I. Vision and Mission of the Institute

Vision

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of the industry, society, the nation and the world at large.

Mission

- Commitment to offer value-based education and enhancement of practical skills
- Continuous assessment of teaching and learning process through scholarly activities
- Enriching research and innovative activities in collaboration with industry and institute of repute
- Ensuring the academic process to uphold culture, ethics and social responsibility

II. Vision and Mission of the Department

Vision

To uphold aspirants by imparting cognitive learning environment with continuous education, research and industrial collaboration to become inventive Artificial Intelligence and Data Science eminent.

Mission

The Mission of the Department is to

- Providing skill-based education to master the students in problem solving and analytical skills to enhance their niche expertise in the field Artificial Intelligence and Data Science.
- Educating the students with latest technologies to update their knowledge in the field of Intelligent computing.
- Enabling students to experience content-based learning with premier quality data science education, research and industrial collaboration.
- Guiding students in Artificial Intelligence based research, with an aim to have an ethical impact in the society by tackling societal grand challenges.

III. Program Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) of the Artificial Intelligence and Data Science (AD) represent major accomplishments that the graduates are expected to achieve after three to five years of graduation.

PEO 1: Obtain knowledge in the field of artificial intelligence and data science, necessary to solve real time problems through value-based education.

PEO 2: Possess skills for team building, leadership quality and ethical values necessary to function productively and professionally.

PEO 3: Develop innovative ideas to establish themselves as artificial intelligence professionals, data scientists and entrepreneurs in intelligent computing industry.

PEO 4: Continue to learn the technological advancements through higher studies and research.

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IV. Program Outcomes (POs)

Graduates of Artificial Intelligence and Data Science department will be able to

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 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.

PO3 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.

PO4 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.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 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.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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.

PO12 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.

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V. Program Specific Outcomes (PSOs)

1. Integrate the foundations of mathematical, analytical, programming and domain knowledge to build AI enabled systems for solving real world problems.
2. Acquire skills to model the data science assisted systems and to analyse the data to solve business related problem.

VI. PEO/PO Mapping

Following three levels of correlation should be used:

1: Low

2: Medium

3: High

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	3	3	3	3	2	2	2	2	2	3	3	2	2	2
PEO2	3	3	3	3	3	2	3	2	2	3	3	3	3	3
PEO3	3	3	3	3	3	2	2	2	3	3	3	3	3	3
PEO4	3	3	3	3	3	3	2	2	3	3	3	3	3	3

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VII. Mapping of Course Outcomes with Program Outcomes

SEM	Subject	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
SEM I	Language Elective I*	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	-
	Calculus and Differential Equations	✓	✓	-	-	-	-	-	-	✓	-	-	✓	-	✓
	Engineering Physics	✓	✓	-	-	✓	✓	-	-	✓	✓	-	-	-	-
	Problem Solving using Python Programming	✓	✓	✓	-	-	-	-	✓	✓	✓	-	✓	✓	✓
	Computational Thinking	✓	✓	✓	-	-	-	-	✓	✓	✓	-	✓	✓	✓
	Principles of Electronics Engineering	✓	✓	-	-	-	-	-	-	-	-	-	✓	-	-
	Numerical Aptitude and Verbal Ability - I	✓	✓	-	-	-	-	-	-	-	✓	-	-	-	-
	Workshop	✓	✓	✓	-	✓	-	-	-	✓	-	-	✓	-	-
	Electronics Engineering Laboratory	✓	✓	✓	-	-	-	-	-	✓	✓	-	-	-	-
SEM II	Language Elective II**	-	-	-	-	-	✓	✓	-	✓	✓	-	✓	-	-
	Applied Statistical Analysis	✓	✓	✓	-	✓	-	-	✓	✓	✓	-	✓	-	✓
	Linear Algebra and Vector Spaces	✓	✓	✓	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Fundamentals of Artificial Intelligence	✓	✓	✓	-	✓	-	-	-	-	✓	-	✓	✓	-
	Introduction to Biology for Engineers	✓	✓	✓	-	-	-	-	-	-	✓	-	-	✓	-
	Data Structures	✓	✓	✓	-	-	-	-	-	-	✓	-	✓	✓	✓
	Numerical Aptitude and Verbal Ability - II	✓	✓	-	-	-	-	-	-	-	✓	-	-	-	✓
	Artificial Intelligence Laboratory	✓	✓	✓	-	✓	-	-	✓	✓	✓	-	✓	✓	✓
	Data Structures Laboratory	✓	✓	✓	-	-	-	-	✓	✓	✓	-	✓	✓	✓
SEM III	Ethics and Holistic Life	-	-	-	-	-	✓	✓	✓	✓	✓	-	✓	-	-
	Probability and Random Processes	✓	✓	✓	-	-	-	-	-	-	-	-	✓	-	✓
	Foundations of Data Science	✓	✓	✓	✓	✓	✓	-	-	-	-	-	✓	-	✓

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	Database Management Systems	✓	✓	✓	✓	✓	-	-	-	-	✓	-	✓	✓	✓
	Object Oriented Programming using JAVA	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	-	-
	Computing Essentials	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-
	Data Science Laboratory	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓
	Object Oriented Programming Laboratory	✓	✓	✓	-	-	-	-	✓	✓	✓	-	✓	-	-
SEM IV	Discrete Mathematics	✓	✓	-	-	-	-	-	-	-	-	-	✓	✓	✓
	Machine Learning	✓	✓	✓	-	✓	-	-	-	-	-	✓	-	✓	✓
	Web Application Development	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
	Networks And Communication	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-
	Design and Analysis of Algorithms	✓	✓	✓	-	-	-	-	-	-	✓	-	✓	✓	✓
	Object Oriented Software Engineering	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓	✓
	Machine Learning Laboratory	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓
	Web Application Development Laboratory	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
SEM V	Deep Learning Principles and Practices	✓	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	✓
	Natural Language Processing	✓	✓	✓	-	-	-	-	-	-	-	-	-	✓	✓
	Knowledge Representation	✓	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	✓
	IOT Fundamentals	✓	✓	✓	✓	✓	-	-	-	-	✓	-	✓	✓	✓
	Deep Learning Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Natural Language Processing Lab	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓

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B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR I - VIII SEMESTERS
SEMESTER I

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
		THEORY					
1		Language Elective I*	HS	1	0	2	2
2	U19MA101	Calculus and Differential Equations	BS	3	1	0	4
3	U19PH103	Engineering Physics	BS	3	0	0	3
4	U19CSG01	Problem Solving using Python Programming	ES	2	0	2	3
5	U19CSG02	Computational Thinking	ES	2	0	2	3
6	U19AD101	Principles of Electronics Engineering	ES	3	0	0	3
7	U19CA001	Numerical Aptitude and Verbal Ability - I	EEC	1	0	0	1
		PRACTICALS					
8	U19CS102	Workshop	ES	0	0	4	2
9	U19AD102	Electronics Engineering Laboratory	ES	0	0	2	1
		TOTAL		15	1	12	22

*** U19LE101-Basic English / U19LE102-Communicative English**

SEMESTER II

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
		THEORY					
1		Language Elective II**	HS	1	0	2	2
2	U19MA205	Applied Statistical Analysis	BS	2	0	2	3
3	U19MA206	Linear Algebra and Vector Spaces	BS	3	0	0	3
4	U19AD201	Fundamentals of Artificial Intelligence	ES	3	0	0	3
5	U19AD202	Introduction to Biology for Engineers	BS	2	0	0	2
6	U19AD203	Data Structures	PC	3	0	0	3
7	U19CA002	Numerical Aptitude and Verbal Ability - II	EEC	1	0	0	1
		PRACTICALS					
8	U19AD204	Artificial Intelligence Laboratory	ES	0	0	2	1
9	U19AD205	Data Structures Laboratory	PC	0	0	2	1
		TOTAL		15	0	8	19

**** U19LE201- Advanced Communicative English/ U19LE20* Other languages**

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SEMESTER III

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19AD301	Ethics and Holistic Life	HS	3	0	0	3
2	U19MA306	Probability and Random Processes	BS	3	1	0	4
3	U19AD302	Foundations of Data Science	PC	3	0	0	3
4	U19AD303	Database Management Systems	PC	2	0	2	3
5	U19AD304	Object Oriented Programming using JAVA	PC	3	0	0	3
6	U19AD305	Computing Essentials	ES	3	0	0	3
PRACTICALS							
7	U19AD306	Data Science Laboratory	PC	0	0	2	1
8	U19AD307	Object Oriented Programming Laboratory	PC	0	0	2	1
			TOTAL	17	1	6	21

SEMESTER IV

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19MA407	Discrete Mathematics	BS	3	1	0	4
2	U19AD401	Machine Learning	PC	3	0	0	3
3	U19AD402	Web Application Development	PC	3	0	0	3
4	U19AD403	Networks and Communication	ES	3	0	0	3
5	U19AD404	Design and Analysis of Algorithms	PC	3	0	0	3
6	U19AD405	Object Oriented Software Engineering	PC	3	0	0	3
PRACTICALS							
7	U19AD406	Machine Learning Laboratory	PC	0	0	4	2
8	U19AD407	Web Application Development Laboratory	PC	0	0	2	1
			TOTAL	18	1	6	22

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SEMESTER V

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
		THEORY					
1	U19AD501	Deep Learning Principles and Practices	PC	2	0	2	3
2	U19AD502	Natural Language Processing	PC	3	0	0	3
3	U19AD503	Knowledge Representation	PC	3	0	0	3
4	U19AD504	IOT Fundamentals	PC	2	0	2	3
5		Professional Elective 1	PE	3	0	0	3
6		Open Elective 1	OE	3	0	0	3
		PRACTICALS					
7	U19AD506	Deep Learning Laboratory	PC	0	0	4	2
8	U19AD507	Natural Language Processing Lab	PC	0	0	4	2
			TOTAL	**17**	**0**	**10**	**22**

SEMESTER VI

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
		THEORY					
1	U19AD601	Computer Vision and Image Processing	PC	3	0	0	3
2	U19AD602	Time Series Analysis and Forecasting	BS	2	0	2	3
3	U19AD603	Big Data Systems	PC	3	0	0	3
4		Professional Elective 2	PE	3	0	0	3
5		Professional Elective 3	PE	3	0	0	3
6		Open Elective 2	OE	3	0	0	3
		PRACTICALS					
8	U19AD605	Computer Vision and Image Processing Laboratory	PC	0	0	4	2
9	U19AD606	Mini Project	EEC	0	0	2	1
			TOTAL	**17**	**0**	**8**	**21**

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SEMESTER VII

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19AD701	Data and Information Security	PC	3	0	0	3
2	U19AD702	Software Project Management	HS	3	0	0	3
3	U19AD703	Reinforcement and Ensemble Learning	PC	2	0	2	3
4		Professional Elective 4	PE	3	0	0	3
5		Open Elective 3	OE	3	0	0	3
6		Open Elective 4	OE	3	0	0	3
PRACTICALS							
7	U19AD704	Information Security Laboratory	PC	0	0	4	2
			TOTAL	**17**	**0**	**6**	**20**

SEMESTER VIII

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1		Professional Elective 5	PE	3	0	0	3
2		Professional Elective 6	PE	3	0	0	3
PRACTICALS							
3	U19AD801	Project	EEC	0	0	20	10
			TOTAL	**6**	**0**	**20**	**16**

INDUSTRIAL INTERNSHIP

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	-	Industrial training / Internship* (4 weeks)	EEC	0	0	0	2
			TOTAL	0	0	0	2

*Four Weeks during any semester vacation from III to VI Semester

TOTAL CREDITS: 165

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HUMANITIES AND SCIENCES (HSM)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19LE101	Basic English	HSM	1	0	2	2
2	U19LE201	Advanced Communicative English	HSM	1	0	2	2
3	U19AD301	Ethics and Holistic Life	HSM	3	0	0	3
4	U19AD603	Software Project Management	HSM	3	0	0	3

BASIC SCIENCES (BS)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19MA101	Calculus and Differential Equations	BS	3	1	0	4
2	U19PH103	Engineering Physics	BS	3	0	0	3
3	U19MA205	Applied Statistical Analysis	BS	2	0	2	3
4	U19MA206	Linear Algebra and Vector Spaces	BS	3	0	0	3
5	U19AD202	Introduction to Biology for Engineers	BS	2	0	0	2
6	U19MA306	Probability and Random Processes	BS	3	1	0	4
7	U19MA407	Discrete Mathematics	BS	3	1	0	4
8	U19AD602	Time Series Analysis and Forecasting	BS	2	0	2	3

ENGINEERING SCIENCES (ES)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19CSG01	Problem Solving using Python Programming	ES	2	0	2	3
2	U19CSG02	Computational Thinking	ES	2	0	2	3
3	U19AD101	Principles of Electronics Engineering	ES	3	0	0	3
4	U19AD201	Fundamentals of Artificial Intelligence	ES	3	0	0	3
5	U19AD305	Computing Essentials	ES	3	0	0	3
6	U19AD403	Networks and Communication	ES	3	0	0	3

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PROFESSIONAL CORE (PC)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19AD203	Data Structures	PC	3	0	0	3
2	U19AD205	Data structures Laboratory	PC	0	0	2	1
3	U19AD302	Foundations of Data Science	PC	3	0	0	3
4	U19AD303	Database Management Systems	PC	2	0	2	3
5	U19AD304	Object Oriented Programming using JAVA	PC	3	0	0	3
6	U19AD306	Data Science Laboratory	PC	0	0	2	1
7	U19AD307	Object Oriented Programming Laboratory	PC	0	0	2	1
8	U19AD401	Machine Learning	PC	3	0	0	3
9	U19AD402	Web Application Development	PC	3	0	0	3
10	U19AD404	Design and Analysis of Algorithms	PC	3	0	0	3
11	U19AD405	Object Oriented Software Engineering	PC	3	0	0	3
12	U19AD406	Machine Learning Laboratory	PC	0	0	4	2
13	U19AD407	Web Application Development Laboratory	PC	0	0	2	1
14	U19AD501	Deep Learning Principles and Practices	PC	2	0	2	3
15	U19AD502	Natural Language Processing	PC	3	0	0	3
16	U19AD503	Knowledge Representation	PC	3	0	0	3
17	U19AD504	IOT Fundamentals	PC	2	0	2	3
18	U19AD506	Deep Learning Laboratory	PC	0	0	4	2
19	U19AD507	Natural Language Processing Lab	PC	0	0	4	2
20	U19AD601	Computer Vision and Image Processing	PC	3	0	0	3
21	U19AD603	Big Data Systems	PC	3	0	0	3
22	U19AD605	Computer Vision and Image Processing Laboratory	PC	0	0	2	1
23	U19AD701	Data and Information Security	PC	3	0	0	3
24	U19AD703	Reinforcement and Ensemble Learning	PC	2	0	2	3
25	U19AD704	Information Security Laboratory	PC	0	0	4	2

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PROFESSIONAL ELECTIVES (PE)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19ADP01	Social and Information Networks	PE	0	0	3	3
2	U19ADP02	Video Analytics	PE	0	0	3	3
3	U19ADP03	Intelligent Multi Agent and Expert systems	PE	0	0	3	3
4	U19ADP04	Human Machine Interaction	PE	0	0	3	3
5	U19ADP05	IoT for Smart Cities	PE	0	0	3	3
6	U19ADP06	Predictive Analysis and IOT	PE	0	0	3	3
7	U19ADP07	Fundamentals of Robotics and its applications	PE	0	0	3	3
8	U19ADP08	Machine Intelligence for Medical Image Analysis	PE	0	0	3	3
9	U19ADP09	Soft Computing	PE	0	0	3	3
10	U19ADP10	Business Intelligence	PE	0	0	3	3
11	U19ADP11	Data Visualization	PE	0	0	3	3
12	U19ADP12	Time Series Analysis and Forecasting	PE	0	0	3	3
13	U19ADP13	Web Mining	PE	0	0	3	3
14	U19ADP14	Regression Analysis and Predictive Models	PE	0	0	3	3
15	U19ADP15	Exploratory Data Analysis and Visualization	PE	0	0	3	3
16	U19ADP16	Social Media Analytics	PE	0	0	3	3
17	U19ADP17	Optimization Techniques	PE	0	0	3	3
18	U19ADP18	Big Data Technologies	PE	0	0	3	3
19	U19ADP19	Cloud Computing	PE	0	0	3	3
20	U19ADP20	Theory of Computation and Compiler Design	PE	0	0	3	3
21	U19ADP21	Mobile Application Development	PE	0	0	3	3
22	U19ADP22	Information Retrieval	PE	0	0	3	3
23	U19ADP23	Agile Methodologies	PE	0	0	3	3
24	U19ADP24	Software Project Management	PE	0	0	3	3
25	U19ADP25	Total Quality Management	PE	0	0	3	3
26	U19ADP26	Digital and Social Media Marketing	PE	0	0	3	3
27	U19ADP27	Marketing Analytics	PE	0	0	3	3
28	U19ADP28	Software Testing and Quality Assurance	PE	0	0	3	3
29	U19ADP29	Comprehension-1	PE	0	0	3	3
30	U19ADP30	Comprehension-2	PE	0	0	3	3

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19CA001	Numerical Aptitude and Verbal Ability - I	EEC	1	0	0	1
2	U19CA002	Numerical Aptitude and Verbal Ability - II	EEC	1	0	0	1
3	U19AD505	Technical Seminar - I	EEC	0	0	2	1
4	U19AD604	Technical Seminar - II	EEC	0	0	2	1
5	U19AD606	Mini Project	EEC	0	0	2	1
6	U19AD801	Project	EEC	0	0	20	10

VIII. Scheme of Credit distribution – Summary

Sl. No	Stream	Credits/Semester								Credits	%	Suggested by AICTE
		I	II	III	IV	V	VI	VII	VIII			
1	Humanities and Social Sciences including Management (HSM)	2	2	3	-	-	-	3	-	10	6	12
2	Basic Sciences (BS)	7	8	4	4	-	3	-	-	26	16	25
3	Engineering Sciences (ES)	12	4	3	3	-	-	-	-	22	13	24
4	Professional Core (PC)	-	4	11	15	16	8	8	-	62	38	48
5	Professional Elective (PE)	-	-	-	-	3	6	3	6	18	11	18
6	Open Electives (OE)	-	-	-	-	3	3	6	-	12	7	18
7	Employability Enhancement Courses (EEC)	1	1	-	-	-	1	-	10	13	9	15
8	Industrial Training/ Internship	-	-	-	-	-	-	-	2	2		
9	Mandatory Non-Credit Course (MNC)	-	-	-	-	-	-	-	-	-	-	-
Total		**22**	**19**	**21**	**22**	**22**	**21**	**20**	**18**	**165**	**100**	**160**

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KPRIET
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SEMESTER I

		Category: HS			
U19LE101	BASIC ENGLISH	L	T	P	C
		1	0	2	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To read the text, understand and write the meaning under Technical, Business, Social and Academic contexts.
- To listen and comprehend monologues, dialogues and discussions.
- To speak effectively with appropriate use of words and participate in discussions.

UNIT I BASICS FOR COMMUNICATION 9

Regular & Irregular Verbs – Modal Verbs – Prepositions – Tenses – Subject Verb Agreement – Spotting Errors – Homonyms & Homophones – Phrasal Verbs – Single word substitute – Word formation – Reported Speech

UNIT II LISTENING 9

Listening for specific Information – Listening to short texts – Listening to product description and process – Listening to formal and informal Conversations – Listening to announcements – Listening Comprehension

UNIT III SPEAKING 9

Introducing oneself – Seeking and sharing information – JAM – Enquiry – Asking for clarification – Describing a place, person, process, product and experience – Current affairs – Making presentations

UNIT IV READING 9

Reading for information – Skimming – Scanning – Predicting the content – Reading comprehension – Reading short texts – Proof reading(editing)

UNIT V WRITING 9

Memo – Email – Letter writing (formal and informal) – Dialogue writing – Descriptive writing – Instructions – Filling forms of application - Paraphrasing

LIST OF EXPERIMENTS

1. Listening for information
2. Listening to announcements
3. Listening to stories
4. Song based listening
5. Listening to conversations
6. Self-Introduction
7. Just a Minute
8. Story narration
9. Picture description
10. Movie review

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Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: 30 Periods Total: 45 Periods

TEXTBOOKS:

1. Mindscapes: "English for Technologist and Engineers", Orient BlackSwan, 2014
2. Sudharshana N P and Savitha C, "English for Technical Communication", Cambridge University Press, 2016

REFERENCES:

1. Murphy, Raymond, "Intermediate English Grammar", Cambridge University Press, 2009
2. Means, Thomas L, "English and Communication for Colleges", Cengage 2017
3. "Using English: A Coursebook for Undergraduate Engineers and Technologists" Orient BlackSwan, 2017

COURSE OUTCOMES:

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

Cos	Statements	K-Level
CO1	Use appropriate vocabulary required for spoken and written communication	Remember
CO2	Comprehend and answer questions and take part in conversations	Understand
CO3	Participate in discussions and presentations	Apply
CO4	Understand the meaning of the content present in letters, reports and newspaper	Understand
CO5	Draft letters, e-mails and make notes with appropriate use of words	Apply

COURSE ARTICULATION MATRIX:

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO2	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO3	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO4	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO5	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO	-	-	-	-	-	2	1	-	3	3	-	-	-	-
Correlation levels:	1: Slight (Low)					2: Moderate (Medium)				3: Substantial (High)				

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SEMESTER I

U19LE102	COMMUNICATIVE ENGLISH	Category: HS			
		L	T	P	C
		1	0	2	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To develop the ability to read, write and comprehend various texts.
- To enhance the listening skills to understand conversations and deliberations on diverse contexts.
- To make effective presentations and demonstrate concepts within a team.

UNIT I BASICS FOR COMMUNICATION 9

Active and Passive – Conditionals – Reported speech – Degrees of comparison – Phrases and clauses – Idioms – Kinds of sentences – Connectives and Discourse markers – Purpose statements

UNIT II LISTENING 9

Listening to TED talks – Listening to product description – Listening to orations – Listening to news – Radio based listening

UNIT III SPEAKING 9

Group discussion – Extempore – Technical seminar – Product and process description – Role play – Conversation and etiquettes – Short group conversation – Narrating a story – Formal and informal discussions

UNIT IV READING 9

Pre-reading and Post-reading – Intensive reading – Extensive reading – Newspaper reading – Reading longer texts – Reviewing company profile – Reading strategies – Interpreting visual graphics

UNIT V WRITING 9

Interpreting charts and graphs – Recommendations – Minutes of meeting – Job application and cover letter – Report writing – Drafting circulars (Business contexts)

LIST OF EXPERIMENTS

1. Listening to TED talks
2. Listening to product description
3. Listening to news
4. Radio based listening
5. Listening to oration
6. Self-Introduction
7. Role play
8. Extempore
9. Presentation
10. Group discussion

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Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: 30 Periods Total: 45 Periods

TEXT BOOKS:

1. Mindscapes: English for Technologist and Engineers", Orient BlackSwan, 2014
2. Sudharshana N P and Savitha C, "English for Technical Communication", Cambridge University Press, 2016

REFERENCES:

1. Murphy, Raymond, "Intermediate English Grammar", Cambridge University Press, 2009
2. Means, Thomas L, "English and Communication for Colleges", Cengage 2017
3. "Using English: A Coursebook for Undergraduate Engineers and Technologists" Orient BlackSwan, 2017

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Make use of relevant vocabulary in formal and informal contexts	Apply
CO2	Infer and exhibit the ability to listen various professional interactions	Understand
CO3	Express views and perceptions in a technical forum	Understand
CO4	Interpret a given text and relate the content effectively	Understand
CO5	Frame coherent and cohesive sentences in select contexts	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO2	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO3	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO4	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO5	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO	-	-	-	-	-	2	1	-	3	3	-	-	-	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER I

U19MA101	CALCULUS AND DIFFERENTIAL EQUATIONS *(Common to all Branches)*	Category: BS			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To apply the concepts of matrices to solve engineering problems
- To acquire knowledge in the areas of total derivatives and partial derivatives
- To introduce the concepts of improper integrals, Gamma and Beta functions and also make the student gain familiarity about the techniques of solving ordinary differential equations

UNIT I MATRICES **9 +3**

Characteristic equation–eigenvalues and eigenvectors –Properties (without proof)–Cayley Hamilton theorem (without proof) – applications — Diagonalization using orthogonal transformation–Reduction of quadratic form to canonical form by orthogonal transformation–Applications of eigenvalues and eigenvectors: Electrical circuit—Mass string problems.

UNIT II DIFFERENTIAL CALCULUS **9+3**

Curvature – radius of curvature – center– circle of curvature – evolute and envelope of plane curves.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **9+3**

Partial derivatives-total derivative – Jacobians – expansion and extreme values of functions of two variables – Lagrange multipliers method.

UNIT IV INTEGRAL CALCULUS **9+3**

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals – surface areas – volume of revolutions.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Second and Higher order linear differential equations with constant coefficients– variable coefficients – Euler Cauchy equation– Legendre equation – Method of variation of parameters – solution of simultaneous equations of first order-Applications: Electrical circuits – Simple harmonic motion-chemical reactions.

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd, New Delhi, (2018).
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, (2017).

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REFERENCES:

1. N.P.Bali and Manish Goyel, A text book of Engineering Mathematics, Laxmi Publications; Twelfth edition (2016).
2. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, Pearson Education India; 9th edition (30 January 2010).
3. Maurice d. Weir, Joel Hass, Christopher Heil, "Thomas Calculus", Pearson Education, Uttar Pradesh, (2018).
4. David C Lay, Linear Algebra and its Applications, Addison-Wesley, Boston, (2016).
5. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, (2015).

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Apply eigenvalues and eigenvectors ideas in engineering field.	Apply
CO2	Determine curvature, evolutes and envelope of plane curves.	Apply
CO3	Expand and find extreme values of functions of two variables using Lagrange multiplier method.	Apply
CO4	Solve problems on improper integrals using Gamma and Beta functions.	Apply
CO5	Solve higher order ordinary differential equations and application problems.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	-	2	-	3
CO2	3	2	-	-	-	-	-	-	1	-	-	2	-	3
CO3	3	2	-	-	-	-	-	-	1	-	-	2	-	3
CO4	3	2	-	-	-	-	-	-	1	-	-	2	-	3
CO5	3	2	-	-	-	-	-	-	1	-	-	2	-	3
CO	3	2	-	-	-	-	-	-	1	-	-	2	-	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER I

U19PH103	ENGINEERING PHYSICS	Category: BS			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge of electron transport properties in conductors and semiconductors
- To understand the types of magnetic, superconducting materials and its applications
- To gain the knowledge of quantum structures and smart materials for engineering applications

UNIT I CONDUCTING MATERIALS 9

Characteristic equation–eigenvalues and eigenvectors –Properties (without proof)–Cayley Hamilton theorem (without proof) – applications –- Diagonalization using orthogonal transformation–Reduction of quadratic form to canonical form by orthogonal transformation–Applications of eigenvalues and eigenvectors: Electrical circuit–-Mass string problems.

UNIT II SEMICONDUCTING MATERIALS 9

Introduction – Direct and indirect band gap semiconductors – Intrinsic semiconductors – Carrier concentration in intrinsic semiconductors – Determination of a band gap of a semiconductor – Law of mass action – Extrinsic semiconductors – Carrier concentration in N-type semiconductor – P-type semiconductors (Qualitative) – Hall effect – Determination of Hall coefficient – Applications.

UNIT III MAGNETIC MATERIALS 9

Magnetic dipole– Magnetic permeability – Susceptibility – Classification of magnetic materials – Ferromagnetism – Domain theory – Hysteresis – Hard and soft magnetic materials – Ferrites – Structure – Applications – Magnetic principles in data storage devices – Magnetic bubble memories – Hall effect – Magnetic hard disc drives (GMR sensor).

UNIT IV SUPERCONDUCTING MATERIALS 9

Superconductors – Meissner effect – Persistent current – Critical temperature – Critical magnetic field – Isotope effect – Type I, Type II superconductors – Cooper pair – BCS theory of Superconductivity – High temperature superconductors – Josephson effect – SQUID – Cryotron – Magnetic levitation.

UNIT V QUANTUM STRUCTURES AND SMART MATERIALS 9

Introduction – Electron density in bulk material – Size dependence of Fermi energy – Quantum confinement – Quantum structures – SiC – SMA – Phases – Characteristics – Applications – GAN – Rheological materials.

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Kasap. S.O., "Principles of Electronic Materials and Devices", McGraw-Hill Education, New Delhi,2015
2. Kittel.C., "Introduction to Solid State Physics", Wiley, New Delhi, 2015.

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REFERENCES:

1. Hanson. G.W, "Fundamentals of Nanoelectronics", Pearson Education, New Delhi,2012
2. A.K. Bandyopathyay, "Nanomaterials", New Age International Publishers, New Delhi, 2010
3. Pallab Bhattacharya, "Semiconductor Opto Electronic Devices", PHI Learning Private Limited, New Delhi, 2017.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Outline the basic ideas of classical and quantum electron theories and energy band structures	Understand
CO2	Classify the semiconductors and its applications	Understand
CO3	Summaries the concept of the magnetic materials for data storage applications	Understand
CO4	Explain the properties of superconducting materials and its applications	Understand
CO5	Use the properties of quantum structures and smart materials to apply it in the field of engineering.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	2	-	-	2	2	-	-	-	-
CO2	3	2	-	-	1	2	-	-	2	1	-	-	-	-
CO3	3	2	-	-	1	2	-	-	2	2	-	-	-	-
CO4	3	2	-	-	1	2	-	-	1	1	-	-	-	-
CO5	3	2	-	-	1	2	-	-	2	2	-	-	-	-
CO	3	2	-	-	1	2	-	-	2	2	-	-	-	-
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)					3: Substantial (High)				

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KPRIET
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SEMESTER I

U19CSG01	PROBLEM SOLVING USING PYTHON PROGRAMMING	Category: ES			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn basics of computers and problem-solving techniques.
- To understand syntax and semantics of python programming.
- To develop simple python programs.

UNIT I COMPUTER BASICS AND PROBLEM-SOLVING STRATEGIES 6

Introduction to Computers: Characteristics, Classification, Applications, Components- Hardware and Software- Algorithms - Algorithmic building blocks - Notations: Pseudo code, Flow chart, Programming language - Programming Paradigms - Computational thinking.

UNIT II LANGUAGE BASICS 5

Python interpreter and interactive mode - Tokens - Data types –Numbers and math functions - Input and Output operations - Comments - Reserved words - Indentation - Operators and expressions - Precedence and associativity - Type conversion- Debugging - Common errors in Python – Classes and objects.

UNIT III CONTROL STATEMENTS, FUNCTIONS AND MODULES 6

Selection/Conditional branching statements: if, if-else, Nested-if, if-elif-else statements - Iterative statements: while, for loop - break, continue and pass statements - Functions: Function Definition and Function call, Variable scope and Lifetime, Return statement, Lambda functions or Anonymous functions, Recursion - Modules and Packages.

UNIT IV PYTHON DATA STRUCTURES 7

Strings: Slicing, Immutability, Built-in string methods and functions, Concatenating, Appending and Multiplying strings, String modules, Regular expressions - List: Creation, Accessing values, Slicing, List methods, In-built functions for Lists - Tuples: Creation, Operations on tuples, Traversing, Indexing and Slicing, Tuple assignment, In-built functions for tuples - Sets: Creation, Operations - Dictionaries: operations and methods.

UNIT V EXCEPTION AND FILE HANDLING 6

Exceptions: Errors and Exceptions, Handling exception, Built-in and User-defined exceptions - Files: Types, Operations: Open, Read, Write, Close.

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LIST OF EXPERIMENTS

1. Algorithms, flowchart, and pseudo code
2. Language basics
3. Input and output statements
4. Looping and decision-making statements
5. String operations
6. Recursive functions
7. Python data structures
8. Searching and Sorting
9. Generating histogram
10. File and exception handling

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

TEXTBOOKS:

1. Reema Thareja, "Python programming: Using problem solving approach", Oxford Press, 2017.
2. Roland Backhouse, "Algorithmic Problem Solving", John Wiley & Sons, 2011

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Programming and Problem Solving with Python", McGrawHill Education, 2018.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach". Pearson India Education Services Pvt. Ltd., 2016.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Interpret computer basics and algorithmic solutions for a given problem.	Understand
CO2	Demonstrate the usage of data types, operators and expressions in python programming.	Apply
CO3	Design python programs using functions, modules and packages.	Apply
CO4	Develop programs using python data structures.	Apply
CO5	Demonstrate the usage of exceptions and file handling.	Apply

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COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	2	2	2	-	2	1	3
CO2	3	3	2	-	-	-	-	2	2	2	-	2	1	3
CO3	3	3	3	-	-	-	-	2	2	2	-	2	1	3
CO4	3	3	2	-	-	-	-	2	2	2	-	2	1	3
CO5	3	3	2	-	-	-	-	2	2	2	-	2	1	3
CO	3	3	2	-	-	-	-	2	2	2	-	2	1	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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KPRIET
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SEMESTER I

U19CSG02	COMPUTATIONAL THINKING *(for BME, CSE, ECE, EEE, AD)*	Category: ES			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To formulate problems in a way that enables the use of a computer to solve them.
- To identify, analyze and implement possible solutions with the goal of achieving the most efficient and effective combination of steps and resources.
- To generalize and transfer this problem-solving process to wide variety of problems.

UNIT I PRINCIPLES OF COMPUTATIONAL THINKING 7

Programming – Algorithmic thinking – Bitwise and Boolean algebra – Compiler vs interpreter – Pseudo coding – Problem definition – Data collection – Problem decomposition – Abstraction – Flowcharting – Name binding – Selection – Repetition – Modularization – Sample exercise problems and deriving solutions.

UNIT II DATA ORGANIZATION & PROCESSING USING PYTHON 5

Operators, Variables and Data types – Loops and conditions – Nested loop – Strings – Euclid's algorithm – Arrays – Functions - Recursion.

UNIT III REVERSE ENGINEERING & SOLUTIONS 6

Algorithm Tracing Technique (simulating execution) – Best practices: keeping it simple, documentation, style, idioms, DRY code, naming conventions, and comments – Debugging - Anticipating output from pseudo code.

UNIT IV APPLIED COMPUTATIONAL THINKING 6

Operating systems basics – Networking basics – Database Management System (DBMS) – SQL – No SQL - JSON – API – XML.

UNIT V EFFICIENCY ANALYSIS AND BENCHMARKING 6

Algorithm efficiency – Time complexity in programs – Mathematical preliminaries – Asymptotic analysis - Recurrence relations – Algorithm design paradigms: Divide and conquer algorithms, Dynamic programming, and Greedy algorithms.

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LIST OF EXPERIMENTS

1. Print the difference of indices of largest and smallest number in an array.
2. Length of the longest substring without repeating characters.
3. Prime factors of a given number.
4. Product of the sum of diagonals of an array.
5. The greatest common divisor (GCD) of two numbers – with & without Euclid's algorithm.
6. Finding output of sequencing and looping puzzles.
7. Finding output of pattern matching puzzles.
8. Using only indexing technique- storing and retrieving Array elements (without library functions).
9. Add, subtract, multiply, and check for equality in the two given matrices (without library functions).
10. Utilize the Pythagorean Theorem to calculate a third side of a right triangle, given the other two sides.
11. Time complexity analysis – Tower of Hanoi (using Recursion) – 3 rods and n disks.
12. Time complexity analysis – Tower of Hanoi (using Recursion) – 4 rods and n disks.

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

REFERENCES:

1. David Riley and Kenny Hunt, "Computational thinking for modern solver", Chapman & Hall/CRC, 2014.
2. R.G. Dromey, "How to solve it by Computer", PHI, 2008.
3. Exploring Computational Thinking. https://edu.google.com/resources/programs/exploring-computational-thinking/.
4. GUVI Technical Learning Platform, Certifications, Assessments and FDP/FEM for KPRIET.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Decompose a given problem into modules	Apply
CO2	Create suitable algorithms to solve simple problems	Apply
CO3	Use best practices for documentation that ensure long term maintenance.	Apply
CO4	Explain the basics of operating system, networking, database management system, API and XML	Understand
CO5	Determine efficiency of algorithms	Analyze

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COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	2	2	-	2	3	3
CO2	2	1	-	-	-	-	-	2	2	2	-	2	3	3
CO3	2	1	-	-	-	-	-	2	2	2	-	2	-	-
CO4	2	-	-	-	-	-	-	2	2	2	-	2	-	-
CO5	3	-	3	-	-	-	-	2	3	2	-	3	3	3
CO	2	2	3	-	-	-	-	2	2	2	-	2	3	3
Correlation levels:			1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)			

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SEMESTER I

U19AD101	PRINCIPLES OF ELECTRONICS ENGINEERING	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the basic concepts of integrated circuits
- To introduce the basics of digital electronics
- To understand about Memory and display devices

UNIT I BASIC ELECTRONIC COMPONENTS 9

Passive components – Resistors, Inductors, Capacitors-specifications, classifications, Diode-PN junction, Zener diode-construction, operation- forward bias, reverse bias, characteristics-BJT – NPN, PNP- Construction and Operation.

UNIT II APPLICATIONS OF DIODES AND TRANSISTORS 9

Half wave, full wave and bridge rectifiers-Voltage regulator, Zener diode shunt regulator- CE Amplifier, RC oscillator. Overview of Voltage stabilizers, Inverters.

UNIT III INTEGRATED CIRCUITS 9

Operational amplifier- ideal characteristics, inverting, non-inverting-applications of op-amp- adder, subtractor, integrator, differentiator, comparator

UNIT IV BASICS OF DIGITAL ELECTRONICS 9

Number systems, Boolean algebra, Logic gates, sequential and combinational circuits- adder, subtractor, Overview of flip-flop, latches, counters, shift registers

UNIT V MEMORY AND DISPLAY DEVICES 9

RAM-SRAM, DRAM, ROM-PROM, EPROM, EEPROM, LED, LCD, Plasma, 3D displays.

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

REFERENCES:

1. R. S. Sedha, "A Textbook of Applied Electronics", S.Chand & Company Ltd, 2013
2. Roy Chaudary, "Linear Integrated Circuits", Seventh Edition, New Age International Publishers, 2018
3. M. Morris Mano, "Digital Design", Pearson, 2018
4. Sol Sherr, "Electronic displays", Second Edition, Wiley, 1993.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Illustrate principles of electronic components	Understand
CO2	Infer applications of diodes and transistors	Understand
CO3	Explain about op-amp and its applications	Understand
CO4	Understand the operation of digital circuits	Understand
CO5	Classify the types of memory and display devices	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO	2	1	-	-	-	-	-	-	-	-	-	2	-	-
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)						3: Substantial (High)			

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SEMESTER I

U19CA001	NUMERICAL APTITUDE AND VERBAL ABILITY - I *(Common to all Branches)*	Category: EEC			
		L	T	P	C
		1	0	0	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Understand the concepts of Coding, Decoding, Interpreting, and applying.
- Comprehend the basic concepts of logical reasoning and verbal reasoning.

UNIT I 3

Clocks & Calendars, Alpha Numeric Series, Coding & Decoding, Blood Relations, Odd man out, Direction.

UNIT II 3

Syllogism, Order and Ranking, Puzzles, Cubes and Dices, Statements, Assumptions and Conclusions, Seating Arrangements, Data Sufficiency, Data Interpretation

UNIT III 3

Parts of Speech (Nouns, Pronouns, Verbs, Adjectives, Adverbs, Preposition, Conjunction, Interjection) Gerunds, Phrases and Clauses

UNIT IV 3

Tenses, Active and Passive Voice (tense usage), Verbal Ability (Vocabulary and Reasoning)

UNIT V 3

Closet Test, Sentence Formation, Para Jumbles, Passage Formation, Spotting Errors, Verbal analogies.

Contact Periods:

Lecture: 15 Periods Tutorial: - Periods Practical: – Periods Total: 15 Periods

TEXTBOOKS:

1. R S Aggarwal – Quantitative Aptitude for Competitive Examinations, 17th Edition
2. S. Chand Publishing, New Delhi, 2017
3. Arun Sharma – How to prepare for Quantitative Aptitude for CAT, 8th Edition McGraw Hill Education, Chennai, 2018.
4. R S Aggarwal – Objective General English, S Chand Publishing, New Delhi, 2017

REFERENCES:

1. R.S. Aggarwal – A Modern Approach to Verbal & Non-Verbal Reasoning's Chand Publishing, New Delhi, 2017
2. Abhijit Guha - Quantitative Aptitude for Competitive Examination, McGraw Hill Education (India) Private Limited, 5th Edition, 2015.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Use basics of counting through Permutation and Combination for arrangement of tasks	Apply
CO2	Draft letters, emails and make notes with appropriate use of words.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO	3	-	-	-	-	-	-	-	-	3	-	-	-	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER I

U19CS102	WORKSHOP *(for CSE, AD)*	Category: ES			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart fundamental hands-on skill in carrying out experiments at higher semester practical courses

MECHANICAL ENGINEERING 6

Study on welding, fitting and carpentry

CIVIL ENGINEERING 6

1. Study of pipeline joints, its location and function, valves, taps, coupling, union, reducers, elbows, in household fitting (Display and Explanation).
2. Exercise:
   Demonstration of
   a. Basic pipeline connection.
   b. Pipe connection with different joining components.
   c. Mixed pipe connections with joints.

ELECTRICAL ENGINEERING 6

1. House wiring (Display and Demonstration).
2. Earthing practices and its significances (Demonstration).
3. Measurements and energy using energy meter (Demonstration).
4. Functionalities of RPS/AFO/CRO (Demonstration / Application).

ELECTRONICS AND COMMUNICATION ENGINEERING 6

1. Identifying electronic components and understanding PCB glossary. (Display and Explanation)
2. Conversion of schematic into PCB layout and PCB fabrication. (Display and Explanation)
3. Practicing of soldering and Disordering. (Display and Explanation)

COMPUTER SCIENCE AND ENGINEERING 36

PC assembling configuration and troubleshooting

1. Assembling a SMPS in a cabinet, fixing a processor in a mother board
2. Assembling RAM in a motherboard, pinning a cooling fan in a mother board
3. Assembling a hard disc drive in a cabinet, assembling a CD/DVD ROM in a cabinet. Fixing motherboard in a cabinet
4. Connecting the cables from the SMPS to motherboard, hard disc, drives & etc, establishing data connection to motherboard, hard disc, drives. Fixing wires for power restart switches, fixing wires for power & HDD LED's, fixing wires for external USB and Audio connections.
5. Hardware troubleshooting
6. Operating system and software installation
7. Configuration of internet

Contact Periods:

Lecture: - Periods Tutorial: - Periods Practical: 60 Periods Total: 60 Periods

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TEXTBOOKS:

1. B.Govindarajulu, "IBM PC and Clones hardware troubleshooting and maintenance", New Delhi, 2002, Tata McGraw-Hill, ISBN-13: 978-0070482869.

REFERENCES:

1. Gary B.Shelly, Misty E.Vermat ,"Discovering Computers", Cengage Learning, 2012.
2. Craig Zacker& John Rourke, "The Complete Reference:PC hardware", New Delhi, Tata McGraw-Hill, 2001, ISBN-13: 978-0072125160.
3. Mike Meyers, "Introduction to PC Hardware and Troubleshooting", New Delhi, Tata McGraw-Hill, 2003, ISBN-13: 978-0072226324.
4. Peter Abel, Niyaz Nizamuddin, "IBM PC Assembly Language and Programming", Pearson Education, 2007.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Assemble/ setup and upgrade personal computer systems	Apply
CO2	Troubleshoot system, software, and hardware problems; configure legacy devices; develop and maintain compatibility with other network operating system platforms; boot a computer when windows OS is not functioning	Apply
CO3	Prepare configuration management of windows operating system	Apply
CO4	Discuss networking gateways and crimping methods	Understand
CO5	Configure and troubleshoot network problems	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	3	-	-	1	-	-
CO2	3	2	3	-	1	-	-	-	3	-	-	1	-	-
CO3	3	2	3	-	1	-	-	-	3	-	-	1	-	-
CO4	3	2	1	-	1	-	-	-	3	-	-	1	-	-
CO5	2	1	1	-	1	-	-	-	3	-	-	1	-	-
CO	3	2	2	-	1	-	-	-	3	-	-	1	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

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SEMESTER I

U19AD102	ELECTRONICS ENGINEERING LABORATORY	Category: ES			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To demonstrate the applications of diodes and transistors.
- To interpret the characteristics of operational amplifiers.
- To design and construct the combinational and sequential logic circuits for different applications.

LIST OF EXPERIMENTS

1. Characteristics of PN Junction diode.
2. Characteristics of Zener junction diode.
3. Halfwave and Full wave rectifier circuits using PN junction diode.
4. Voltage regulator circuit using Zener diode.
5. Common Emitter input-output characteristics of Bipolar Junction Transistor.
6. Characteristics of Common Emitter BJT Amplifier in NPN configuration.
7. Design and implementation of RC Phase-shift oscillator.
8. Execution of Inverting and Non-inverting modes of operational amplifier.
9. Design of Integrator and differentiator using operational amplifier.
10. Implementation of adder and subtractor using logic gates.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 15 Periods Total: 15 Periods

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Analyze the characteristics and applications of PN junction diode and Zener diode.	Apply
CO2	Implement electronic circuits using Bipolar Junction Transistor.	Apply
CO3	Design sinusoidal oscillators for different frequencies.	Apply
CO4	Construct wave-shaping circuits using operational amplifier.	Apply
CO5	Design combinational circuits using logic gates.	Apply

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COURSE ARTICULATION MATRIX:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	2	2	-	-	-	-
CO2	3	2	2	-	-	-	-	-	2	2	-	-	-	-
CO3	3	2	2	-	-	-	-	-	2	2	-	-	-	-
CO4	3	2	2	-	-	-	-	-	2	2	-	-	-	-
CO5	3	2	2	-	-	-	-	-	2	2	-	-	-	-
CO	3	2	2	-	-	-	-	-	2	2	-	-	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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SEMESTER II

U19LE201	ADVANCED COMMUNICATIVE ENGLISH	Category: HS			
		L	T	P	C
		1	0	2	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Foster their ability to develop communicative strategies and skills.
- Strengthen the learners to evocate their listening skills and enhance writing ability.
- Exhibit proactive reading strategies and speaking techniques.

UNIT I LANGUAGE ADEPTNERS 9

Cloze test – Sentence completion – Relative clause – Transformation of sentences – Common errors – Discourse markers – Formal and Informal expressions – Framing questions – Figures of speech

UNIT II LISTENING 9

Listening to announcements – Interviews – Group discussions– Dialogues – News items – Documentaries – IELTS – GRE – TOEFL based listening

UNIT III SPEAKING 9

Real life situations through role play – Language use – Pronunciation, Stress and Intonation – Narrating events – Presentation – Group discussion

UNIT IV READING 9

Reading strategies – Reading comprehension – Reading short stories – Journal articles – Inferring editorial column – Cloze reading

UNIT V WRITING 9

Book review – Guided writing – Writing gadget review – Free writing – Rephrasing – Interpreting text – Email writing – Process description

LIST OF EXPERIMENTS

1. Listening for announcements
2. Listening to dialogues
3. Listening to documentaries
4. Listening to interviews
5. IELTS based listening
6. Role play
7. Product description
8. Group discussion
9. Book review
10. General presentation

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: 30 Periods Total: 45 Periods

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TEXTBOOKS:

1. K N Shoba, Lourdes JoavaniRayen. "Communicative English". Cambridge University Press, 2017.
2. Sudharshana N P and Savitha C, "English for Technical Communication", Cambridge University Press, 2016

REFERENCES:

1. Murphy, Raymond, "Intermediate English Grammar", Cambridge University Press, 2009
2. Means, Thomas L, "English and Communication for Colleges", Cengage 2017
3. "Using English: A Course book for Undergraduate Engineers and Technologists" Orient BlackSwan, 2017

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Inculcate effective reading strategy	Understand
CO2	Express opinions in real life situations	Understand
CO3	Construct academic and professional writing	Apply
CO4	Impart the listening ability in self-learning	Apply
CO5	Adept to the needs of the second language learner in a grammatical context	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	3	-	1	-	-
CO3	-	-	-	-	-	2	-	-	2	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO5	-	-	-	-	-	-	2	-	-	3	-	1	-	-
CO	-	-	-	-	-	2	2	-	2	3	-	1	-	-
Correlation levels:	1: Slight (Low)					2: Moderate (Medium)				3: Substantial (High)				

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SEMESTER II

U19MA205	APPLIED STATISTICAL ANALYSIS	Category: BS			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of Statistics in the field of engineering and technology
- To apply the concepts of testing of hypothesis for small and large samples.
- To apply design of experiments in the field of engineering and technology.

UNIT I DESCRIPTIVE STATISTICS 6

Frequency distribution – Bar graphs and Pie charts – Histogram- Ogive – Simpson's paradox – Measures of central tenancy - Measures of Variability.

UNIT II SAMPLING 6

Sampling distribution - Estimation: Point estimation, interval estimation - Criteria of a good estimator –Interval estimation of mean (single sample and two samples) - Maximum likelihood estimator.

UNIT III TESTING OF HYPOTHESIS 6

Large sample test for single mean - Small sample test: t, F distributions - Tests for Goodness of fit.

UNIT IV CORRELATION AND REGRESSION 6

Estimation using the regression line - Correlation analysis -Limitations, errors, and caveats of using regression and correlation analyses.

UNIT V DESIGN OF EXPERIMENTS 6

Analysis of variance - Completely Randomized Design, Randomized Block Design

LIST OF EXPERIMENTS

1. Data Examination
2. Student's t- Test
3. Correlation
4. Regression
5. ANOVA

Contact Periods:

Lecture: 30 Periods Tutorial: - Periods Practical: 15 Periods Total: 45 Periods

TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Meyers and Sharon L. Meyers, "Probability and Statistics for Engineers and Scientists", Pearson Education, 2014.
2. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Cengage Learning, 2015.

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REFERENCES:

1. Sheldon M.Ross, "Introduction to Probability Models", Academic Press, 2014.
2. Douglas C Montgomery and George C Runges, "Applied Statistics and Probability for Engineers", John Wiley &Sons, 2014.
3. Trivedi K.S., "Probability and Statistics with Reliability, Queuing and Computer Science Applications", Prentice Hall, 2011.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Apply the technology to create graphical representation of the data	Apply
CO2	Analyze data from multi-stage surveys	Apply
CO3	Analyze small and large samples in industry by using testing of hypothesis	Apply
CO4	Interpret the correlation between two variables.	Apply
CO5	Compute and interpret the results of real time applications by performing ANOVA and F test.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	-	3	-	-	2	3	2	-	1	-	3
CO2	3	2	3	-	3	-	-	2	3	2	-	1	-	3
CO3	3	2	3	-	3	-	-	2	3	2	-	1	-	3
CO4	3	2	3	-	3	-	-	-	3	2	-	1	-	3
CO5	3	2	3	-	3	-	-	-	3	2	-	1	-	3
CO	3	2	3	-	3	-	-	2	3	2	-	1	-	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19MA206	LINEAR ALGEBRA AND VECTOR SPACES	Category: BS			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge of decomposition of matrices.
- To understand postulates of vector spaces and linear transformations.
- To understand concepts of eigenvalues and eigenvectors of a matrix and inner product spaces

UNIT I LINEAR SYSTEMS 9

Geometric interpretation of linear system in 2 and 3 unknowns - Row reduction and Echelon forms – Vector equation – Matrix equation Ax=b-LU decomposition- Applications of linear systems.

UNIT II VECTOR SPACES 9

Vector spaces and subspaces – Linear combination, Span, Linear independence and dependence - Null space, Column space, and Row space – Basis and dimension of a vector space – Rank and nullity-Applications to Electrical network

UNIT III LINEAR TRANSFORMATION 9

General Linear Transformations – Kernel and range – Matrices of general linear transformation-Geometry linear operators-Change of basis.

UNIT IV INNER PRODUCT SPACES 9

Inner product, Length, angle and orthogonality – Orthogonal sets – Orthogonal projections – Inner product spaces – Orthonormal basis: Gram-Schmidt process.

UNIT V EIGENVALUES AND EIGENVECTORS 9

Eigenvalues and Eigenvectors– Singular Value Decomposition – Eigenvalues and linear transformations - Discrete Dynamical systems.

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: - Periods Total: 45 Periods

TEXTBOOKS:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley, 2011.
2. David C. Lay, "Linear Algebra and its Applications", Pearson Education, 2011.

REFERENCES:

1. Gilbert Strang, "Linear Algebra and its Applications", Thomson Learning, 2009.
2. Steven J. Leon, "Linear Algebra with Applications", Prentice Hall, 2006.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Solve and interpret the linear system of equations.	Apply
CO2	Identify linear independence and dependence of vectors and basis of vector space.	Apply
CO3	Apply linear transformations engineering fields.	Apply
CO4	Compute orthonormal basis using standard methods.	Apply
CO5	Compute the singular value decomposition of a matrix.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	3	-	1	2	3
CO2	3	3	1	-	-	-	-	-	2	3	-	-	2	3
CO3	3	3	3	-	-	-	-	-	3	3	-	-	2	3
CO4	3	3	3	-	-	-	-	-	3	3	-	-	3	3
CO5	3	3	3	-	-	-	-	-	3	3	-	1	2	3
CO	3	2	2	-	-	-	-	-	3	3	-	1	2	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19AD201	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the fundamentals of artificial intelligence and intelligent agents
- To learn the methods of knowledge representation and knowledge inference
- To understand the concepts of expert systems

UNIT I INTRODUCTION 9

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent agents – Typical Intelligent Agents – Introduction to AI-problem formulation, Problem definition.

UNIT II PRODUCTION SYSTEMS AND PROBLEM-SOLVING METHODS 9

Production systems, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, matching, indexing and heuristic functions – Hill climbing - Depth first and breath first, constraints satisfaction problem.

UNIT III KNOWLEDGE REPRESENTATION AND INFERENCE 9

Knowledge representation: Predicate logic- Predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic - Knowledge Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory.

UNIT IV DATA ANALYSIS AND FEATURE ENGINEERING 9

Data description – Feature types – Categorical & continuous variables – Data correlation – Feature selection – Handling missing data – Scaling & Normalization

UNIT V EXPERT SYSTEMS AND LINEAR MODELS 9

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells– Linear Regression – Decision Tree – Logistic Regression

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill- 2008. (Units-I,II,IV)
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007. (Unit-III &V).

REFERENCES:

1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
2. Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
3. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Exemplify the fundamentals of Artificial Intelligence and Intelligent agents.	Understand
CO2	Identify appropriate methods to solve AI problems.	Apply
CO3	Use different methodologies to represent and infer knowledge.	Apply
CO4	Apply pre-processing techniques on data.	Analyze
CO5	Discuss the concepts of Expert Systems and its models.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	2	-	3	3	-
CO2	3	3	2	-	2	-	-	-	-	2	-	3	3	-
CO3	3	3	2	-	2	-	-	-	-	2	-	3	3	-
CO4	3	3	2	-	2	-	-	-	-	2	-	3	3	-
CO5	3	3	2	-	2	-	-	-	-	2	-	3	3	-
CO	3	3	2	-	2	-	-	-	-	2	-	3	3	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19AD202	INTRODUCTION TO BIOLOGY FOR ENGINEERS	Category: ES			
		L	T	P	C
		2	0	0	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the fundamentals of cell biology and cellular processes
- To learn the about intelligence of the cell
- To infer the basic concepts of bioinformatics using computational methods

UNIT I BASICS OF CELLS 6

Classification of biological macro molecules, Cellular Structures, Cellular Energy Production and Utilization- The Cell Cycle and Cell Division, Meiosis and Formation of Gametes.

UNIT II GENES 6

Protein Synthesis, Gene Expression and Mutation, Evolution Patterns and Processes.

UNIT III DNA COMPUTATION 6

DNA replication – genome - hidden messages in the genome - Python Programming and packages for Bioinformatics.

UNIT IV APPLIED DNA SEQUENCING 6

Finding Replication Origins – DNA A boxes - Counting words - The Frequent Words Problem - Frequent words in Vibrio cholera.

UNIT V ALGORITHMS FOR BIOLOGY 6

Hunting for Regulatory Motifs - Motif Search - Gibbs Sampling. Assembling Genomes using Graph algorithms.

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: – Periods Total: 30 Periods

TEXTBOOKS:

1. Ryan Rogers, Cell and Molecular Biology for Environmental Engineers, Momentum Press Engineering, 2018.
2. Gabi Nindl Waite, Lee R. Waite, Applied Cell and Molecular Biology for Engineers, McGraw Hill Publishers, 2007.
3. Philip Compeau and Pavel Pevzener, Finding Hidden Messages in DNA, Active Learning Publishers, 2015.

REFERENCES:

1. 'Bioinformatics algorithm, An active learning Approach', Phillip Compeauand Pavel Pevzner Vol. 1. and Vol. 2, 2015.
2. 'Essential Bioinformatics', JinXiong, Cambridge University Press, 2006.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Discuss the basic concepts in cell biology.	Understand
CO2	Illustrate the basics of cellular process.	Understand
CO3	Use python programming for bioinformatics.	Understand
CO4	Deliberate the computational algorithms of DNA encoding.	Understand
CO5	Enumerate the assembling genomes using computational methods	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	2	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	2	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	2	-	-	3	-
CO4	3	2	1	-	-	-	-	-	-	2	-	-	2	-
CO5	3	2	1	-	-	-	-	-	-	2	-	-	2	-
CO	3	2	1	-	-	-	-	-	-	2	-	-	2	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19AD203	DATA STRUCTURES	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Computational thinking, Programming basics

COURSE OBJECTIVES:

- To write simple programs using C programming constructs
- To apply concepts of arrays, pointers, functions and structures in programming
- To construct List, Stack, Queue Abstract Data Types (ADTs) and Trees

UNIT I PROGRAMMING FUNDAMENTALS IN C LANGUAGE 9

Structure of C program - Data Types - Storage classes - Constants – Enumeration Constants - Keywords – Operators- Control structures - Pre-processor directives – Arrays: One dimensional array - Two dimensional arrays – Multi dimensional arrays - Strings: operations on strings.

UNIT II POINTERS, FUNCTIONS AND STRUCTURES 9

Pointers: Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers- Introduction to functions: Function prototype - function definition - function call – Call by value – Call by reference - function types -Built-in functions - Recursive functions - Structure - Nested structures – Self-referential structures.

UNIT III LINEAR DATA STRUCTURES 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation - singly linked lists - doubly-linked lists - circularly linked lists - Stack ADT – Operations – Applications – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue –Sorting – Searching.

UNIT IV NON-LINEAR DATA STRUCTURES 9

Trees – Binary Trees – Complete binary tree – Full binary tree – Skewed binary tree - Binary tree representation and binary tree traversals – Binary Search Trees -Operations in binary search tree – AVL Trees – Rotations- Graphs – graph traversals.

UNIT V ALGORITHM ANALYSIS 9

Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Mathematical Analysis of Non-recursive and recursive Algorithms – Algorithm Design Technique – Brute Force –selection sort, bubble sort – Divide and Conquer - merge sort and quick sort.

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. 1. Reema Thareja, "Programming in C", First Edition, Oxford University Press, 2018. (UNIT- I, II).
2. Reema Thareja, "Data structures using C", Oxford University Press, 2014. (UNIT – III &IV)
3. Anany Levitin," Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012 (UNIT V)

REFERENCES:

1. Pradip Dey, Manas Gosh, "Programming in C", First Edition, Oxford University Press, 2018.
2. Herbert Schildt, "C: The Complete Reference" McGraw Hill Education; 4/e, 2017.
3. R. Venkatesan, S. Lovelyn Rose, "Data Structures", Wiley, 2/e, 2019.
4. Seymour Lipschutz, "Data structures with C" McGraw Hill Education; 4/e, 2017.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Implement the programming fundamentals in C language with using arrays.	Apply
CO2	Apply the concepts of pointers, functions and structures in programming.	Apply
CO3	Implement the concept of linear data structures like list, stack and queue.	Apply
CO4	Articulate the concepts of the non-linear data structures trees and graphs	Understand
CO5	Determine the complexity of algorithms	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	2	-	2	-	-
CO2	3	3	3	-	-	-	-	-	-	2	-	2	-	-
CO3	3	3	3	-	-	-	-	-	-	2	-	2	-	-
CO4	3	3	2	-	-	-	-	-	-	2	-	2	1	1
CO5	3	3	3	-	-	-	-	-	-	2	-	2	3	3
CO	3	3	2	-	-	-	-	-	-	2	-	2	2	2

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19CA002	NUMERICAL APTITUDE AND VERBAL ABILITY -II	Category: EEC			
		L	T	P	C
		1	0	0	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Understand the concepts of Number System, Profit and Loss and Infer Time, Speed and Distance.
- Write sentences with appropriate grammatical structure in a professional context.

UNIT I 3

Divisibility tests (Divisibility Factor, Prime Factor, Divisibility Rules, Finding UNIT Digit), LCM&HCF (Listing Multiples, Prime Factorization, Division method, etc.), NUMBER SYSTEM (Numbers, Prime, Composite, Co-Prime numbers), PERCENTAGE (Percentage, Fractions of Percentages, Expenditure, Price, Consumption, Population, Depreciation)

UNIT II 3

PROFIT, LOSS & DISCOUNTS – (CP, SP, MP, Profit, Loss, Discount), RATIO & PROPORTION (Compounded Ratio, Mean Proportional, Componendo, Dividendo, Directly Proportional, Inversely Proportional), Age Problems (Various techniques to solve age problems)

UNIT III 3

Averages (Simple average, weighted average) Mixtures and Alligations (Various techniques to solve mixtures and alligations), Time, Speed and Distance, Train Problems (Problems in same and opposite Direction), Boats and Streams (Downstream, Upstream, Average Speed)

UNIT IV 3

Time & Work (Problems on Time, Work and Efficiency), Permutation & Combination (arrangements & selections, together and not together problems), Probability (Coins, card, Dice) Logarithms (Log Function, Common Log, Natural Log, Binary Log, Laws of Logarithms), Areas and Volumes

UNIT V 3

Reading Comprehension, Letter Writing, Email Writing, Essay Writing, Resume Building

Contact Periods:

Lecture: 15 Periods Tutorial: - Periods Practical: – Periods Total: 15 Periods

TEXTBOOKS:

1. R S Aggarwal – Quantitative Aptitude for Competitive Examinations, 17th Edition S. Chand Publishing, New Delhi, 2017
2. Arun Sharma – How to prepare for Quantitative Aptitude for CAT, 8th Edition McGraw Hill Education, Chennai, 2018.
3. R S Aggarwal – Objective General English, S Chand Publishing, New Delhi, 2017

REFERENCES:

1. R.S. Aggarwal – A Modern Approach to Verbal & Non-Verbal Reasoning, S Chand Publishing, New Delhi, 2017
2. Abhijit Guha - Quantitative Aptitude for Competitive Examination, McGraw Hill Education (India) Private Limited, 5th Edition, 2015.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Use basics of counting through Permutation and Combination for arrangement of tasks	Apply
CO2	Draft letters, emails and make notes with appropriate use of words	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO	3	3	-	-	-	-	-	-	-	3	-	-	-	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19AD204	ARTIFICIAL INTELLIGENCE LABORATORY	Category: ES			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Problem Solving using Python Programming

COURSE OBJECTIVES:

- To learn the basic programming constructs essential for building AI systems.
- To write programs for handling data.
- To write simple programs to implement knowledge inference system using python

LIST OF EXPERIMENTS

1. Basics of Numpy for Feature representation
   - Mathematical Operators, Numpy Arrays
   - Reshaping, Indexing and Manipulation of Numpy Arrays
   - Broadcasting, Random Number Generation (Uniform Distribution & Normal Distribution)
2. Pandas, Tabular Data Handler
   - Pandas Data frame, Column Indexing
   - File I/O using Pandas, Pandas & Numpy Integration, Distribution Analysis
3. Exploratory Data Analysis (Basic)
   - Identify the features and target variable. Interpret basic Data Description about data set (Categorical Data)
   - Identify the missing values in the given dataset and handle the missing values using Data Imputation Methods (Average, Max, Min)
   - Choose the features for training from the given dataset and split the dataset into train and testing data.
4. Data Processing (Normalization, Scaling, Categorical Feature Encoding)
5. Implement Linear Regression to build an intelligent predictive analytics model.
6. Implement Decision Tree to build an intelligent predictive analytics model.
7. Performance analysis on models using Test Dataset. (Accuracy, MAE, MSE)
8. AI Project (possibly from Kaggle, DevMesh)
   a) Sample: Cardiac Arrest Diagnosis using Logistic Regression
      The symptoms are running nose, cough and body temperature is 99.89 degree. Based on these symptoms diagnose the relevant illness. Should be done using Dataset from Kaggle and Publish a notebook with data description and model description
   b) Sample: Flowers's classification using ML
      Classify the flowers into among the three species – virginica, setosa, or versicolor based on length and width of petals and sepals.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Implement data handling concepts using numpy and pandas package	Apply
CO2	Implement data pre-processing techniques	Apply
CO3	Write programs to infer knowledge from datasets	Apply
CO4	Implement and measure performance of basic intelligent models	Apply
CO5	Develop simple projects on artificial intelligence	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	-	-	2	2	2	-	3	3	3
CO2	3	3	2	-	3	-	-	2	2	2	-	3	3	3
CO3	3	3	2	-	3	-	-	2	2	2	-	3	3	3
CO4	3	3	2	-	3	-	-	2	2	2	-	3	3	-
CO5	3	3	2	-	3	-	-	2	2	2	-	3	3	-
CO	3	3	2	-	3	-	-	2	2	2	-	3	3	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER II

U19AD205	DATA STRUCTURES LABORATORY	Category: PC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Computational thinking, C Programming basics

COURSE OBJECTIVES:

- To write simple programs using C programming constructs with arrays and pointers
- To develop applications in C using functions and structures
- To implement linear data structures List, Stack and Queue ADTs (Abstract Data Types) using C

LIST OF EXPERIMENTS

1. Write a C program to get various shape information (Circle, Square, Rectangle, etc.,) and print the area and circumference.
2. Design a simple mathematical calculator using C.
3. Create a C application to get employee information for a reputed school and print the pay slip of employees. Consider various possible roles in the school and perform the pay-slip generation.
4. Design and develop a health application that computes the Body Mass Index (BMI) of the individuals given with height and weight of persons and suggest the diet plan.
5. Design and develop a number converter that performs the decimal number into binary, octal and hexadecimal numbers using user defined functions and vice-versa.
6. Create a word processor which could perform the following on a paragraph:
7. Find the total number of words.
8. Capitalize the first word of each sentence.
9. Replace a given word with another word.
10. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using structures and pointers.
11. Creation of Array and linked list implementation of Stack and Queue ADTs
12. Choose an appropriate data structure and create a token system for banking service (withdrawal, deposit, and money transfer).
13. Create a food delivering system which allocates the path for delivery of food using appropriate data structures.
14. Create a book rack allocation system in a library, which allocates appropriate space for the books based on category using appropriate data structures.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Apply the programming fundamentals in C language for simple mathematical problems.	Apply
CO2	Apply arrays and pointers in C programs.	Apply
CO3	Apply the concept of functions and structures in C for problem solving	Apply
CO4	Implement linear data structures like List ADTs, Stack and Queue using C.	Apply
CO5	Implement the non-linear data structures trees and graph using C	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	2	2	-	2	-	3
CO2	3	3	2	-	-	-	-	2	2	2	-	2	-	-
CO3	3	3	3	-	-	-	-	2	2	2	-	2	-	-
CO4	3	3	2	-	-	-	-	2	2	2	-	2	-	-
CO5	3	3	2	-	-	-	-	2	2	2	-	2	2	2
CO	3	3	2	-	-	-	-	2	2	2	-	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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SEMESTER III

U19AD301	ETHICS AND HOLISTIC LIFE	Category: HS			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To emphasize the meaning and nature of human values, ethics, and holistic life for leading a good, successful, and happy life through continuous examination of thoughts and conduct in day-to-day life.
- To understand the status and responsible role of individual in order to develop a civilized and human society.
- To view the place of Ethics and Human Values in the development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

UNIT I HUMAN LIFE, ITS AIM AND SIGNIFICANCE 9

Importance of human values, the concept of a successful life, Happy life and a meaningful life, Ethical and decision-making capability and its development: Meaning of Ethical dilemma, Stress management, Sharing real life experiences.

UNIT II CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT 9

Intellectual, Emotional, Creative, Ethical - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude, Planning and prioritizing, Time management.

UNIT III HARMONY IN PERSONAL AND SOCIAL 9

Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, Interpersonal Skills, Creating a value-based work culture in hostel, classroom and other places in the campus and society.

UNIT IV CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE 9

Attitude, Ego lessness, Humility, Righteousness, Purity, Sharing, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE 9

Science, Technology, Consumerism, Relation with Nature and Environment, New Dimension of Global Harmony: Democracy, Equality, Social Justice.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. A. N. Tripati, "Human Values", New Age International, 2009.
2. S. K. Chakraborty, Debangshu Chakraborty, "Human Values and Ethics, In search of Organisational Integrity", Himalaya Publishing House, 2013.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. World Community Service Centre, 'Value Education', Vethathiri publications, Erode, 2011.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Explain the meaning of human values, importance of ethics at individual, local, global level for leading a successful, happy holistic life	Remember
CO2	Realize his/her individual responsibility and develop their ability to create a civilized and human society	Understand
CO3	Identify the personal, professional, and social values and integrate them in their personality after cross examination	Understand
CO4	Develop positive habits of thought and conduct to work cohesively with fellow beings who have variety of strengths, experiences, shortcomings, and challenges, hence, to enable them to handle diverse type of personalities	Apply
CO5	Explain the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional, and social life	Remember

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	2	2	2	-	-	3	-	-
CO2	-	-	-	-	-	3	3	3	3	-	-	3	-	-
CO3	-	-	-	-	-	3	3	3	3	-	-	3	-	-
CO4	-	-	-	-	-	3	3	3	3	3	-	3	-	-
CO5	-	-	-	-	-	2	2	2	2	3	-	3	-	-
CO	-	-	-	-	-	3	3	3	3	3	-	3	-	-
Correlation levels:	1: Slight (Low)					2: Moderate (Medium)						3: Substantial (High)		

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SEMESTER III

U19MA306	PROBABILITY AND RANDOM PROCESSES	Category: BS			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the mathematical concepts of probability, one- and two-dimensional random variables and distributions.
- To understand the concepts of random processes which are widely used in IT fields.
- To use the concept of queueing models in the field of engineering.

UNIT I PROBABILITY **9+3**

Probability – Axioms of probability – Conditional probability – Total probability – Bayes' theorem – Discrete and continuous random variables – Moments – Moment generating functions.

UNIT II DISTRIBUTION FUNCTIONS **9 +3**

Binomial, Poisson, Exponential, Uniform and Normal distributions – Applications.

UNIT III TWO – DIMENSIONAL RANDOM VARIABLES **9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression.

UNIT IV RANDOM PROCESSES **9+3**

Classification – Stationary Process – Markov chain – Poisson Process – Discrete parameter Markov Chain

UNIT V CORRELATION AND SPECTRAL DENSITIES **9+3**

Auto correlation Functions – Cross correlation functions – Properties – Power Spectral Density – Cross Spectral Density – Properties.

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXTBOOKS:

1. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", 2nd Edition, Elsevier, 2014.
2. Gross D and Harris C. M, "Fundamentals of Queueing Theory", Wiley Students 4th Edition, 2012.

REFERENCES:

1. Allen A. O, "Probability, Statistics and Queueing Theory with computer applications", 2nd edition, Elsevier, 2005.
2. Taha H. A, "Operations Research", 9th edition, Pearson Education, Asia, 2014.
3. Trivedi K. S, "Probability and Statistics with Reliability, Queueing and computer science Applications", 2nd edition, John wiley and sons, 2012.
4. Narayanan S, Manicavachagom Pillay T. K and Ramanaiah G, "Advanced Mathematics for Engineering Students", Vol. II & III, 2nd edition, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Apply probability theory and random variable as a need for the analysis of random experiment	Apply
CO2	Use discrete and continuous probability distributions including requirements, mean and variance for making decisions	Apply
CO3	Distinguish correlation and linear regression in two dimensional random variables	Apply
CO4	Apply Poisson and Markov Process in low pass and band pass noise models	Apply
CO5	Compute the traffic intensity, blocked traffic and the utilization of some queuing systems	Analyse

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	3
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	3
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	1	-	2
CO	3	2	1	-	-	-	-	-	-	-	-	1	-	2

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER III

U19AD302	FOUNDATIONS OF DATA SCIENCE	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Problem Solving using Python Programming

COURSE OBJECTIVES:

- To learn basics of data science and statistical inference.
- To understand the concept of data pre-processing and feature selection algorithms.
- To visualize the processed data using visualization techniques.

UNIT I INTRODUCTION 10

Data Science - Big Data and Data Science – Datafication - Current landscape of perspectives - Skill sets needed – Types of Data – Storage Capacities - Data Processing Abilities - Data Formats, Organization of Data – Data essentials - Big Data - Sources and characteristics of Big Data. Introduction to R, History of R, Role of R in Data Science, Data Types, Loops and Functions, Data Frames, Swirl in R, R Vs Python.

UNIT II LINEAR ALGEBRA FOR DATA SCIENCE 8

Matrices - Matrices to represent relations between data, and necessary linear algebraic operations on matrices -Approximately representing matrices by decompositions (SVD and PCA); Statistics: Descriptive Statistics: distributions and probability - Statistical Inference: Populations and samples - Statistical modelling - probability distributions - fitting a model - Hypothesis Testing.

UNIT III DATA PREPROCESSING 9

Data pre-processing: Data cleaning - data integration - Data Reduction Data Transformation and Data Discretization. Evaluation of classification methods – Confusion matrix, Students T-tests and ROC curves - Exploratory Data Analysis - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA - The Data Science Process.

UNIT IV BASIC MACHINE LEARNING ALGORITHMS 10

Association Rule mining - Linear Regression- Logistic Regression - Classifiers - k-Nearest Neighbors (k-NN), k-means -Decision tree - Naive Bayes - Feature Generation and Feature Selection - Feature Selection algorithms - Filters; Wrappers; Decision Trees; Random Forests.

UNIT V CLUSTERING AND DATA VISUALIZATION 8

Clustering: Choosing distance metrics - Different clustering approaches - hierarchical and agglomerative clustering, k-means – Applications - Business Intelligence – Visual Analytics - Visualization: Data wrangling - Basic principles, ideas, and tools for data visualization -Plots and its types.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk from The Frontline", O'Reilly, 2014.
2. Mohammed J. Zaki and Wagner Miera Jr, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2014.
3. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O'Reilly, 2016.
4. Mario Dobler and Tim Großmann, "The Data Visualization Workshop", O'Reilly Media, 2020.

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REFERENCES:

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, ISBN 0123814790, (2011).
2. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015.
3. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2012.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Interpret data science basics, exploratory data analysis and its tools.	Understand
CO2	Demonstrate the usage of statistical inference and regression models	Apply
CO3	Use the concept of linear algebra in principal component analysis.	Apply
CO4	Understand and apply the various data pre-processing methods, feature selection algorithms.	Apply
CO5	Implement the visualization of data using the visualization tools.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	3	2	-	-	-	-	-	2	-	3
CO2	3	3	3	-	3	2	-	-	-	-	-	2	-	3
CO3	3	3	3	-	3	2	-	-	-	-	-	2	-	3
CO4	3	3	3	2	3	2	-	-	-	-	-	2	-	3
CO5	3	3	3	2	3	2	-	-	-	-	-	2	-	3
CO	3	3	3	2	3	2	-	-	-	-	-	2	-	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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SEMESTER III

U19AD303	DATABASE MANAGEMENT SYSTEMS	Category: PC			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Data Structures

COURSE OBJECTIVES:

- To learn the fundamentals of data models and database design
- To study SQL and relational database design.
- To understand indexing and hashing techniques which helps in physical DB design.

UNIT I RELATIONAL DATABASE 6

Introduction to DBMS: Purpose, Views of data, Data Models, Database System Architecture - Relational databases - Relational Model – Keys - Relational Algebra - SQL fundamentals.

UNIT II DATABASE DESIGN 6

Entity-Relationship model, Diagrams - Functional Dependencies - Non-Loss Decomposition – Normalization and its types – 1NF to BCNF.

UNIT III TRANSACTIONS 6

Transaction Concepts, ACID Properties – Schedules – Serializability - Concurrency Control - Locking Protocols – Deadlock - Transaction Recovery - SQL for Concurrency and Recovery.

UNIT IV IMPLEMENTATION TECHNIQUES 6

RAID - File Organization – Organization of Records in Files - Indexing and Hashing - Ordered Indices - B+ tree Index Files – Hashing and its types.

UNIT V NoSQL DATABASE SYSTEMS 6

Introduction and classification to NoSQL Database Systems: Graph Databases, Key-Value Stores, Document Stores -Columnar Databases - NoSQL vs SQL.

LIST OF EXPERIMENTS

1. DDL and DML Commands for inserting, deleting, updating, and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling and normalization and Implementation for any application

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

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TEXTBOOKS:

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata Mc Graw Hill, 2011.
2. RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2010.

REFERENCES:

1. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2012.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata Mc Graw Hill, 2010.
3. G.K.Gupta, "Database Management Systems", Tata Mc Graw Hill, 2011.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Understand the fundamentals of Database Management Systems	Understand
CO2	Formulate solutions to real time problems using SQL	Apply
CO3	Apply normalization techniques for database design.	Apply
CO4	Apply concurrency control and recovery mechanisms.	Apply
CO5	Compare the various storage and optimization mechanisms	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	2	2	3
CO2	3	2	2	2	2	-	-	-	-	2	-	2	2	3
CO3	2	2	2	-	-	-	-	-	-	1	-	2	-	3
CO4	2	2	-	-	-	-	-	-	-	1	-	2	-	3
CO5	3	2	2	2	-	-	-	-	-	-	-	2	-	3
CO	2	2	2	2	2	-	-	-	-	1	-	2	2	3
Correlation levels:	1: Slight (Low)					2: Moderate (Medium)						3: Substantial (High)		

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SEMESTER III

		Category: PC			
U19AD304	OBJECT ORIENTED PROGRAMMING USING JAVA	L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Programming basics
- Computational Thinking

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes

UNIT I INTRODUCTION TO OOP 9

A look at procedure-oriented programming – Object oriented programming paradigm – Basic concepts of object-oriented programming – Benefits of OOP – Introduction to Java – Characteristics – JRE – JDK. Fundamental Programming Structures in Java – Defining classes in Java – Simple Java program.

UNIT II JAVA BASIC ELEMENTS AND INHERITANCE 9

Constructors, Methods – Access specifiers – Data Types, Variables, Operators, Control Flow, Arrays, Packages - Javadoc comments. Inheritance – Super classes- Sub classes –Protected members – Constructors in sub classes- Object class – abstract classes and methods- final methods and classes.

UNIT III INTERFACES AND EXCEPTION HANDLING 9

Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -Inner classes, Array Lists – Strings. Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements.

UNIT IV I/O AND MULTITHREADING 9

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

UNIT V DATABASE CONNECTIVITY AND SERVLET 9

Accessing databases using JDBC connectivity - Introduction to servlet - Servlet life cycle - Developing and Deploying Servlets – Exploring Deployment Descriptor (web.xml) - Handling Request and Response - Session Tracking Management.

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", Revised Second Edition, Oxford, 2018.
2. Herbert Schildt, "Java The complete reference", 8th Edition, McGraw Hill Education, 2011.
3. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.

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REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Black book", Dreamtech Press, 2011.
3. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Demonstrate the fundamentals of object-oriented programming using java	Apply
CO2	Implement the concepts of inheritance and packages using java.	Apply
CO3	Build java applications using exceptions and interfaces.	Apply
CO4	Develop java applications using multi-threading and i/o.	Apply
CO5	Illustrate interactive java programs.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	1	-	-	-	-	-	-	3	-	-
CO2	2	3	2	3	2	-	-	-	-	-	-	3	-	-
CO3	2	3	3	3	2	-	-	-	-	-	-	3	-	-
CO4	2	3	3	3	2	-	-	-	-	-	-	3	-	-
CO5	2	3	2	2	1	-	-	-	-	-	-	3	-	-
CO	2	3	2	3	2	-	-	-	-	-	-	3	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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SEMESTER III

U19AD305	COMPUTING ESSENTIALS	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the architecture of the computer systems
- To interpret the I/O and Memory Interfacing circuits of the computer
- To learn the concepts and functions of operating systems in computer systems.

UNIT I Computer Organization and Microprocessors 9

Introduction – Types and Evolution of computers - CPU organization and data path –Pipelining Principles of RISC and CISC and their design principles, – Features and evolution of Intel x86 architecture, Performance assessment of processors – Evolution and Architecture of microprocessors and microcontrollers: 8086, Intel Processors, 8051, Raspberry Pi.

UNIT II Memory and I/O Organization 9

Characteristics of memory systems and memory hierarchy - Static and dynamic memory, Synchronous DRAM and its bus cycle, Principles and operations: Cache memory -SSD - flash memory - magnetic disks - DMA operation – Bus Structure and its operations - Overview of programmed I/O and interrupt driven I/O techniques.

UNIT III Fundamentals of Operating Systems 9

Operating System types, Structure and Operations- System Calls, System Programs, OS Generation and System Boot. Processes-scheduling-operations-cooperating processes-inter process communication. CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor Scheduling – Real time scheduling. Threads-multi threading models and issues.

UNIT IV Process Synchronization 9

Process Synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock. .

UNIT V Storage Management and File Systems 9

Main Memory – swapping, Contiguous Memory Allocation, Paging, Segmentation, segmentation with Paging. Virtual Memory – Demand paging – Process creation – Page replacement – Allocation of frames File System structure- File concept – Access methods, Directory structure-allocation methods-Free space management. Mass storage- Disk Structure, Disk Scheduling, Swap - Space Management.

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Andrew S Tanenbaum and Todd Austin, Structured Computer Organization, Sixth edition, Pearson, 2013.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.

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REFERENCES:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family – Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2016.
2. Ramaz Elmasri, A. Gil Carrick, David Levine, Operating Systems - A Spiral Approach, Tata McGraw Hill Edition, 2010.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Describe the basic structure and operations of a digital computer.	Understand
CO2	Elaborate the memory and I/O in computer systems.	Understand
CO3	Discuss the role of operating systems and process management.	Understand
CO4	Exemplify the process synchronization and deadlock handling mechanisms.	Understand
CO5	Interpret various memory and storage management techniques.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3									-	-	-
CO	2	2	2	-	-	-	-	-	-	-	-	-	-	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER III

U19AD306	DATA SCIENCE LABORATORY	Category: PC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Problem Solving using Python Programming

COURSE OBJECTIVES:

1. To familiarize with Jupyter Notebook, Pandas and SciPy for data analysis.
2. To implement linear regression and to validate the regression using various tests.
3. To perform visualization on different data sets.

SUGGESTED LIST OF EXPERIMENTS

1. Working with Jupyter Notebook on fundamental Concepts.
2. Computations using NumPy functions – Computation on Arrays, Aggregation, Indexing and Sorting.
3. Data manipulations using Pandas – Handling of missing data and hierarchical indexing
4. Data Visualization using Matplotlib – Implementation of 2D plotting and 3D plotting
5. Case study to demonstrate Curve Fitting.
6. Implementation of Principle component analysis.
7. Using Simple Linear Regression, calculate Gradient and Cost minimum, along with line of best fit.
8. Understand Linear Regression and other regression techniques using house prices prediction dataset.
9. Implement K-means Clustering to Find Natural Patterns in Data.
10. Data Handling Project Base.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Work with Jupyter Notebook, Pandas and SciPy for data analysis.	Apply
CO2	Apply statistical methods to hypotheses testing and inference problems	Apply
CO3	Implement simple linear regression and to perform tests to validate the regression.	Apply
CO4	Implement the EDA using the principal component analysis technique.	Apply
CO5	Apply different visualization techniques on various massive datasets.	Apply

COURSE ARTICULATION MATRIX:

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COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	-	2	2	1	2	2	-	3
CO2	3	3	3	2	2	2	-	2	2	2	2	2	-	3
CO3	3	3	3	2	2	2	-	2	2	2	2	2	-	3
CO4	3	3	3	2	2	2	-	2	2	2	2	2	-	3
CO5	3	3	3	2	2	2	-	2	2	2	2	2	-	3
CO	3	3	3	2	2	2	-	2	2	2	2	2	-	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER III

U19AD307	OBJECT ORIENTED PROGRAMMING LABORATORY	Category: PC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Programming basics
- Computational Thinking

COURSE OBJECTIVES:

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

SUGGESTED LIST OF EXPERIMENTS

4. i. Write a Java program that determines the number of days in a month.
   ii. Write a java program that arranges the given set of strings in alphabetical order. Supply the strings through command line.
5. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, and type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff:
   If the type of the EB connection is domestic, calculate the amount to be paid as follows:
   - First 100 units - Rs. 1 per unit
   - 101-200 units - Rs. 2.50 per unit
   - 201 -500 units - Rs. 4 per unit
   - 501 units - Rs. 6 per unit

   If the type of the EB connection is commercial, calculate the amount to be paid as follows:
   - First 100 units - Rs. 2 per unit
   - 101-200 units - Rs. 4.50 per unit
   - 201 -500 units - Rs. 6 per unit
   - 501 units - Rs. 7 per unit
6. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.
7. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
8. Create an interface "CreditCardInterface" with methods to viewCreditAmount, viewPin, changePin and payBalance. Create a class Customer (name, card number, pin, creditAmount –

initialized to 0). Implement methods of the interface "CreditCardInterface" in Customer class. Create an array of customer objects and perform the following actions.

- Pay Balance
- Change Pin

9. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
10. Write a Java application for banking transaction system that helps the users to do their credit transactions. Rises user defined exception while encountering errors during credit transaction and also solves the exception by using appropriate handling techniques.
11. Write a Java program that reads a file name 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.
12. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
13. Write a program to register students data using JDBC with MySQL Database.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Write java programs that make use of classes, objects, interfaces and packages.	Apply
CO2	Implement abstraction and inheritance using java programs.	Apply
CO3	Create programs that perform exception handling and multiple inheritance.	Apply
CO4	Build multithreaded java programs and i/o operations.	Apply
CO5	Develop applications using JDBC and servlets.	Apply

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COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	1	2	2	-	3	-	-
CO2	3	2	2	-	-	-	-	1	2	2	-	3	-	-
CO3	3	2	3	-	-	-	-	1	2	2	-	3	-	-
CO4	3	2	2	-	-	-	-	1	2	2	-	3	-	-
CO5	3	2	3	-	-	-	-	1	2	2	-	3	-	-
CO	3	2	2	-	-	-	-	1	2	2	-	3	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

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SEMESTER IV

U19MA407	DISCRETE MATHEMATICS	Category: BS			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of mathematical logic for analysing propositions and proving theorems.
- To understand the concepts of Permutations, Combination and Pigeonhole principle and apply it in logical reasoning.
- To apply the concepts of Graph Theory, Lattices and Boolean Algebra in networks.

UNIT I LOGIC **9 + 3**

Propositional logic – Propositional equivalences – Inconsistency Predicates – Quantifiers – Rules of inference – Introduction to proofs – Method of proofs

UNIT II COMBINATORICS **9 + 3**

Basics of counting – Pigeonhole principle – Permutations and Combinations – Recurrence Relations – Generating functions – Inclusion and Exclusion principle – Mathematical Induction

UNIT III GRAPH **9 + 3**

Graphs and graph models – Graph terminology and special types of Graphs – Matrix representation of graphs and Graph isomorphism – Connectivity – Euler and Hamilton paths – Shortest path

UNIT IV ALGEBRAIC STRUCTURES **9 + 3**

Algebraic systems – Semi Groups and Monoids – Groups – Subgroups – Homomorphism's Normal subgroup and cosets – Lagrange's Theorem – Rings and Fields (Definitions)

UNIT V LATTICES AND BOOLEAN ALGEBRA **9 + 3**

Partial ordering – Possets – Lattices – Properties of lattices – Lattices as algebraic systems – Sub lattices – Boolean Algebra – Applications: Switching circuits

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, Special Indian Edition, 2016
2. Tremblay J. P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", 7th Edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2011

REFERENCES:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2014
2. Thomas Koshy, "Discrete Mathematics with Applications", 1st edition, Elsevier Publications, 2008
3. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", 3rd Edition, Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2010

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Analyse logical propositions via truth tables	Analyse
CO2	Apply basic counting techniques to solve combinatorial problems	Apply
CO3	Apply graph theory models of data structures to solve problems of connectivity and constraint satisfaction	Apply
CO4	Distinguish the characteristics of Group, Rings and Field	Apply
CO5	Use homomorphism of Lattices and Boolean Algebra and apply it in switching circuits.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO3	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO4	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO5	3	3	-	-	-	-	-	-	-	-	-	1	2	2
CO	3	2	-	-	-	-	-	-	-	-	-	1	2	2

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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U19AD401	MACHINE LEARNING	Category: PC			
		L	T	P	C
		3	0	2	4

PRE–REQUISITES:

- Fundamental of Computing

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques
- To understand graphical models of machine learning algorithms

UNIT I MACHINE LEARNING LANDSCAPE 9

Machine learning – Need machine learning – Machine Learning Applications – Types of Machine Learning systems – Challenges – Machine Learning Process – Data Collection, Exploration, Preparation, Training, Optimization – Performance Measures.

UNIT II SUPERVISED LEARNING - I 9

Classification and Regression Technique – Linear regression - Polynomial Regression, Logistic Regression – Generalization – Overfitting – Underfitting – Support Vector Machine – Kernels – KNN – Naïve bayes classifiers – Decision Tree.

UNIT III SUPERVISED LEARNING - II 9

Random Forest - Ensemble Learning – Bagging – Boosting – Ada Boost – Gradient Boosting – Neural Networks – Biological Neurons – logical computations with neurons – ANN – Perceptron – MLPs and Backpropagation – Hyperparameter Optimization – Dimensionality Reduction.

UNIT IV UNSUPERVISED LEARNING 9

Clustering – Techniques – K-Means Clustering – AGNES – DIANA – Density Based Clustering (DBSCAN) – Grid based clustering – Gaussian Mixtures – Clustering High Dimensional Data – Outlier Analysis.

UNIT V MACHINE LEARNING USECASES 9

Dimensionality Reduction Applications – Factor Analysis – Model selection & evaluation – Optimization of turning parameters – Visualization of results – Contemporary Issues – Case Studies – Application of ML – Medical science, Fraud Detection, Traffic prediction, Personal Assistant, Stock Prediction.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Müller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.", 2016.
2. Géron, Aurélien. Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems. O'Reilly Media, 2019.

REFERENCES:

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1. Deep Neuro-Fuzzy Systems with Python: With Case Studies and Applications from the Industry by Himanshu Singh , Yunis Ahmad Lone , 2019
2. Hands-On Neural Networks: Learn how to Build and Train Your First Neural Network Model Using Python Book by Leonardo De Marchi, 2019
3. Neural Network Projects with Python: The ultimate guide to using Python to explore the true power of neural networks through six projects 1st Edition, Kindle Edition by James Loy, 2019

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Distinguish between, supervised, unsupervised and reinforcement learning	Understand
CO2	Apply the classification and regression technique for any given problem	Apply
CO3	To Understand the concept of neural networks.	Understand
CO4	Modify existing clustering algorithms to improve efficiency for model	Apply
CO5	To analyse the applications of machine learning	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	3
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	3
CO3	2	2	2	-	-	-	-	-	-	-	-	-	2	3
CO4	2	2	1	-	-	-	-	-	-	-	1	-	2	3
CO5	2	2	2	-	1	-	-	-	-	-	1	-	2	3
CO	2	2	1	-	-	-	-	-	-	-	1	-	2	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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SEMESTER IV

		Category: PC			
U19AD402	WEB APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Programming basics
- U19CSG02-Computational Thinking

COURSE OBJECTIVES:

- To understand the essential components of web and internet.
- To create various small website projects.
- To use cascading style sheets (CSS) for website development.
- To describe how the client-server model of Internet programming.

UNIT I WEB ESSENTIALS AND DYNAMIC WEB CONTENT 9

Web Essentials: Clients, Servers, and Communication – The Internet – Benefits of PHP, MySQL, JavaScript, CSS and HTML – HTTP Request Message – HTTP Response Message – Apache – Web Clients – Web Servers – WAMP – LAMP – MAMP – Working Remotely

UNIT II INTRODUCTION TO PHP 9

PHP – Syntax – Variable types – Operators – Control Structures – Arrays – Strings – Web concepts – GET – POST –Web SQL – PHP & MySQL – PHP Form Handling – Cookies – Sessions

UNIT III PHP WITH HTML AND CSS 9

Overview to HTML5 – Syntax – Attributes – Web forms – Events – SVG – Canvas – Audio – video – Introduction to Cascading Style Sheets (CSS) – Basics and elements – Inline – Styles – Outline styles – CSS3 – Inline – Embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations

UNIT IV EXPLORING JAVASCRIPT 9

Java Script: An introduction to JavaScript – JavaScript DOM Model-Date and Objects – Regular Expressions – PHP Validation – Exception Handling – Validation – Built-in objects – Event Handling.

UNIT V APPLICATION DEVELOPMENT USING NODE JS 9

Introduction to Node.js – Installing Node.js – Using Events – Listeners – Timers – Callbacks in Node.js – Introduction to Mongo DB – Accessing MongoDB from Node.js.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: - Periods Total: 45 Periods

TEXTBOOKS:

1. Nixon, Robin. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5. " O'Reilly Media, Inc.", 2014.
2. Thomas A Powal, HTML & CSS: The Complete Reference, Fifth Edition, McGraw Hill Education,2017

REFERENCES:

1. John Dean,"Web Programming with HTML5, CSS, and JavaScript Pap/Psc",First Edition, Jones and Bartlett Learning,2019
2. Fritz Schneider, Thomas Powell , JavaScript – The Complete Reference, 3rd Edition, Mc-Graw Hill, 2017

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3. Syed, Basarat Ali, and Martin Bean. Beginning Node. js. New York City: Apress, 2014.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Comprehend and analyse the concepts of web protocols and web architecture.	Understand
CO2	Develop interactive and data driven Web pages Using PHP form and MySQL.	Apply
CO3	Apply HTML and CSS effectively to create interactive and dynamic websites.	Apply
CO4	Implement client-side scripting using JavaScript.	Apply
CO5	Develop a dynamic web application using Node.js	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	1	-	1	-	-	3	1	2	2	1	1
CO2	3	3	2	2	2	1	-	-	3	1	2	2	1	1
CO3	3	3	3	2	3	1	-	-	3	1	2	2	1	1
CO4	3	3	3	2	3	1	-	-	3	1	2	2	1	1
CO5	3	3	3	2	2	-	-	-	3	1	2	2	1	1
CO	3	3	3	2	2	1	-	-	3	1	2	2	1	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

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SEMESTER IV

U19AD403	NETWORKS AND COMMUNICATION	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the fundamental concepts of computer networking, protocols, architectures, and applications.
- To acquire knowledge in design, implement and analyse performance of OSI and TCP-IP based Architectures.
- To understand the ideas of routing protocols, congestion and traffic management.

UNIT I NETWORKING PRINCIPLES AND LAYERED ARCHITECTURE 9

Data Communications and Networking: A Communications Model – Data Communications – Evolution of network generations – Requirements – Applications – Network Topology (Line configuration, Data Flow) – Protocols and Standards – Network Models (OSI, TCP/IP)

UNIT II CIRCUIT AND PACKET SWITCHING 9

Components of network – Switched Communications Networks – Circuit Switching – Packet Switching – Comparison of Circuit Switching and Packet Switching – Implementing Network Software, Networking Parameters (Transmission Impairment, Data Rate and Performance).

UNIT III DATA LINK LAYER 9

Error Detection and Correction – Hamming Code – CRC – Checksum – Flow control mechanism – Sliding Window Protocol – GoBack – N – Selective Repeat – Multiple access Aloha – Slotted Aloha – CSMA – CSMA/CD – Multiple Access Networks (IEEE 802.3) – Token Ring (IEEE 802.5) and Wireless Networks (IEEE 802.11, 802.15).

UNIT IV NETWORK LAYER 9

IPV4 Address Space – Notations – Classful Addressing – Classless Addressing – Network Address Translation – IPv6 Address Structure – IPv4 and IPv6 header format – Routing – Link State and Distance Vector Routing Protocols.

UNIT V TRANSPORT AND APPLICATION LAYER 9

TCP and UDP – Congestion Control – Effects of Congestion – Traffic Management – TCP Congestion Control – Congestion Avoidance Mechanisms – Queuing Mechanisms – QoS Parameters – Application Layer – Domain Name System – Case Study: FTP-HTTP-SMTP-SNMP.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Behrouz A. Forouzan, "Data Communications and Networking", McGraw Hill Education, 5th Edition., 2012.
2. Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", 5th Edition, The Morgan Kaufmann Series, Elsevier, 2011.

REFERENCES:

1. J.F. Kurose and K.W.Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 6th Edition, Pearson Education, 2012.

2. William Stallings, "Data and Computer Communications", Pearson Education, 10th Edition, 2013.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Interpret the different building blocks of communication network and its architecture.	Understand
CO2	Contrast different types of switching networks and analyse the performance of network.	Apply
CO3	Identify and analyse error and flow control mechanisms in data link layer.	Apply
CO4	Understand subnetting, analyse the performance of network layer and examine various routing protocols.	Understand
CO5	Compare various congestion control mechanisms and identify appropriate transport layer protocol for real time applications.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO	3	3	3	-	-	-	-	-	-	-	-	-	-	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER IV

U19AD404	DESIGN AND ANALYSIS OF ALGORITHMS	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Data Structures

COURSE OBJECTIVES:

- To provide a mathematical foundation for analysing and proving the efficiency of an algorithm.
- To focus on the design of algorithms in various domains of computer engineering.
- To provide familiarity with main thrusts of work in algorithms sufficient to give some context for formulating and seeking known solutions to an algorithmic problem.

UNIT I INTRODUCTION TO ALGORITHMS AND ANALYSIS 9

Stages of algorithm development for solving a problem: Describing the problem – Identifying a suitable technique – Design of an algorithm – Proof of Correctness of the algorithm – Fundamentals of algorithm analysis – Space and time complexity of an algorithm – Types of asymptotic notations and orders of growth – Algorithm efficiency – best case, worst case, average case.

UNIT II ALGORITHM DESIGN TECHNIQUES 9

Brute force techniques – Travelling Salesman Problem, Divide and Conquer – Finding a maximum and minimum in a given array – Matrix multiplication: Strassen 's algorithm – Greedy techniques Huffman Codes and Data Compression – Fractional Knapsack problem.

UNIT III DYNAMIC PROGRAMMING AND BACKTRACKING 9

Dynamic programming – O/1 Knapsack Problem – Matrix chain multiplication, LCS, Travelling Salesman Problem – Backtracking N-Queens Problem – Knights Tour on Chess Board.

UNIT IV GRAPH ALGORITHMS 9

All pair shortest path – Floyd-Warshall Algorithm – Network Flows – Flow Networks – Maximum Flows – Ford-Fulkerson Algorithm – Push Re-label Algorithm – Minimum Cost Flows – Cycle Cancelling Algorithm.

UNIT V COMPLEXITY CLASSES 9

The Class P – The Class NP – Reducibility and NP-completeness – SAT (without proof) – 3-SAT – Vertex Cover – Independent Set – Maximum Clique.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: - Periods Total: 45 Periods

TEXTBOOKS:

1. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009.
2. Ravindra K. Ahuja, Thomas L. Magnanti, and James B. Orlin, —Network Flows: Theory, Algorithms, and Applicationsll, Pearson Education, 2014

REFERENCES:

1. Jon Kleinberg, ÉvaTardos, Algorithm Design, Pearson education, 2014.
2. Kurt Mehlhorn, and Peter Sanders – Algorithms and Data Sturctures The Basic Toolbox, Springer-Verlag Berlin Heidelberg, 2008.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Ability to use mathematical tools to analyse and derive the running time of algorithms and prove the correctness.	Understand
CO2	Formulate and discuss the major algorithm design paradigms.	Apply
CO3	Apply the dynamic and backtracking techniques to solve for real world problems	Apply
CO4	Compare the major graph algorithms and their analyses.	Apply
CO5	Discuss the hardness of real-world problems with respect to algorithmic efficiency	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	2	1	1
CO2	3	2	-	-	-	-	-	-	-	2	-	2	1	1
CO3	3	2	2	-	-	-	-	-	-	1	-	2	1	1
CO4	2	2	-	-	-	-	-	-	-	1	-	2	1	1
CO5	3	2	1	-	-	-	-	-	-	-	-	2	1	1
CO	2	2	2	-	-	-	-	-	-	1	-	2	1	1

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER IV

U19AD405	OBJECT ORIENTED SOFTWARE ENGINEERING	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide basic elements of software engineering principles, design and development.
- To impart the knowledge in UML artifacts for requirements gathering, analysis as well as design phases.
- To learn software design principles for software project development.

UNIT I INTRODUCTION TO SOFTWARE ENGINEERING 9

Introduction to Software Engineering - Software Development process models – Agile Process – Extreme Programming - Agile Process models - Object Oriented concepts, Principles and Methodologies

UNIT II MODELING 9

Requirements Elicitation – Functional requirement – Non-functional requirements – Basics of object, class, instance – Use case model – Activity diagram-SRS standards.

UNIT III ANALYSIS 9

Analysis Object models and Dynamic models – Entity – Boundary – Control Object – Analysis Activities: From use cases to Objects – Managing Analysis – Case Study

UNIT IV DESIGN 9

System Design Concepts – Identifying and Addressing design goals – Managing System design - Object Design: Reusing Pattern Solutions and Specifying interfaces – Case Study

UNIT V IMPLEMENTATION, TESTING AND QUALITY ASSURANCE 9

Mapping models to code – Forward and Reverse Engineering – Software Testing Concepts – Test Strategies and methods for conventional and object-oriented applications - Recent Trends in Software Design/Specialized Software Testing, Related Tools and Standards – Software Quality Assurance: Tasks, Goals and Metrics

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Roger. S. Pressman and Bruce R. Maxim, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw Hill, 2015.
2. Bernd Bruegge & Allen H. Dutoit, "Object-Oriented Software Engineering Using UML, Patterns, and Java", Third Edition, Prentice Hall, 2010.

REFERENCES:

1. Bing Ian Sommerville, "Software Engineering", 9th Edition, Addision-Wesley, 2016
2. Pankaj Jalote, "A Concise Introduction to Software Engineering", Springer, 2008.
3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable object-oriented software", Addison-Wesley, 1995.

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Understand the various software development process models and object-oriented concepts	Understand
CO2	Model the requirements for software projects using UML	Apply
CO3	Analyze the real-world problems	Understand
CO4	Develop an object-based software design adhering to design principles	Apply
CO5	Describe the role of software testing and quality assurance	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	1	2	1	1
CO2	3	3	-	-	-	-	-	-	-	-	2	3	1	1
CO3	3	3	-	-	-	-	-	-	-	-	2	3	1	1
CO4	3	2	3	-	-	-	-	-	-	-	2	3	1	1
CO5	3	2	2	3	-	-	-	-	-	-	3	3	1	1
CO	3	2	1	1	-	-	-	-	-	-	2	3	1	1

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER IV

U19AD406	MACHINE LEARNING LABORATORY	Category: PC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- U19CSG01 - Problem Solving using Python Programming

COURSE OBJECTIVES:

- To apply the concepts of Machine Learning to solve real-world problems
- To implement basic algorithms in clustering & classification applied to text & numeric data
- To implement algorithms related to dimensionality reduction

LIST OF EXPERIMENTS (INDICATIVE)

1. Using MNIST dataset implement Linear Regression, calculate Gradient and Cost minimum, along with line of best fit.
2. Understand Linear Regression and other regression techniques using house prices prediction dataset.
3. Use IRIS dataset to illustrate Logistic Regression i.e., the most famous dataset that contains 150 IRIS flowers.
4. Train an SVM Classifier on MINIST dataset, Since SVM classifier are binary you need to use one versus the rest to classify all 10 digits. Tune the hyperparameters using small validation sets to speed up the process. Show what accuracy you reached?
5. Train an SVM Regressor on California Housing Dataset. Show what Accuracy you reached?
6. Train and fine -tune a decision tree for MOONs Dataset by following these steps.
   (1) Use make-moons (n_samples= 1000 noise =0.4) to generate a moons dataset.
   (2) Use train_test_split() to split the dataset into training and testing dataset.
   (3) Use grid search with cross-validation to find good hyperparameter values for a DecisionTreeClassifier. Hint: Try various values for Max_leaf_nodes.
   (4) Show What accuracy you have reached.
7. Grow a forest by following these steps:
   (1) Generate 1000 subsets of MOONs Dataset each subset should contain 100 instances selected randomly. Hint: Use Scikit- ShuffleSplit class.
   (2) Evaluate these 1000 decision tree on the tests set. Since they were trained on smaller set, these Decision Trees will likely perform worse, Show the Accuracy.

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(3) Now comes the magic, For each test set instance, Generate the prediction of 1000 Decision Trees and keep only the most Frequent prediction use SciPy's Mode() function. This Approach gives you *Majority-vote prediction* over the test set.

(4) Evaluate these predictions on the test set: show the accuracy.

8. Load MNIST Dataset and train various classifiers like, random forest, Extra tree classifiers , SVM and try to combine them on Ensemble that outperform each individual classifier on the validation set, using soft or hard voting. Classify how much better does it perform as compared to Individual classifier.
9. Use t-SNE to reduce the MNIST dataset down to 2-dimesions and plot the results using Matplotlib. You can use scatterplot using 10 different colors to represent each image target class. Alternatively, you can replace each dot in the scatterplot with the corresponding instance's class. Plot scaled-down version of digits images also. Do the same for other reduction algorithms such as PCA, LLE or MDS and compare the resulting visualization.
10. Load the classic OLLIVETTI faces dataset split the dataset into a training set, a validation set and test set. Since dataset is small, you probably want to use Stratified sampling to ensure that there are same number of images per person, Next cluster the images using K-Mean. Now use K-mean as Dimensionality reduction tool, train the classifier on reduced set. Search for the number of clusters that allows the classifier to get the best performance.
11. Write a program for Artificial Neural Network on Aerial Cactus Dataset.
12. The TensorFlow Playground is a handy neural network simulator built by TensorFlow Team, by using TensorFlow train Deep MLP on MNIST dataset (using keras.datasets.minist.load_data()). Get all the performance measures and by growing the learning rate exponentially, plot the errors. Try adding all the bells and whistles—Save checkpoint, use early stopping and plot learning curves using Tensor Board.
13. Project Base

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 15 Periods Total: 15 Periods

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	To learn to use of PYTHON for implementing machine learning algorithms related to numeric data	Apply
CO2	To learn the application of machine learning algorithms for text data and Image data	Apply
CO3	To use dimensionality reduction algorithms for image processing applications	Apply
CO4	Use fundamental and advanced neural network algorithms for solving real-world data	Apply
CO5	Develop simple ML application	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1	2	-	2	3	2	3	2	3
CO2	3	3	2	2	3	1	2	-	2	2	2	2	2	3
CO3	3	3	3	2	3	1	2	-	2	2	2	2	2	3
CO4	3	3	2	2	3	1	2	-	2	2	2	2	2	3
CO5	3	3	2	2	3	-	2	-	2	2	2	2	2	3
CO	3	3	2	2	3	1	2	-	2	2	2	2	2	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER IV

		Category: PC			
U19AD407	WEB APPLICATION DEVELOPMENT LABORATORY	L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- U19CSG02 - Computational Thinking

COURSE OBJECTIVES:

- To implement the HTML and CSS designing concepts for webpage development.
- To learn client side scripting using JavaScript and server side scripting using PHP
- To develop simple web application.

LIST OF EXPERIMENTS

1. Create your own home page using PHP and HTML.
2. Create student record using PHP table and save the data in MySQL.
3. Create your Session and Cookies.
4. Create HTML Webpage using inline CSS, outline CSS, your own CSS library.
5. Embed your audio and video gallery in self introduction page of your webpage.
6. Create a login, registration form and validate the registration, user login, user profile and age using JavaScript.
7. Validate the form using PHP regular expression and store the data into database.
8. Develop a course registration website for students with the following:
   - User registration
   - User login
   - Home page with course registration form.
9. Create a shopping website of your choice.
10. Install PHP framework CakePHP 4 and connect it with MYSQL and HTML using MVC.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 15 Periods Total: 15 Periods

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COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Comprehend and analyse the concepts of web protocols and web architecture.	Apply
CO2	Develop interactive and data driven Web pages Using PHP form and MySQL.	Apply
CO3	Apply HTML and CSS effectively to create interactive and dynamic websites.	Apply
CO4	Implement client-side scripting using JavaScript.	Apply
CO5	Develop simple web application	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1	-	-	2	3	2	3	1	1
CO2	3	3	2	2	3	1	-	-	2	2	2	2	1	1
CO3	3	3	3	2	3	1	-	-	2	2	2	2	1	1
CO4	3	3	2	2	3	1	-	-	2	2	2	2	1	1
CO5	3	3	2	2	3	-	-	-	2	2	2	2	1	1
CO	3	3	2	2	3	1	-	-	2	2	2	2	1	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

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SEMESTER V

U19AD501	DEEP LEARNING AND ITS APPLICATIONS	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Problem Solving using Python Programming

COURSE OBJECTIVES:

- To present theoretical foundations, algorithms, methodologies, and applications of neural networks and deep Learning.
- To design and develop an application-specific deep learning models
- To apply the deep learning models in various real world applications

UNIT I INTRODUCTION TO DEEP LEARNING & ARCHITECTURES 9

Machine Learning Vs. Deep Learning – Representation Learning – Width Vs. Depth of Neural Networks – Activation Functions: RELU, LRELU, ERELU – Unsupervised Training of Neural Networks – Regularization – dropout – drop connect – optimization methods for neural networks – Adagrad, adadelta, rmsprop, adam, NAG.

UNIT II CONVOLUTIONAL NEURAL NETWORKS & TRANSFER LEARNING 9

Architectural Overview – Motivation - Layers – Filters – Parameter sharing – Regularization, Popular CNN Architectures: LeNet, ResNet, Vggnet, AlexNet – Transfer Learning Techniques – DenseNet, PixelNet.

UNIT III TRAINING NEURAL NETWORKS 9

Deep Learning Hardware and Software – CPUs, GPUs, TPUs, PyTorch, TensorFlow, Dynamic vs Static computation graphs – Data Pre-processing – Data Augmentation, batch normalization, Transfer Learning – Deep Transfer Learning Strategies, Update rules, hyperparameter tuning, Learning rate scheduling, variants of CNN – ResNet, GoogleNet, Xception.

UNIT IV SEQUENCE MODELLING RECURRENT AND RECURSIVE NETS 9

Recurrent Neural Networks – Bidirectional RNNs – Encoder – decoder — sequence to sequence architectures – Backpropagation Through Time for training RNN – Long Short Term Memory Networks.

UNIT V AUTO ENCODERS AND DEEP GENERATIVE MODELS 9

Under complete Autoencoders – Regularized Autoencoders – Sparse Autoencoders, Denoising Autoencoders, Representational Power, Layer, Size, and Depth of Autoencoders, Stochastic Encoders and Decoders – Contractive Encoders.
Deep Belief networks – Boltzmann Machines – Deep Boltzmann Machine - Generative Adversarial Networks.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2017.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017

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REFERENCES:

1. J Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012.
2. Ethem Alpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
3. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy, "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Understand the methods and terminologies involved in deep learning networks	Understand
CO2	Describe the various CNN architectures and its parameters	Understand
CO3	Explain the functions of hardware and software components of deep transfer learning networks.	Understand
CO4	Comprehend the encoder and decoder sequence of RNN and bidirectional RNN	Apply
CO5	Develop deep learning models to encode the original data and reconstruct data	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	2	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	3
CO4	3	2	3	3	-	-	-	-	-	-	-	2	3	2
CO5	3	2	3	3	-	-	-	-	-	-	-	2	3	2
CO	3	2	2	2	-	-	-	-	-	-	-	2	3	2

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER V

U19AD504	NATURAL LANGUAGE PROCESSING	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Machine Learning
- Deep Learning

COURSE OBJECTIVES:

- To understand syntactic and semantic elements natural language processing.
- To acquire knowledge in basics of knowledge representation and inference.
- To understand the ideas of subjectivity and sentiment analysis.

UNIT I INTRODUCTION 9

Applications of NLP techniques and key issues - MT - grammar checkers – dictation - document generation - NL interfaces - Natural Language Processing key issues - The different analysis levels used for NLP: morpho-lexical - syntactic – semantic - pragmatic - markup (TEI, UNICODE) - finite state automata - Recursive and augmented transition networks – open problems.

UNIT II LEXICAL LEVEL 9

Error-tolerant lexical processing (spelling error correction) - Transducers for the design of morphologic analyzers Features - Towards syntax: Part-of-speech tagging (Brill, HMM) - Efficient representations for linguistic resources (lexica, grammars) tries and finite-state automata.

UNIT III SYNTACTIC LEVEL 9

Grammars (e.g. Formal/Chomsky hierarchy, DCGs, systemic, case, unification, stochastic) - Parsing (top- down, bottom-up, chart (Earley algorithm), CYK algorithm) - Automated estimation of probabilistic model parameters (inside-outside algorithm) - Data Oriented Parsing - Grammar formalisms and treebanks - Efficient parsing for context-free grammars (CFGs).

UNIT IV SEMANTIC LEVEL 9

IPV4 Address Space – Notations – Classful Addressing – Classless Addressing – Network Address Translation – IPv6 Address Structure – IPv4 and IPv6 header format – Routing – Link State and Distance Vector Routing Protocols.

UNIT V NATURAL LANGUAGE GENERATION 9

ontent determination - sentence planning - surface realization. ubjectivity and sentiment analysis: Information extraction - Automatic ummarization - Information retrieval and Question answering - Named entity recognition nd relation extraction - IE using sequence labeling - Machine translation: Basic issues in IT - Statistical translation - word alignment - phrase-based translation and synchronous rammars.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. Daniel Jurafsky and James H. Martin, —Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognitionll, Prentice Hall, 2009.
2. Ian H. Witten and Eibe Frank, Mark A. Hall, —Data Mining: Practical Machine Learning Tools and Techniquesll, Morgan Kaufmann, 2013.

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REFERENCES:

1. Christopher Manning and Hinrich Schütze, —Foundations of Statistical Natural Language Processingll, MIT Press, 2008.
2. James Allen, —Natural Language Understandingll, Addison Wesley, 1995. Steven Bird, Ewan Klein, and Edward Loper, —Natural Language Processing with Python - Analyzing Text with the Natural Language Toolkitll, O'Reilly Media, Sebastopol, 2009.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Understand and explain the approaches for syntax and semantics in NLP.	Understand
CO2	Understand the concepts of morphology, syntax, semantics and pragmatics of the language.	Understand
CO3	Apply machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars.	Apply
CO4	Analyse the current methods for statistical approaches to machine translation.	Analyze
CO5	Compare and contrast the clustering and unsupervised methods, log-linear and discriminative models and the EM algorithm as applied within NLP.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO	3	3	3	-	-	-	-	-	-	-	-	-	3	3

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER V

U19AD503	KNOWLEDGE REPRESENTATION	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce basic concepts in knowledge representation, reasoning and its role in artificial intelligence
- To model simple application domains in a logic-based language and enable students to design and apply knowledge-based systems
- To learn the logics underlying ontology-based technologies and knowledge systems

UNIT I PROPOSITIONAL AND FIRST ORDER LOGICS 9

Principles of knowledge representation – Propositional Logic – Proof Systems – Natural Deduction, Tableau Method – Resolution Method First Order Logic Syntax and Semantics – Unification – Forward Chaining – Horn Fragments of First Order Logic

UNIT II RULE-BASED SYSTEMS 9

Rule based systems – The Rete Algorithm – Rete example – Programming Rule Based Systems

UNIT III DESCRIPTION LOGIC 9

Description Logics – Reasoning in Description Logics – Structure Matching – Classification, Extensions of DL – The ALC Language

UNIT IV ONTOLOGY REPRESENTATION LANGUAGES AND OWL 9

Ontology Languages – RDF – RDFS-Rule Interchange Format OWL – Building OWL ontology – SPARQL – RDF/OWL ontology processing using Graph databases.

UNIT V NON MONOTONIC LOGICS 9

Classical vs non-monotonic logic – Ways to achieve non – Monotonicity-Stable Model – Semantics querying Semantic Nets and Frames – Contemporary Issues

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXTBOOKS:

1. An Introduction to Description Logic. Franz Baader, Ian Horrocks, Carsten Lutz, Uli Sattler, Cambridge University Press, 2017.
2. Knowledge Representation and Reasoning by Ronald Brachman & Hector Levesque, Morgan Kaufmann 2004.

REFERENCES:

1. Foundations of Semantic Web Technologies. Chapman & Hall/ CRC Textbooks in Computing. Pascal Hitzler, Markus Kroetsch, and Sebastian Rudolph, 2009.
2. The Description Logic Handbook: Theory, Implementation, and Applications. F. Baader, D. Calvanese, D. McGuinness, D. Nardi, and P. F. Patel-Schneider. Cambridge University Press, 2003.
3. Logic for Computer Scientists. Uwe Schoning. Modern Birkäuser Classics, Reprint of the 1989 edition

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Use logic programming and knowledge representation languages for modelling simple application domains in Artificial Intelligence.	Understand
CO2	Explain the various rule based knowledge representation systems.	Understand
CO3	Demonstrate the different description logics for real world problems.	Apply
CO4	Design ontology based knowledge systems with reasoning mechanism.	Apply
CO5	Describe the various classical and non-monotonic logics.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO4	3	2	3	3	-	-	-	-	-	-	-	3	3	2
CO5	3	2	3	3	-	-	-	-	-	-	-	3	3	2
CO	3	2	2	2	-	-	-	-	-	-	-	3	3	2

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER V

U19AD502	IOT FUNDAMENTALS	Category: PC			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart knowledge on the infrastructure, sensor technologies and networking technologies of IoT.
- To analyse, design and develop IoT solutions.
- To apply the concept of Internet of Things in the real-world scenarios.

UNIT I INTRODUCTION 6

IT-ITeS/BPM Industry – An Introduction, the relevance of the IT-ITeS sector – Future Skills – An Introduction – General overview of the Future Skills sub-sector – Evolution of IoT and the trends – Impact of IoT on businesses and society – Existing IoT use cases and applications across industries.

UNIT II IOT SECURITY AND PRIVACY 6

Security and privacy risks – analyze security risks – Technologies and methods that mitigate security – Privacy standards and regulations – Social and privacy impacts.

UNIT III IOT SOLUTIONS 6

IoT use case development – Need and Goals for IoT solution – Adoption of IoT solutions – Planning for IoT Solution: Evaluate costs – competition – technology challenges and internal resource considerations – Need for stakeholder buy-in.

UNIT IV PROTOTYPING THE PILOT EXECUTION 6

Prototype developing Stages – deploy real-time UI/UX visualizations – Methods and metrics to analyze and convey business outcomes – feedback and data obtained from execution.

UNIT V SCALABILITY OF IOT SOLUTIONS 6

Roadmap for developing complete IoT solutions – Strategies for implementation – key Milestone – Scalability of IoT Solutions – Methods – platforms and tools – Web and Mobile Interfaces.

LIST OF EXPERIMENTS

1. Measure the light intensity in the room and output data to the web API.
2. Control your home power outlet from anywhere using raspberry pi.
3. Build a web-based application to automate door that unlocks itself using facial recognition.
4. Drinking water monitoring and analytics, consists of IoT device, cloud, and mobile and web app.
5. Smart Parking System.
6. IoT based Healthcare application
7. Real-time environmental monitoring and weather prediction
8. Traffic pattern prediction
9. Smart Street light
10. Plant health monitoring

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

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TEXTBOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A hands-on Approach", University Press, 2015.
2. Adrian McEwen & Hakim Cassimally, "Designing the Internet of Things", Wiley,Nov 2013, (1 st edition).
3. Claire Rowland, Elizabeth Goodman, Martin Charlier, Ann Light, Algred Lui," Designing Connected Products: UX for the consumer internet of things", O'Reilly, (1 st edition),2015.

REFERENCES:

1. Rethinking the Internet of things: A Scalable Approach to Connecting Everything by Francis daCosta, Apress, 2014.
2. Learning Internet of Things by Peter Waher, Packt Publishing, 2015.
3. Designing the Internet of Things, by Adrian Mcewen, Hakin Cassimally, Wiley India Private Limited.

COURSE OUTCOMES:

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

COs	Statements	K-Level
CO1	Identify the main component of IoT.	Understand
CO2	Understand the security and privacy risks in IoT.	Understand
CO3	Program the controller and sensor as part of IoT	Apply
CO4	Understand the prototyping stages and analyze business outcomes.	Understand
CO5	Assess different IoT technologies and their applications	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	2	1	1
CO2	3	2	2	2	-	-	-	-	-	2	-	2	1	1
CO3	2	2	2	2	2	-	-	-	-	1	-	2	1	1
CO4	2	2	-	-	-	-	-	-	-	1	-	2	1	1
CO5	3	2	2	2	-	-	-	-	-	-	-	2	1	1
CO	2	2	2	2	2	-	-	-	-	1	-	2	1	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

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SEMESTER V

U19AD506	DEEP LEARNING LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Machine Learning

COURSE OBJECTIVES:

- To Identify and apply suitable deep learning approaches for given application
- To solve real world applications using Deep learning.

LIST OF EXPERIMENTS

1. Demonstration and implementation of Shallow architecture using Python, Tensor flow and Keras
   a. Google Collaboratory - Cloning GitHub repository, Upload Data, Importing Kaggle's dataset, Basic File operations
   b. Implementing Perceptron,
   c. Digit Classification: Neural network to classify MNIST dataset
2. Convolution Neural Network application using Tensorflow and Keras.
   a. Classification of MNIST Dataset using CNN
   b. Face recognition using CNN
3. Object detection using Transfer Learning of CNN architectures
4. Image denoising (Fashion dataset) using Auto Encoders
5. Handling Color Image in Neural Network Aka Stacked Auto Encoders (Denoising)
6. Text processing, Language Modeling using RNN
7. Time Series Prediction using RNN
8. Sentiment Analysis using LSTM
9. Image generation using GAN

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

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

Cos	Statements	K-Level
CO1	Implement the Shallow architecture using Python, Tensor flow and Keras	Apply
CO2	Apply the Convolution Neural Network on computer vision problems	Apply
CO3	Demonstrate the Deep Learning Models in the field of Natural Language Processing	Apply
CO4	Exhibit the Autoencoder algorithms for encoding the real-world data	Apply
CO5	Apply Generative Adversarial Networks for image generation	Apply

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COURSE ARTICULATION MATRIX:

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	3	-	-	-	2	3	2	2	2	3
CO2	2	3	3	3	3	-	-	-	2	3	2	2	2	3
CO3	2	3	3	3	3	-	-	-	2	3	2	2	2	3
CO4	2	3	3	3	3	-	-	-	2	3	2	2	2	3
CO5	2	3	3	3	3	-	-	-	2	3	2	2	2	3
CO	2	3	3	3	3	-	-	-	2	3	2	2	2	3
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)					3: Substantial (High)				

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SEMESTER V

U19AD507	NATURAL LANGUAGE PROCESSING LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Machine Learning

COURSE OBJECTIVES:

- To apply the concepts of machine learning to solve NLP problems
- To implement word related problems in NLP using machine learning algorithms.
- To implement sentiment analysis.

LIST OF EXPERIMENTS

1. Implementing word similarity.
2. Implementing simple problems related to word disambiguation.
3. Simple demonstration of part of speech tagging.
4. Implementing spelling error correction in any document using lexical processing.
5. Implementing the automated estimation of probabilistic model parameters using inside-outside algorithm.
6. Implementation of semantic role labelling and semantic parsing.
7. Implementation of information retrieval and question answering using sentiment analysis.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

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

Cos	Statements	K-Level
CO1	Use python for implementing machine learning algorithms related to the implementation of NLP.	Apply
CO2	Apply the machine learning algorithms for text related NLP problems.	Apply
CO3	Use lexical analyser for part-of-speech tagging	Apply
CO4	Estimation of probabilistic model parameters using semantic analyzer.	Apply
CO5	Perform sentimental analysis for information retrieval and question answering.	Apply

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COURSE ARTICULATION MATRIX:

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1	-	-	2	3	2	3	3	3
CO2	3	3	2	2	3	1	-	-	2	2	2	2	3	3
CO3	3	3	3	2	3	1	-	-	2	2	2	2	3	3
CO4	3	3	2	2	3	1	-	-	2	2	2	2	3	3
CO5	3	3	2	2	3	-	-	-	2	2	2	2	3	3
CO	3	3	2	2	3	1	-	-	2	2	2	2	3	3
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)					3: Substantial (High)				

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