorithms, Algorithmic techniques: Divide and Conquer, examples, Randomization, Applications

Module 2: Algorithms Graphs, maps, Map searching, Application of algorithms: stable marriages example, Dictionaries and hashing, search trees, Dynamic programming

Module 3: Application to Personal Genomics Linear Programming, NP completeness, Introduction to personal Genomics, Massive Raw data in Genomics, Data science on Personal Genomes, Interconnectedness on Personal Genomes, Case studies

Module 4: Machine Learning Introduction, Classification, Linear Classification, Ensemble Classifiers, Model Selection, Cross Validation, Holdout

Module 5: Machine Learning Applications Probabilistic modelling, Topic modelling, Probabilistic Inference, Application: prediction of preterm birth, Data description and preparation,
Relationship between machine learning and statistics.

PROFESSIONAL ELECTIVE – III
SEMESTER-VII

PE1701A CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT I INTRODUCTION TO BLOCKCHAIN **7**

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT II BITCOIN AND CRYPTOCURRENCY **6**

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT III BITCOIN CONSENSUS **6**

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW

,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT IV HYPERLEDGER FABRIC & ETHEREUM **5**

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT V BLOCKCHAIN APPLICATIONS **6**

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

COURSE OUTCOMES:

CO1: Understand emerging abstract models for Blockchain Technology

CO2: Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.

CO3: It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

CO4: Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.

30 PERIODS

PRACTICAL PERIODS **30**

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.
2. Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.
3. Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.
4. Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.
5. Use blockchain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.
6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan

TOTAL: 60 PERIODS

TEXT BOOKS

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. 2.Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCES:

1. Daniel Drescher, "Blockchain Basics", First Edition, Apress, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015
4. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain", Packt Publishing
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

COURSE CODE	COURSE TITLE	L T P C
PE1702A	BUSINESS ANALYTICS	2 0 2 3

COURSE OBJECTIVES: • To understand the Analytics Life Cycle. • To comprehend the process of acquiring Business Intelligence • To understand various types of analytics for Business Forecasting • To model the supply chain management for Analytics. • To apply analytics for different functions of a business

UNIT I INTRODUCTION TO BUSINESS ANALYTICS 6

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT II BUSINESS INTELLIGENCE 6

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNIT III BUSINESS FORECASTING 6

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models –Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.

UNIT IV HR & SUPPLY CHAIN ANALYTICS 6

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year.

UNIT V MARKETING & SALES ANALYTICS 6

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.

COURSE CODE	COURSE TITLE	L T P C
PE1703A	IMAGE AND VIDEO ANALYTICS	2 0 2 3

COURSE OBJECTIVES: • To understand the basics of image processing techniques for computer vision. • To learn the techniques used for image pre-processing. • To discuss the various object detection techniques. • To understand the various Object recognition mechanisms. • To elaborate on the video analytics techniques.

UNIT I INTRODUCTION 6

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

UNIT II IMAGE PRE-PROCESSING 6

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multisperalct images - Local pre-processing in the frequency domain - Line detection by local preprocessing operators - Image restoration.

UNIT III OBJECT DETECTION USING MACHINE LEARNING 6

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures

UNIT IV FACE RECOGNITION AND GESTURE RECOGNITION 6

Face Recognition-Introduction-Applications of Face Recognition-Process of Face RecognitionDeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNetGesture Recognition.

UNIT V VIDEO ANALYTICS 6

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problemRestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architectureImprovement in Inception v2-Video analytics-RestNet and Inception v3.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1704A	DATA ANALYTICS & VISUALIZATION	3	0	2	4

OBJECTIVES: ● Understand the challenges and processes in data analytics ● Apply descriptive data analytics and visualization techniques ● Apply inferential data analytics ● Build and evaluate models for predictive analytics

UNIT I INTRODUCTION TO DATA SCIENCE 8

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

UNIT II DESCRIPTIVE ANALYTICS AND VISUALIZATION 10

Frequency distributions – Outliers –interpreting distributions – graphs – averages - describing variability – interquartile range – variability for qualitative and ranked data - Normal distributions – z scores –correlation – scatter plots – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean.

UNIT III INFERENTIAL STATISTICS 9

Populations – samples – random sampling – Sampling distribution- standard error of the mean - Hypothesis testing – z-test – z-test procedure –decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests – Estimation – point estimate – confidence interval – level of confidence – effect of sample size.

UNIT IV ANALYSIS OF VARIANCE 9

t-test for one sample – sampling distribution of t – t-test procedure – t-test for two independent samples – pvalue – statistical significance – t-test for two related samples. F-test – ANOVA – Two-factor experiments – three f-tests – two-factor 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 – Time series analysis – moving averages – missing values – serial correlation – autocorrelation. Introduction to survival analysis.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1705A	**Statistical Thinking for Data Science**	**3**	**0**	**2**	**4**

Course Objective: This course will provide the students a statistical foundation for data science. They will be able to exercise statistical thinking in collecting, modelling and analyzing data. Detailed Contents:

Module 1: Introduction to Data Science Data acquisition, cleaning, and aggregation, Exploratory data analysis and visualization, Feature engineering, Model creation and validation

Module 2: Statistical Thinking Examples of Statistical Thinking, Numerical Data, Summary Statistics, From Population to Sampled Data, Different Types of Biases, Introduction to Probability, Introduction to Statistical Inference

Module 3: Statistical Thinking 2 Association and Dependence, Association and Causation, Conditional Probability and Bayes Rule, Simpsons Paradox, Confounding, Introduction to Linear Regression, Special Regression Models

Module 4: Exploratory Data Analysis and Visualization Goals of statistical graphics and data visualization, Graphs of Data, Graphs of Fitted Models, Graphs to Check Fitted Models, What makes a good graph? Principles of graphics

Module 5: Introduction to Bayesian Modeling Bayesian inference: combining models and data in a forecasting problem, Bayesian hierarchical modeling for studying public opinion, Bayesian modeling for Big Data.

PROFESSIONAL ELECTIVE – IV

SEMESTER-VIII

COURSE CODE	COURSE TITLE	L	T	P	C
PE1801A	**TEXT AND SPEECH ANALYSIS**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES: • Understand natural language processing basics • Apply classification algorithms to text documents • Build question-answering and dialogue systems • Develop a speech recognition system • Develop a speech synthesizer

UNIT I NATURAL LANGUAGE BASICS 6

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stopwords – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model

Suggested Activities ● Flipped classroom on NLP ● Implementation of Text Preprocessing using NLTK ● Implementation of TF-IDF models

Suggested Evaluation Methods • Quiz on NLP Basics • Demonstration of Programs

UNIT II TEXT CLASSIFICATION 6

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models

Suggested Activities • Flipped classroom on Feature extraction of documents • Implementation of SVM models for text classification • External learning: Text summarization and Topic models

Suggested Evaluation Methods • Assignment on above topics • Quiz on RNN, Transformers • Implementing NLP with RNN and Transformers

UNIT III QUESTION ANSWERING AND DIALOGUE SYSTEMS 9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -– evaluating dialogue systems

Suggested Activities: • Flipped classroom on language models for QA • Developing a knowledge-based question-answering system • Classic QA model development

Suggested Evaluation Methods • Assignment on the above topics • Quiz on knowledge-based question answering system • Development of simple chatbots

UNIT IV TEXT-TO-SPEECH SYNTHESIS 6

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems

Suggested Activities: • Flipped classroom on Speech signal processing • Exploring Text normalization • Data collection • Implementation of TTS systems

Suggested Evaluation Methods • Assignment on the above topics • Quiz on wavenet, deep learning-based TTS systems

UNIT V AUTOMATIC SPEECH RECOGNITION 6

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems

Suggested Activities: • Flipped classroom on Speech recognition. • Exploring Feature extraction Suggested Evaluation Methods • Assignment on the above topics • Quiz on acoustic modeling

COURSE CODE	COURSE TITLE	L	T	P	C
PE1802A	REINFORCEMENT LEARNING	2	0	2	3

OBJECTIVES: The objective of this course is to enable the students to ● Introduce the different basic concepts of reinforcement learning. ● Learn about the Finite Markov Decision Process. ● Study about the dynamic programming. ● Study about the Monte Carlo Methods. ● Learn about the temporal difference learning

UNIT 1 INTRODUCTION 6

Reinforcement Learning (RL) – elements, limitations and scope; Probability basics - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence.

UNIT II FINITE MARKOV DECISION PROCESS 6

Agent-environment interface, Markov property; Goals and rewards, returns and episodes; Policies and value functions – Bellman equation; Optimal policies and optimal value functions - Bellman optimality equations.

UNIT III DYNAMIC PROGRAMMING 6

Iterative policy evaluation, policy improvement theorem, policy iteration, value iteration, asynchronous dynamic programming.

UNIT IV MONTE CARLO METHODS 6

Monte Carlo prediction, Monte Carlo estimation of action values, Monte Carlo control, Off-policy prediction via importance sampling.

UNIT V TEMPORAL-DIFFERENCE (TD) LEARNING 6

TD prediction – TD(0) and TD(λ), optimality of TD(0), Sarsa, Q-learning – Deep Q networks; Function approximation methods – stochastic gradient and semi-gradient methods; Policy gradient methods; RL for real world problems.

COURSE CODE	COURSE TITLE	L	T	P	C
PE1803A	SOFT COMPUTING	2	0	2	3

UNIT 1 INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC 6

Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems

UNIT II NEURAL NETWORKS 6

Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks

UNIT III GENETIC ALGORITHMS 6

Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function

UNIT IV NEURO FUZZY MODELING 6

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability

UNIT V APPLICATIONS 6

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction.

Course Code	Course Title	L	T	P	C
PE1804A	**Cognitive Science & Analytics**	3	0	2	4

Course Objectives:

1. To understand the way in which cognitive science is methodologically distinctive while at the same time is an interdisciplinary field where established fields of research—including Psychology, Computer Science, Linguistics, Neuroscience.
2. To develop skills in analyzing, interpreting, and assessing the empirical data and research techniques that contribute to cognitive science.
3. To understand central modeling techniques in cognitive science, including traditional computational approaches, neural network/deep learning approaches, and dynamical approaches.

Expected Course Outcome:

1. To understand the basic principles and process of cognitive science
2. Learn and understand the learning model and apply the same to appropriate real world applications
3. To demonstrate qualitative and quantitative skill and critical thinking on cognitive science by applying suitable methodology to real world applications
4. Students will understand and apply declarative and logic models
5. Envisage the concept of cognitive learning
6. To demonstrate the acquired inter-disciplinary knowledge in language processing and application of different research approaches with cognitive science

Module:1 Introduction to Cognitive Science 7

Introduction to the study of cognitive sciences. Neural Network Models- language: definition Affordances Categories and concepts; Concept learning: Linguistic knowledge: Syntax, semantics, (and pragmatics) Direct perception, Logic; Machine learning.

Module:2 Concept Hierarchies 7

A brief history of cognitive science. Processing of sensory information in the brain, Linguistic knowledge: Syntax, semantics, (and pragmatics), Ecological Psychology, constructing memories Methodological concerns in philosophy, Discretization and generating concept hierarchies, Data Mining System, Generative linguistic, Affordance learning in robotics, Explicit vs. implicit memory

Module:3 Anatomy of brain 7

Artificial intelligence and psychology, Brain Imaging, Brain and language, Affordance learning in robotics, Information processing (three-boxes) model of memory Structure and constituents of the brain fMRI, MEG, Language disorders, Development Information processing (three-boxes) model of memory.

Module:4 Memory Models 6 Brief history of neuroscience, PET, EEG Lateralization Child and robotic development Sensory memory; Short term memory Mathematical models, Multisensory integration in cortex, Lateralization, Attention and related concepts, long term memory; Rationality

Module:5 Sensory Information fusion 5

Mathematical models Information fusion, the great past tense debate, Human visual attention, Bounded rationality; Prospect theory; Heuristics and biases Looking at brain signals**.**

Module:6 Modelling 6 From sensation to cognition, The great past tense debate, Computational models of attention, Reasoning in computers, Cybernetics, Cognitivist and emergent stand points, Computational models of attention, Key points in social cognition,

Module:7 Information processing 5

Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional Context and social judgment; Schemas; Social signals

Module:8 Contemporary issues 2

Guest lecture by Industry Experts or R&D organization Total Lecture hours 45 hours

Course Code	Course Title	L	T	P	C
PE1805A	Data and Visual Analytics	3	0	2	4

Course Objective :

The student will be able to understand techniques and algorithms for creating effective visualizations based on principles from graphic design. They will also be introduced to several industry-standard software tools to create a compelling and interactive visualization of various types of data.

Module 1: Introduction Data for Graphics, Design principles, Value for visualization, Categorical, time series, and statistical data graphics, Introduction to Visualization Tools.

Module 2: Graphics Pipeline and Aesthetics and Perception Introduction, Primitives: vertices, edges, triangles, Model transforms: translations, rotations, scaling, View transform, Perspective transform, window transform, Graphical Perception Theory, Experimentation, and the Application, Graphical Integrity, Layering and Separation, Color and Information, Using Space

Module 3: Visualization Design Visual Display of Quantitative Information, Data-Ink Maximization, Graphical Design, Exploratory Data Analysis, Heat Map

Module 4: Multidimensional Data and Interaction Query, Analysis and Visualization of Multi-Dimensional Relational Databases, Interactive Exploration, tSNE, Interactive Dynamics for Visual Analysis, Visual Queries, Finding Patterns in Time Series Data, Trend visualization, Animation, Dashboard, Visual Storytelling

Module 5: Collaboration Graph Visualization and Navigation, Online Social Networks, Social Data Analysis, Collaborative Visual Analytics, Text, Map, Geospatial data

PROFESSIONAL ELECTIVE – V
SEMESTER-VIII

Course Code	Course Title	L	T	P	C
PE1806A	GAME DEVELOPMENT	2	0	2	3

COURSE OBJECTIVES:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT I 3D GRAPHICS FOR GAME DESIGN **6**

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

UNIT II GAME DESIGN PRINCIPLES **6**

Character Development, Storyboard Development for Gaming – Script Design – Script Narration,Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

UNIT III GAME ENGINE DESIGN **6**

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding.

UNIT IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS **6**

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, UnitySingle player and Multi-Player games.

UNIT V GAME DEVELOPMENT USING PYGAME **6**

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.

30 PERIODS

COURSE OUTCOMES:

CO1:Explain the concepts of 2D and 3d Graphics

CO2:Design game design documents.

CO3: Implementation of gaming engines.

CO4: Survey gaming environments and frameworks. **CO5**:Implement a simple game in Pygame.

EXPERIMENTS: **30 PERIODS**

1. Installation of a game engine, e.g., Unity, Unreal Engine, familiarization of the GUI.Conceptualize the theme for a 2D game.
2. Character design, sprites, movement and character control
3. Level design: design of the world in the form of tiles along with interactive and collectible objects.
4. Design of interaction between the player and the world, optionally using the physicsengine.
5. Developing a 2D interactive using Pygame
6. Developing a Puzzle game

TOTAL: 60 PERIODS

Course Code	Course Title	L	T	P	C
PE1807A	**QUANTUM COMPUTING**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

- To know the background of classical computing and quantum computing.To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT I QUANTUM COMPUTING BASIC CONCEPTS **6**

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates ofQuantum Mechanics – Quantum Bits - Representations of Qubits - Superpositions

UNIT II QUANTUM GATES AND CIRCUITS **5**

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT III QUANTUM ALGORITHMS **7**

Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

UNIT IV QUANTUM INFORMATION THEORY **6**

Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantumnoiseless channel coding theorem - Classical information over noisy quantum channels

UNIT V QUANTUM CRYPTOGRAPHY **6**

Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

30 PERIODS

PRACTICAL EXERCISES **30 PERIODS**

1. Single qubit gate simulation - Quantum Composer
2. Multiple qubit gate simulation - Quantum Composer
3. Composing simple quantum circuits with q-gates and measuring the output into classicalbits.
4. IBM Qiskit Platform Introduction
5. Implementation of Shor's Algorithms
6. Implementation of Grover's Algorithm
7. Implementation of Deutsch's Algorithm
8. Implementation of Deutsch-Jozsa's Algorithm
9. Integer factorization using Shor's Algorithm
10. QKD Simulation
11. Mini Project such as implementing an API for efficient search using Grover's Algorithms or

COURSE OUTCOMES:

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

CO1: Understand the basics of quantum computing. **CO2:** Understand the background of Quantum Mechanics. **CO3:** Analyze the computation models.

CO4: Model the circuits using quantum computation. environments and frameworks.

CO5: Understand the quantum operations such as noise and error–correction.

TOTAL:60 PERIODS

TEXTBOOKS:

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction",First edition (1 November 2020).
2. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information",Tenth Edition, Cambridge University Press, 2010.
3. Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "QuantumComputing for Everyone.

REFERENCES

- Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press,2013.
- N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge UniversityPress, 2007.

Course Code	Course Title	L	T	P	C
PE1808A	**DATA STREAM MINING**	**2**	**0**	**2**	**3**

Course Objectives:

1. The aim of the course is to introduce the fundamentals of Data Stream Mining.
2. The course gives an overview of – Mining Strategies, methods and algorithms for data stream mining.
3. Apply prediction strategies in evolving data streams.
4. Learn methodologies for adaptive stream mining, to handle changes in the data streams.
5. Evaluate and implement adaptive ensemble methods in in real-time applications.

UNIT - I

MOA Stream Mining, Assumptions, Requirements, Mining Strategies, Change Detection Strategies, MOA Experimental Settings, Previous Evaluation Practices, Evaluation Procedures for Data Streams, Testing Framework, Environments, Data Sources, Generation Speed and Data Size, Evolving Stream Experimental Setting.

UNIT - II

Hoeffding Trees, The Hoeffding Bound for Tree Induction, The Basic Algorithm, Memory Management, Numeric Attributes, Batch Setting Approaches, Data Stream Approaches.

UNIT - III

Prediction Strategies, Majority Class, Naïve Bayes Leaves, Adaptive Hybrid, Hoeffding Tree Ensembles, Data Stream Setting, Realistic Ensemble Sizes.

UNIT - IV

Evolving Data Streams, Algorithms for Mining with Change, A Methodology for Adaptive Stream Mining, Optimal Change Detector and Predictor, Adaptive Sliding Windows, Introduction, Maintaining Updated Windows of Varying Length.

UNIT - V

Adaptive Hoeffding Trees, Introduction, Decision Trees on Sliding Windows, Hoeffding Adaptive Trees, Adaptive Ensemble Methods, New methods of Bagging using trees of different size, New method of bagging using ADWIN, Adaptive Hoeffding Option Trees, Method performance.

Course Outcomes:

1. Understand how to formulate a knowledge extraction problem from data streams.
2. Ability to apply methods / algorithms to new data stream analysis problems.
3. Evaluate the results and understand the functioning of the methods studied.
4. Demonstrate decision tree and adaptive Hoeffding Tree concepts
5. Evaluate and deploy adaptive ensemble methods

TEXT BOOK:

1. DATA STREAM MINING: A Practical Approach by Albert Bifet and Richard Kirkby.

REFERENCE BOOKS:

1. Knowledge discovery from data streams by Gama João. ISBN: 978-1-4398-2611-9.
2. Machine Learning for Data Streams by Albert Bifet, Ricard Gavalda; MIT Press, 2017.

Course Code	Course Title	L	T	P	C
PE1809A	**ROBOTICS & AI**	**2**	**0**	**2**	**3**

UNIT I

Introduction – History, Definition of AI, Emulation of human cognitive process, Intelligent agents – The concept of rationality, the nature of environments, the structure of agents.

UNIT II

Problem – Solving Agents: Problem Definitions, Formulating Problems, Searching for solutions – Measuring Problem – Solving Performance with examples. Search Strategies: Uninformed search strategies – Breadth – first Search, Uniform – Cost Search, depth –first search, depth – limited search, Iterative deepening depth – first search, bidirectional search, comparing uniformed search strategies.

UNIT III

Informed search strategies – Heuristic information, Hill climbing methods, best – first search, branch – and – bound search, optimal search and A* and Iterative deepening A*. LISP, Syntax and numerical function, LISP and PROLOG distinction, input, output and local variables, interaction and recursion, property list and arrays alternative languages, formalized symbolic logics – properties of WERS, non- deductive inference methods.

UNIT – IV

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice. Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples

UNIT – V

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations. Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear

Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization.Model-Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

Course Outcomes:

1. Implement fundamental image processing techniques required for computer vision.
2. Implement boundary tracking techniques.
3. Apply chain codes and other region descriptors, Hough Transform for line, circle, and
4. Apply 3D vision techniques and Implement motion related techniques.
5 Develop applications using computer vision techniques.llipse detections.

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008.
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

Course Code	Course Title	L	T	P	C
PE18010A	**ETHICS AND AI**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

- Study the morality and ethics in AI
- Learn about the Ethical initiatives in the field of artificial intelligence
- Study about AI standards and Regulations
- Study about social and ethical issues of Robot Ethics
- Study about AI and Ethics- challenges and opportunities

UNIT I INTRODUCTION **6**

Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet- Impact on trust

UNIT II ETHICAL INITIATIVES IN AI **6**

International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization.

UNIT III AI STANDARDS AND REGULATION **6**

Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems

UNIT IV ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS 6

Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility- Roboethics Taxonomy.

UNIT V AI AND ETHICS- CHALLENGES AND OPPORTUNITIES 6

Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

30 PERIODS

COURSE OUTCOMES:

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

CO1: Learn about morality and ethics in AI

CO2: Acquire the knowledge of real time application ethics, issues and its challenges.

CO3: Understand the ethical harms and ethical initiatives in AI

CO4: Learn about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems

CO5: Understand the concepts of Roboethics and Morality with professional responsibilities.

CO6: Learn about the societal issues in AI with National and International Strategies on AI

PRACTICAL EXERCISES 30 PERIODS

1. Recent case study of ethical initiatives in healthcare, autonomous vehicles and defense
2. Exploratory data analysis on a 2 variable linear regression model
3. Experiment the regression model without a bias and with bias
4. Classification of a dataset from UCI repository using a perceptron with and without bias
5. Case study on ontology where ethics is at stake
6. Identification on optimization in AI affecting ethics

TOTAL: 60 PERIODS

TEXT BOOKS:

1. y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020
2. Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCES:

1. Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017
2. Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020
3. Web link:
4. https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65
5. https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteen- challenges-and-opportunities/
6. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/
7. https://sci-hub.mksa.top/10.1159/000492428