HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)
CHENNAI

B.Sc. Artificial Intelligence and Data Analytics

(Duration: 3 Years)

CURRICULUM and SYLLABI

(Applicable for Students admitted from Academic Year 2022-23)

DEPARTMENT OF COMPUTER APPLICATIONS

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

Motto:

To Make Every Man a Success and No Man a Failure

Vision:

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

Mission:

- *To create an ecosystem that promotes learning and world class research.*
- *To nurture creativity and innovation.*
- *To instill highest ethical standards and values.*
- *To pursue activities for the development of the Society.*
- *To develop national and international collaborations with institutes and industries of eminence.*
- *To enable graduates to become future leaders and innovators.*

Value Statement:

Integrity, Innovation, Internationalization.

DEPARTMENT OF COMPUTER APPLICATIONS

Vision:

The department of Computer Applications aims to transform aspiring students into software professionals with a high degree of technical skills and to inculcate a research mind set.

Mission:

- *To provide strong theoretical foundations complemented with extensive practical training.*
- *To design and deliver curricula to meet the changing needs of industry.*
- *To establish strong collaborations with industry, R&D and academic institutes for training and research.*
- *To promote all-round development of the students through interaction with alumni and industry*

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The Program Educational Objectives (PEOs) of the Computer Applications are listed below:

PEO1. To prepare graduates to be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms

PEO2. To prepare graduates to achieve peer-recognition, as an individual and as a team player, through demonstration of good analytical, design, implementation and interpersonal skills.

PEO3. To prepare graduates to contribute to society as broadly educated, expressive ethical and responsible citizens with proven expertise

PEO4. To prepare graduates to pursue life-long learning to fulfil their goals.

PROGRAMME'S OUTCOMES(PO'S):

At the end of this program, graduates will be able to

1. ***Computer knowledge**: Apply the knowledge of mathematics, computer Fundamentals to IT applications.*
2. ***Design/Development of solutions:** Design solutions for IT applications using latest technologies and develop and implement the solutions using various latest languages.*
3. ***Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex IT applications with an understanding of the limitations.*
4. ***Environment and sustainability**: Understand the impact of the IT analyst solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.*
5. ***Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.*
6. ***Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.*

PROGRAMME'S SPECIFIC OUTCOMES (PSO'S):

At the end of this program, graduates will be able to execute the outcomes defined by Professional body.

***PSO-1:** Demonstrate the knowledge of human cognition, Artificial Intelligence and Data Analytics, effectively and efficiently complete the responsibilities assigned to in accordance with the expected quality standards.*

***PSO-2:** Implement critical thinking and technical abilities acquired in the field of Artificial Intelligence and Data Analytics.*

***PSO-3:** Design and create project-based solutions for challenging problems in the*

Artificial Intelligence and Data Analytics industries while keeping public health, safety, cultural, socioeconomic, and environmental concerns in mind.

B.Sc. Artificial Intelligence and Data Analytics
Curriculum

SEMESTER I									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	BS	CEL01001	English	3	0	0	3	0	3
2	BS	CMA01001	Statistics and Probability	3	1	0	4	0	4
3	PC	CAD01001	Introduction to Artificial Intelligence	3	0	2	4	0	5
4	PC	CAD01002	Data Structures	3	0	2	4	0	5
5	PC	CAD01003	Python Programming	3	0	2	4	0	5
PRACTICAL									
6	PC	CAD01400	Data Pre-Processing Laboratory	0	0	4	2	0	4
Total				**15**	**1**	**11**	**21**	**0**	**27**
L – Lecture; T – Tutorial; P – Practical; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER II									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	CAD01004	Design and Analysis of Algorithms	3	1	0	4	0	4
2	PC	CAD01005	Machine Learning Techniques	3	0	2	4	0	5
3	PC	CAD01006	Data Warehousing and Data Mining	3	0	2	4	0	5
4	PC	CAD01007	Data Analysis Techniques	3	0	2	4	0	5
5	PC	CAD01008	R Programming	3	0	2	4	0	5
PRACTICAL									
6	PC	CAD01401	Data Modelling Laboratory	0	0	4	2	0	4
Total				**15**	**1**	**12**	**22**	**0**	**28**
L – Lecture; T – Tutorial; P – Practical; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER III									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	CAD01009	Computer Vision	3	0	2	4	0	5
2	PC	CAD01010	Business Intelligence	3	0	2	4	0	5
3	PC	CAD01011	Search Engine Optimization	3	0	2	4	0	5
4	PC	CAD01012	Fundamentals of IoT	3	0	2	4	0	5
5	PC	CAD01013	Data Visualization Techniques	3	1	0	4	0	4
PRACTICAL									
6	PC	CAD01402	Data visualization Laboratory	0	0	4	2	0	4
Total				**15**	**1**	**12**	**22**	**0**	**28**
L – Lecture; T – Tutorial; P – Practical; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER IV									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	CAD01014	Big Data Analytics	3	0	2	4	0	5
2	PC	CAD01015	Deep Learning	3	0	0	3	0	3
3	PC	CAD01016	Mobile Application Development	3	0	2	4	0	5
4	DE	CAD0105*	Elective-I	3	0	0	3	0	3
5	DE	CAD0105*	Elective-II	3	0	0	3	0	3
PRACTICAL									
6	PC	CAD01403	Deep Learning Laboratory	0	0	4	2	0	4
Total				**15**	**0**	**8**	**19**	**0**	**23**
L – Lecture; T – Tutorial; P – Practical; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER V									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	CAD01017	Cognitive Computing	3	0	2	4	0	5
2	PC	CAD01018	Digital Marketing	3	0	2	4	0	5
3	DE	CAD0105*	Elective III	3	0	0	3	0	3
4	DE	CAD0105*	Elective IV	3	0	0	3	0	3
PRACTICAL									
5	PC	CAD01800	Mini Project	0	0	10	5	0	10
Total				**12**	**0**	**14**	**19**	**0**	**26**
L – Lecture; T – Tutorial; P – Practical; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER VI									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	CAD01019	Predictive Analytics	3	0	2	4	0	5
2	DE	CAD015**	Elective V	3	0	0	3	0	3
PRACTICAL									
3	PC	CAD01801	Project Work	0	0	20	10	0	20
Total				**6**	**0**	**22**	**17**	**0**	**28**
L – Lecture; T – Tutorial; P – Practical; C – Credit; S- Self Study; TCH- Total Contact Hours									

Total Credits: 120

LIST OF DEPARTMENTAL ELECTIVES WITH GROUPING - SEMESTER WISE

SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
ELECTIVE-I									
4	DE	CAD01500	Augmented and Virtual Reality	3	0	0	3	0	3
4	DE	CAD01501	Natural Language Processing	3	0	0	3	0	3
ELECTIVE-II									
4	DE	CAD01502	Gaming Technology	3	0	0	3	0	3
4	DE	CAD01503	Artificial Intelligence and Block chain	3	0	0	3	0	3
ELECTIVE-III									
5	DE	CAD01504	IoT Analytics	3	0	0	3	0	3
5	DE	CAD01505	Robotics and Automation	3	0	0	3	0	3
ELECTIVE-1V									
5	DE	CAD01506	Web Analytics	3	0	0	3	0	3
5	DE	CAD01507	Reinforcement Learning	3	0	0	3	0	3
ELECTIVE V									
6	DE	CAD01508	Social Media Analytics	3	0	0	3	0	3
6	DE	CAD01509	Cyber Analytics	3	0	0	3	0	3

SEMESTER-1

COURSE TITLE		ENGLISH			CREDITS	3
COURSE CODE		CEL01001	COURSE CATEGORY	CF	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course has been designed to develop students' language skills and communication needs. It attempts to develop their proficiency through oral communication skills with an application knowledge of grammar and vocabulary. This course teaches students how to communicate accurately, appropriately and fluently in professional and social situations.
Course Objective	1. To acquire self-confidence by which the learner can improve upon their informative listening skills by an enhanced acquisition of the English language 2. To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate 3. To equip the students to read intensively and extensively, short meaningful extracts from literary and non-literary texts and identify various types of connections among statements 4. To enhance the oral communication skills of the students via functions in clusters and respond to daily conversations naturally 5. To equip the learners in develop critical thinking skills and participate in Group activities, task-based activities and respond to hypothetical situations
Course Outcome	Upon completion of this course, the students will be able to 1. Apply the basic knowledge to upgrade from grammatical competence to communicative competence. 2. Develop skills by listening to speeches, lectures, telephone conversations, recorded versions of all the above, and responding non-verbally as well as verbally 3. Develop conscious awareness about the processes of metacognitive skills by considering societal and environmental contexts 4. Apply and analyse the contextual knowledge through reading the passages and participate in group activities and task-based activities 5. Identify his/her choicest field or specialized area through wide reading such as science fiction, crime thriller and so on by applying ethical principles and contributing to society

Prerequisites: Basic English

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	-	-	-	1	1	-

CO-2	-	-	-	-	-	-	-	-	-
CO-3	**1**	-	**2**	-	-	**2**	**1**	-	**2**
CO-4	-	-	-	-	-	**1**	-	-	-
CO-5	-	-	-	**1**	**1**	**2**	-	**1**	**1**
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: EXTENSIVE READING	**(9L)**
Reading short meaningful extracts from literary and non-literary texts and identifying various types of connections among statements such as reason-result, statement-illustration, cause-effect, result-reason, addition, contradiction/opposite, introduction, furthering, adding, summing up, conclusion - Tracing the texture of texts — Referencing -- Anaphoric and cataphoric references — Identifying relationships between topic sentences and subordinate sentences **Suggested Activities:** Reading leading to making notes—Random note making—Systematizing conventions **Suggested Reading:** 1. Cambridge Academic English, An integrated skills course for EAP by Martin Hewing and Craig Thaine, by Cambridge University Press, 2014 2. Professional Speaking Skills by ArunaKoneru, Oxford Press, 2015	**CO-1** **BTL-3**
MODULE 2 – INTENSIVE READING	**(9L)**
Matching discourse functions with corresponding linguistic structures — one function carried out through several structures — one structure fulfilling several functions - Cohesion and cohesive markers — Coherence and grammatical linkers -Reading newspapers at breakfast table — Reading publicity materials – Skimming – Reading quickly for grasping the main idea or point — Scanning — Reading carefully, looking for specific information — Railway timetable — medical prescription — textbooks — cover letters accompanying important documents - Reading and Note making — Purposes of note making -- Various formats of making notes — Short forms and abbreviations — commonly used and personal conventions **Suggested activities:** Non-literary texts for comparison and contrast -- Identifying words, phrases, idioms, phatic communion phrases, formulaic expressions etc. (which suits day to day communication) from reading materials and using them appropriately in one's own use **Suggested sources:** 1. (Listening and Speaking Modules) – Language Lab 2. Professional Speaking Skills by ArunaKoneru, Oxford Press	**CO-2** **BTL-3**
MODULE – 3 :CRITICAL THINKING	**(9L)**
Identifying differences and similarities between pairs of pictures, illustrations, diagrams etc. and talking about them by working in pairs and small groups - Defining 'argument' — Components of an argument: reason and conclusion — illustrating arguments — Identifying arguments from a set of statements and identifying their components **Suggested Activities:** Developing critical thinking skills through visuals (print and electronic), Choose the best responses from the statements, Group activities, task-based activities, responses to hypothetical situations **Suggested sources:**	**CO-3** **BTL-3**

1. Essential English Grammar by Raymond Murphy, Cambridge University Press, 2016 edition 2. Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.	
MODULE – 4 :ORAL COMMUNICATION SKILLS	**(9L)**
Functions in clusters: Cluster 1**.** Inviting, responding with thanks, accepting invitation/declining - invitation with a valid reason, promising to meet on a later occasion, taking leave & bidding farewell 2. Apologizing, explaining reason, promising not to repeat the mistake, reassuring, taking leave - 3. Correcting someone, defending the right point or stance, convincing the other etc. - 4. Greeting, appreciating something good, illustrating the point further, Complimenting - 5. Complaining, defending logically, demanding things to be set right, and producing proof or evidence - Examples in the form of short recorded extracts of direct interactions as well as telephone conversations from various walks of life such as office work, business, advertisement, law court, police, various service providers such as gas agency, door delivery agency and so on **Suggested activities:** Listening to small meaningful chunks of day-to-day communication and responding to them naturally -- Greetings, formulaic expressions etc. Identifying and listing natural ways of functioning in contexts, based on short extracts taken from plays, or dialogues from fiction. **Suggested sources:** 1. Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.	**CO-4** **BTL-3**
MODULE 5 – FUNCTIONAL GRAMMAR	**(9L)**
Sentence – Parts of Speech – Comparative Adjectives - Pronouns – prepositions – conjunctions – Articles – Non-finite Verbs - tenses – conditionals – question tags – modal verbs – common errors – concord – Reported speech – Active & Passive voice **Suggested Activities:** Exercises related to grammatical aspects and its function in functional English (day to day conversations) **Suggested Sources:** 1. Essential English Grammar by Raymond Murphy, Cambridge University Press, 2016 edition	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Sabina Pillai and Agna Fernandez (2018), *Soft Skills & Employability Skills* ,Cambridge University Press.
2	Dolly John(2014), "*English for Life and the Workplace through LSRW&T skills*", Pearson Publications.
REFERENCE BOOKS	
1	Steve Hart et al(2016*), English for Undergraduates* Cambridge University Press
E BOOKS	
1	https://www.britishcouncil.in/english/courses-business
2	http://www.bbc.co.uk/learningenglish/english/features/pronunciation
MOOC	
1	https://www.mooc-list.com/tags/english

2	https://www.mooc-list.com/course/adventures-writing-stanford-online

COURSE TITLE	STATISTICS AND PROBABILITY		CREDITS	4
COURSE CODE	CMA01001	COURSE CATEGORY	CF	L-T-P-S	3-1-0-0
VERSION 1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course aims to provides the mathematical concepts in Data Science. Probability and Statistics form the basis of Data Science. The probability theory is very much helpful for making the prediction. Thus, statistical methods are largely dependent on the theory of probability
Course Objective	1. To understand the concepts of Statistics Methods and data collection 2. To understand the concepts of Probability and types of distribution 3. To learn simple correlation and Regression analysis 4. To analysis Sampling inference and testing of hypothesis 5. To Understand time series and forecasting problems in statistical data
Course Outcome	Upon completion of this course, the students will be able to 1. Study the concepts of Statistics method to compute averages for statistics data 2. Identify probability value of real-life situation problem by using Probability and distribution concepts 3. Analyze the casual relation between two variables by using correlation and regression methods 4. Analyze the significance difference between Null and Alternative Hypothesis for statistical data 5. Recognize the trends between two statistical data by using time series method and solution of forecasting problems.

Prerequisites: Basics of Statistics and Probability

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	-	1	-	2	2	-
CO-2	2	1	1	-	-	1	-	-	1
CO-3	2	1	1	1	-	-	-	1	-
CO-4	2	1	-	-	1	1	1	-	-
CO-5	2	2	1	-	-	-	-	-	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: STATISTICAL METHODS (9L+3T)

Introduction to statistics and Data collection – Summarizing and presenting statistical Data – Measures of central tendency – Measures of variation –	**CO-1 BTL-2**

Measures of skewness and kurtosis	
MODULE 2: PROBABILITY AND DISTRIBUTION	**(9L+3T)**
Introduction – Definition of Probability – Basic concepts – Addition law of probability or Theorem of total probability – conditional probability – Bayes' theorem. Random variable – MGF – Distributions - Binomial - Poisson – Uniform – Normal	**CO-2** **BTL-3**
MODULE 3: SIMPLE CORRELATION AND REGRESSION ANALYSIS	**(9L+3T)**
Introduction – correlation analysis – simple correlation analysis – Rank correlation – Regression analysis	**CO-3** **BTL-3**
MODULE 4: SAMPLING INFERENCE AND TESTING OF HYPOTHESIS	**(9L+3T)**
Introduction – Parameters & Statistics – Statistical Inference – Testing of Hypothesis – Null & alternative Hypothesis – LOS- Test of significance of large and small samples – student's t-distribution – Chi – square test – F-distribution.	**CO-4** **BTL-3**
MODULE 5: TIME SERIES AND FORECASTING	**(9L+3T)**
Introduction – Variation in Time series – Trend analysis – cyclical variation – seasonal variation – irregular variation – A problem involving all 4 components of time series – Forecasting.	**CO-5** **BTL-3**

TEXT BOOKS	
1	Richard I. Levin, David S. Rubin(2017) ,*Statistics for Management*, Pearson Education Prentice -Hall 8th Edition.
2	T. Veerarajan(2009), *Probability, Statistics and Random Processes*– McGraw hill, Third Edition.
3	Dr.B.S. Grewal(2017), *Higher Engineering Mathematics*, Khanna Publishers, 42nd Edition.
REFERENCE BOOKS	
1.	C Fernandez Granda(2017)-*Probability and Statistics for Data Science*-New York.
E BOOKS	
1.	https://cims.nyu.edu/~cfgranda/pages/stuff/probability_stats_for_DS.pdf
2	https://www.theinsaneapp.com/2020/12/free-data-science-books-pdf.html
MOOC	
1.	https://www.udemy.com/course/statistics-for-data-science-and-business-analysis
2.	https://www.coursera.org/courses?query=statistics%20for%20data%20science

COURSE TITLE	INTRODUCTION TO ARTIFICIAL INTELLIGENCE		CREDITS	4
COURSE CODE	CAD01001	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version 1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course aims to provide the basic concepts of AI and its application
Course Objective	1. To demonstrate the fundamental understanding and history of AI 2. To apply problem solving skills using the problem-solving methods of AI. 3. To demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents 4. To understand the expert systems, artificial neural networks and other machine learning models 5. To understand the applications of AI
Course Outcome	Upon completion of this course, the students will be able 1. Demonstrate the fundamental understanding and history of AI 2. Apply problem solving skills using the problem-solving methods of AI. 3. Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, 4. Explain the expert systems, artificial neural networks and other machine learning models 5. Describe the applications of AI

Prerequisites: Algorithms

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	1	2	-	-	-	2	3	3
CO-2	3	-	2	1	2	-	2	2	2
CO-3	2	1	-	-	2	1	2	2	2
CO-4	2	1	2	-	-	-	2	2	2
CO-5	2	-	3	-	3	-	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO AI	**(9L+3P)**
Introduction to AI, Application, AI future, Intelligent Agents, Typical Intelligent Agents, Problem Solving Approach to Typical AI Problems **Practical Component:** 1.Write a python program to implement simple Chatbox 2. Write a python program to for Text Classification in the given sentence	**CO-1 BTL-3**
MODULE 2: PROBLEM SOLVING METHODS	**(9L+3P)**
Formulating Problems, Search Strategies, Uninformed and Informed, Heuristics, Local Search Algorithms and Optimization Problems, Searching	**CO-2 BTL-3**

with Partial Observations, Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search, Game Playing, Optimal Decisions in Games, Alpha – Beta Pruning, Stochastic Games. **Practical Component:** 1.Write a Program to Implement Breadth First Search using Python 2. Write a Program to Implement Tic-Tac-Toe game using Python	
MODULE 3: KNOWLEDGE REPRESENTATION (9L+3P)	
Introduction, Formal Logics, Propositional Logic, First order Logic, Rule based system, Representation in FOL, Logic programming using Prolog, Knowledge Engineering, Ontological Engineering, FOL inference **Practical Component:** 1.Write a python script to Verify whether a line segment is horizontal, vertical or oblique 2.Write a python script to represent the list and perform the basic operations on prolog such as Insert, delete, update, append.	**CO-3** **BTL-3**
MODULE 4: SOFTWARE AGENTS	**(9L+3P)**
Introduction, Reasoning Systems for Categories, Reasoning with Default Information, Software Agents, Architecture for Intelligent Agents, Agent Communication, Negotiation and Bargaining, Argumentation among Agents, Trust and Reputation in Multi-agent Systems **Practical Component :** 1.Write a Program to Implement Water-Jug problem using Python 2. Write a python program to implement simple Chatbox	**CO-4** **BTL-3**
MODULE 5: EXPERT SYSTEMS	**(9L+3P)**
Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems – MYCIN, DART, XOON, Expert systems shells. **Practical Component:** 1 Implement the five components of the expert systems 2 Case study on MYCIN-An expert system	**CO-5** **BTL-3**
TEXT BOOKS	
1.	S. Russell and P. Norvig(2009), —*Artificial Intelligence: A Modern Approach*‖, Prentice Hall, Third Edition.
2.	I. Bratko(2011), - *Prolog: Programming for Artificial Intelligence*, Fourth Edition, Addison-Wesley Educational Publishers Inc.
REFERENCE BOOKS	
1.	M. Tim Jones(2008), - *Artificial Intelligence: A Systems Approach* (Computer Science), Jones and Bartlett Publishers Inc.; First Edition.
2.	William F. Clocksin and Christopher S Mellish(2003), *Programming in Prolog*: Using the ISO Standard, Fifth Edition, Springer.
E BOOKS	
1.	https://www.cin.ufpe.br/~tfl2/artificial-intelligence-modern-approach.9780131038059.25368.pdf
MOOC	
1	https://nptel.ac.in/courses/112103280

COURSE TITLE	DATA STRUCTURES		CREDITS	4
COURSE CODE	CAD01002	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course describes basic data structures, arrays, heaps etc. Also, this course builds the knowledge in the graphs, algorithm, creation, deletion, insertion. Briefs the idea about developing the projects in the data structures.
Course Objective	1 To develop the knowledge in the basic designing of algorithms 2 To apply the concept of algorithms for the creation, insertion, deletion, searching, and sorting of each data structure. 3 To understand the concept of Sort, arrays, linked lists etc. 4 To define the idea of graphs and its traversal. 5 To develop the implementation knowledge in the projects.
Course Outcome	Upon completion of this course, the students will be able to 1. Analyze and compute the problem complexity. 2. Define the concept of basic data structures such as stacks, arrays, linked lists, binary trees. 3. Analyze the problems by applying suitable data structures with the algorithms for the creation, insertion, deletion, searching, and sorting of each data structure. 4. Build graphs and illustrate graph traversals. 5. Define and design projects and implement data structures concepts.

Prerequisites: Fundamentals of Programming language

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	-	-	-	1	-	-
CO-2	3	3	3	1	2	-	1	1	-
CO-3	2	3	3	-	2	1	1	-	1
CO-4	2	-	3	1	-	-	1	-	-
CO-5	2	-	3	-	3	-	-	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9L+3P)

Introduction to Data structures – Algorithms - Algorithm Specifications - Performance analysis – Space Complexity – Time Complexity - Asymptotic Notations – Elementary of Data structures – Stack and Queue - Linked lists - Singly Linked List - Doubly linked list - Linked list-based implementation of Stacks. **Practical component:** 1 Write a C program using functions to perform the following: a) Create a singly linked list of integers. b) Delete the given integer from the above linked list. c) Display the contents of the linked list before and after deletion. 2. Write a C program using functions to perform the following: a) Create a doubly linked list of strings. b) Delete the given string from the above linked list. c) Display the contents of the linked list before and after deletion. **Suggested Readings:** Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	**CO-1** **BTL-3**
MODULE 2: TREES AND GRAPHS	**(9L+3P)**
Trees - Dictionaries – Binary search trees- Priority Queues – Heaps - Heap Sort – Sets and Disjoint Set union – Union and Find operations – Graphs – introduction – Definitions – Graph representations. **Practical component:** 1. Search for the given element in a matrix. 2. Binary search using recursion. 3. Infix to postfix conversion and evaluation of postfix. **Suggested Readings:** Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	**CO-2** **BTL-3**
MODULE 3: SORTING AND SEARCHING	**(9L+3P)**
Sorting Algorithms: Basic concepts - Binary search – Finding the maximum and minimum – Merge sort – Quick sort – Performance measure – Randomized sorting algorithms – Selection sort – Strassen's matrix multiplication. **Practical component:** 1. Sort the list of integers using the following sorting methods: a) Merger Sort b) Selection Sort c) Quick Sort d) Heap sort **Suggested Readings:** Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	**CO-3** **BTL-3**
MODULE 4: TRAVERSAL AND SEARCH TECHNIQUES	**(9L+3P)**
Techniques for Binary trees – Techniques for graphs – Breadth First Search and Traversal – Depth First search Traversal- Connected components and Disconnected components. **Practical component:**	**CO-4** **BTL-3**

1. Construct an expression tree and print the postfix and prefix using suitable traversal. 2. Create a binary search tree of integers and display the integers in ascending order using a traversal algorithm. **Suggested Readings:** Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	
MODULE 5: KNAPSACK PROBLEM AND GREEDY METHOD	**(9L+3P)**
The general method – Knapsack problem – Tree vertex splitting – Job sequencing with deadlines – Minimum cost spanning trees – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm- An optimal randomized algorithm – Optimal storage on tapes. **Practical component:** 1. Construct a Minimum spanning Tree using Prim's and Kruskal's algorithm. 2. Construct the shortest path in a graph using Dijkstra's algorithm. **Suggested Readings:** Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	**CO-5** **BTL-3**
TEXT BOOKS	
1.	Ellis Horowitz, Sahni, Freed, S. (2015). *Fundamentals of Data Structures in C*, 2nd edition.
REFERENCE BOOKS	
2.	William, Stallings. (2018). *Effective Cyber security: A Guide to Using Best Practices and Standards,* Addison - Wesley Professional Publishers, 1st Edition.
E BOOKS	
1.	https://pdfs.semanticscholar.org/54eb/d5fbd450c745ffb1a5a126d975aa0a53c2e1.pdf **(**Succinct Data Structures)
2.	https://courses.csail.mit.edu/6.851/spring12/scribe/lec12.pdf (Fusion Data Structures)
MOOC	
1.	https://www.mooc-list.com/tags/data-structures
2.	https://nptel.ac.in/courses/106102064/
3.	https://www.udemy.com/algorithm/

COURSE TITLE	PYTHON PROGRAMMING		CREDITS	4
COURSE CODE	CAD01003	COURSE CATEGORY	PC	L-T-P-S 3-0-2-0
VERSION 1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course shows you how to use the free open-source Python to write basic programs and high-level applications using concepts such as Class, BIF of Python, functions, variables, If Else statements, For loops, While loops, iterative and recursive programs and algorithms such as the Insertion Sort algorithm. This course will be of great interest to all learners who would like to gain a thorough knowledge and understanding of the basic components of computer programming using the Python language – and might be a gentle introduction to programming for those who think they might have a longer-term interest in the subject area.
Course Objective	1. To understand the basics of python programming 2. To understand the data collections and language components of the Python 3. To learn object-oriented concepts in Python. 4. To understand the concepts of functions and modules. 5. To understand I/O and Error Handling in Python
Course Outcome	Upon completion of this course, the students will be able to 1. Apply the principles python programming. 2. Write clear and effective python code. 3. Develop applications using python programming. 4. Implement functions and modules. 5. Describe the OOPS concepts in the Python.

Prerequisites: NA

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	-	1	-	2	-	2
CO-2	1	2	1	-	-	-	2	-	
CO-3	3	1	2	1	-	-	1	1	2
CO-4	2	2	1	-	1	1	1	-	
CO-5	3	1	1	-	-	-		-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO PYTHON PROGRAMMING LANGUAGE	(9L+3P)
Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Built in Functions	CO-1 BTL-3

Practical component: **1.** Implementation of various data types in Python **2.** Implementation of strings and its operators using python **3.** Implementation of built-in functions using python **Suggested Readings:** Data types and structures	
MODULE 2: DATA COLLECTIONS AND LANGUAGECOMPONENT	**(9L+3P)**
Introduction, Control Flow and Syntax, Indenting, The if Statement, Relational Operators, Logical, Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections. **Practical component:** 1. Python 3 editor. 2. Implementation of control statements using python 3. Implementation of dictionaries, collections and list using python **Suggested Readings:** Advances in data types	**CO-2** **BTL-3**
MODULE 3: OBJECT AND CLASSES **(9L+3P)**	
Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes **Practical component:** 1. Handling objects and classes in Python. 2. Implementation of Inheritance, polymorphism and file organization using python **Suggested Readings:** Best practices for classes and classes	**CO-3** **BTL-3**
MODULE 4: FUNCTIONS AND MODULES **(9L+3P)**	
Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope, Functions - "First Class Citizens", Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules, Standard Modules – sys, Standard Modules – math, Standard Modules – time, The dir. Function **Practical component:** 1**.** Implementing functions and modules in Python. 2. Implementation of types of function in python **Suggested Readings:** Functions and modules	**CO-4** **BTL-3**
MODULE 5: I/O AND ERROR HANDLING IN PYTHON **(9L+3P)**	
Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions **Practical component:** 1. I/O and error handling test in Python. 2. Implementation of file operations using python	**CO-5** **BTL-3**

Suggested Readings: Introduction to next level of Python programming language	
TEXT BOOKS	
1.	Mark Pilgrim(2012), *Dive into Python*, Mike,CreateSpace
REFERENCE BOOKS	
1.	Mark Lutz(2010) , *Programming Python*, O'Reilly Media, 4th Edition
E-BOOKS	
1.	https://docs.python.org/3/tutorial/
MOOC	
1.	https://www.mooc-list.com/course/learn-python-fundamentals-python-programming-language-skillshare
2.	https://www.mooc-list.com/course/python-basics-absolute-beginners-skillshare

COURSE TITLE	DATA PRE-PROCESSING LABORATORY		CREDITS	2
COURSE CODE	CAD01400	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	This course provides hands on study of making the students to handle data preprocessing techniques such as data cleaning, data transformation, data integration, data reduction using various tools**.**
Course Objective	1. To perform data cleansing. 2. To perform data Transformation. 3. To perform data integration. 4. To perform data reduction.
Course Outcome	Upon completion of this course, the students will be 1. Implement data preprocessing techniques 2. Implement data cleansing by aligning formatting the data set. 3. Implement data transformation by aggregating and extracting data 4. Integrate the data from different sources 5. Minimize the given data set to make further process easier.

Prerequisites: Database

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO1	1-	-	3	1	1	-	1	-	1
CO2	-	-	3	-	-	-	1	1	-
CO3	-	-	2	2	-	1	-	-	1
CO4	2	1	-	-	1	-	-	1	-
CO5	-	-	3	-	-	1	1	-	1

1: Weakly related, 2: Moderately related and 3: Strongly related

Lab/mini project/fieldwork

1. Perform Data cleansing process by importing the data set to identify and handle missing values.
2. Evaluate data integration process by combining data from multiple sources.
3. Using data cleansing technique detect and correct the inaccurate record from the given data set using python/weka tools.

4. Implement data cleansing technique by replacing/modifying the irrelevant data using python.
5. Obtain minimal data field by any of the clustering techniques using R.
6. Implement data integration by collecting various data types and format into a single location and make it as usable information.
7. Perform data reduction process by reducing the volume of original data and represent it in much smaller volume.
8. Create indexes to locate and access the required data quickly in the given data set.
9. Using python implement the concept of feature extraction.

TEXT BOOKS	
1.	Salvador Garcia, Julian lueng,.Fransiscoherera(2015) , *Data preprocessing in data mining,* Salvador Garcia, Julian lueng,. Fransiscoherera.,.Springer series
REFERENCE BOOKS	
1	TyeRattenbury , Joseph Hellerstein, Jeffrey Heer , Sean Kandel, Connor Carreras(2017*), Principles of data wrangling: Practical Techniques for data preparation*, Ist Edition

SEMESTER-II

COURSE TITLE	DESIGN AND ANALYSIS OF ALGORITHMS			CREDITS	4
COURSE CODE	CAD01004	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
VERSION 1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will enable the students to analyze various algorithms based on running time and to use them for various real time applications.
Course Objective	1. To understand the basics of algorithms 2. To analyze the runtime of algorithms and its limitations. 3. To solve real word examples using graphs 4. To Implement approximation algorithms.
Course Outcome	Upon completion of this course, the students will be able to 1. Analyze the worst-case and average-case running times of algorithms. 2. Identify the limitations of algorithms in problem solving 3. Describe the various algorithmic techniques and its real time applications. 4. Solve the real word problems using graphs. 5. Implement Approximation Algorithms.

Prerequisites: Data Structures

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	1	3	1	-	-	-	1	2
CO-2	1	1	3	1	-	-	-	2	2
CO-3	1	2	3	2	2	-	2	3	3
CO-4	1	3	3	2	2	2	2	3	3
CO-5	2	3	3	3	2	2	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	**(9L+3T)**
Fundamentals of Algorithmic Problem Solving-Sorting-Searching-Graphs-Analysis Framework- Asymptotic Notations and Basic Efficiency Classes-Analysis of Recursive and Non-recursive algorithms. **Practical component:** Calculate the complexity of algorithms.	**CO-1** **BTL-3**
MODULE 2: BRUTE FORCE & DIVIDE-AND-CONQUER	**(9L+3T)**
Brute Force-Travelling Salesman Problem, Knapsack Problem, Assignment Problem. Divide and Conquer Approach- Binary Tree Traversals, Multiplication of large Integers, Strassen's Matrix Multiplication. **Practical component:** 1. Solve problems using brute force approach and analyze its	**CO-2** **BTL-3**

complexity 2. Solve problems using divide and conquer approach and analyze its complexity	
MODULE 3: DYNAMIC PROGRAMMING	**(9L+3T)**
Dynamic Programming- Warshall's and Floyd's algorithm- Optimal Binary Search Trees-Memory Functions. **Practical component:** 1. Solve problem using dynamic programming approach and analyze its complexity	**CO-3** **BTL-3**
MODULE 4: GREEDY TECHNIQUE AND GRAPH ALGORITHMS	**(9L+3T)**
Representing Graphs-Breadth First Search (BFS)-Depth First Search (DFS)-Single source shortest-path-Dijkstra's algorithm- Prim's algorithm-and Kruskal's algorithm **Practical component:** 1. Solve problem using Greedy approach and analyze its complexity 2. Implement Single source shortest path algorithm and Analyze its complexity	**CO-4** **BTL-3**
MODULE 5: BACKTRACKING AND APPROXIMATION ALGORITHMS	**(9L+3T)**
Backtracking- n Queen's problem-Hamiltonian Circuit Problem-Subset-Sum Problem-Branch and Bound- Approximation Algorithms-Travelling Salesman Problem, Knapsack Problem. **Practical component:** 1. Implement Approximation algorithms for Traveling salesman problem and analyze its complexity 2. Implement Approximation algorithms for Knapsack problem and analyze its complexity	**CO-5** **BTL-3**
T BOOKS	
1.	AnanyLevitin(2017), "*Introduction to the Design and Analysis of Algorithms*", Third Edition, Pearson Education.
ERENCE BOOKS	
1.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein(2012), "*Introduction to Algorithms*", Third Edition, PHI Learning Private Limited.
2.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman(2006), "*Data Structures and Algorithms*", Pearson Education.
E BOOKS	
1.	https://edutechlearners.com/download/Introduction_to_algorithms-3rd%20Edition.pdf
MOOC	
1.	https://www.coursera.org/learn/analysis-of-algorithms
2.	https://www.coursera.org/lecture/algorithms-part1/analysis-of-algorithms-introduction-xaxyP

COURSE TITLE	MACHINE LEARNING TECHNIQUES		CREDITS	4
COURSE CODE	CAD01005	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignment / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Machine Learning is a method of data analysis that automates analytical model building. Intensive knowledge-oriented course provided to build business models for analytics. It is designed to give the participant enough exposure to the variety of applications that can be built using techniques
Course Objective	1. To understand the need of Machine learning. 2. To acquire the knowledge of various classification techniques. 3. To study the various algorithms related to supervised and unsupervised learning. 4. To learn the theoretical and practical aspects of probabilistic graphical models. 5. To expose the applications of machine learning.
Course Outcome	Upon completion of this course, the students will be able to 1. Able to explain the need of machine learning and model building. 2. Understand the concept to apply the supervised algorithms. 3. Develop a skill to implement unsupervised algorithms for problem solving. 4. Understand the concept of reassurance learning algorithms. 5. Able to apply the learning algorithms in real world problem solving.

Prerequisites: Data Mining

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	-	-	-	1	1	1
CO-2	2	2	3	2	2	1	1	1	3
CO-3	1	2	1	1	-	1	3	-	3
CO-4	1	1	-	2	2	1	2	1	3
CO-5	1	2	3	3	3	3	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO MACHINE LEARNING (9L+3P)

Introduction to Machine learning: Type of Learning and Examples, basic concepts in machine learning, Computational Learning theory, Introduction to Parametric Models – Non-Parametric Models – Probability Basics. **Practical Component :**	**CO-1** **BTL-3**

1 Write a Python program to load the iris data from a given csv file into a dataframe and print the shape of the data, type of the data and first 3 rows 2 Write a Python program using Scikit-learn to print the keys, number of rows-columns, feature names and the description of the Iris data **Suggested Readings**: Basics of Machine learning	
MODULE 2: SUPERVISED LEARNING	**(9L+3P)**
Supervised Learning Algorithms Supervised Machine Learning Algorithms, working of supervised machine learning algorithm, Naive Bayes algorithm, decision tree, Support Vector Machines, KNN, Random Forest algorithm. **Practical Component :** 1 Write a Python program to get the number of observations, missing values and nan value 2 Write a python program to implement random forest algorithm **Suggested Readings:** Fundamentals of supervised Learning	**CO-2** **BTL-3**
MODULE 3: UNSUPERVISED LEARNING	**(9L+3P)**
Clustering- K-means -EM Algorithm- Mixtures of Gaussians - Dimensionality Reduction - Factor analysis – Feature Selection - Principal Component Analysis - Probabilistic PCA - Independent components analysis - Singular Value Decomposition. **Practical Component :** 1.Write a python script to implement K -means clustering algorithm 2.Write a python script to perform singular value decomposition **Suggested Readings:** Basics of Unsupervised Learning	**CO-3** **BTL-3**
MODULE 4: REINFORCEMENT LEARNING	**(9L+3P)**
Reinforcement Learning Algorithms Reinforcement Machine Learning Algorithms, working of reinforcement machine learning algorithm, Finite Markov Decision Processes, Dynamic Programming, Monte Carlo Methods **Practical Component:** 1.Write a python script to perform Markov decision processes 2.Write a python script to implement monte carlo methods **Suggested Readings:** Reinforcement learning algorithms	**CO-4** **BTL-3**
MODULE 5: APPLICATIONS AND USE CASE	**(9L+3P)**
Ranking: Priority Inbox - Ordering Email Messages by Priority - Writing a Priority Inbox - Spam Filtering - Analyzing Social Graphs - Social Network Analysis - Hacking Twitter Social Graph Data - Analyzing Twitter Networks – Case Study. **Practical Component:** 1.Write a python script to filter the anonymous mail messages 2. Write a python script to perform network analysis **Suggested Readings:** Applications of machine learning	**CO-5** **BTL-3**
TEXT BOOKS	

1.	Ethem Alpaydın(2020), *Introduction to Machine Learning*, The MIT Press Cambridge, Fourth Edition, MIT Press Hardcover.
2	Shai Shalev-Shwartz, Shai Ben-David(2014), *Understanding Machine Learning: From Theory to Algorithms*, Cambridge University Press.
REFERENCE BOOKS	
1.	V Kishore Ayyadevara(2018), *Pro Machine Learning Algorithms A Hands-On Approach to Implementing Algorithms in Python and R*, Apress
2	Kevin P. Murphy(2022) , *Probabilistic Machine Learning an Introduction*. The MIT Press.
E BOOKS	
1.	https://alex.smola.org/drafts/thebook.pdf
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc21_cs85/preview
2.	https://onlinecourses.nptel.ac.in/noc21_cs70

COURSE TITLE	DATA WAREHOUSING AND DATA MINING		CREDITS	4
COURSE CODE	CAD01006	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course focus on issues relating to the feasibility, usefulness, effectiveness, and scalability of techniques for the discovery of patterns hidden in large data sets. This course presents an overall picture of the field, introducing interesting data mining techniques and systems and discussing applications and research directions
Course Objective	1. To understand the basic concepts, modeling, design architectures, and general implementations of data warehouses 2. To apply methods for data cleaning, data integration, data reduction, data transformation, and data discretization 3. To mine frequent patterns, associations, and correlations in large data sets 4. To understand the basic concepts and methods for classification. 5. To discuss the basic concepts and methods for data clustering,
Course Outcome	Upon completion of this course, the students will be able to 1. Compare data warehouse architecture and operational databases. 2. Illustrate Data preprocessing methods for data mining. 3. Construct Association rules for Data mining. 4. Solve Classification and clustering methods. 5. Describe recent trends in data mining

Prerequisites: Database Management Systems

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	-	3	2	-	-	2	2	1	-
CO-2	3	1	-	1	-	2	-	2	-
CO-3	2	3	3	-	2	-	1	-	3
CO-4	3	1	2	-	-	2	3	3	-
CO-5	-	-	-	3	3	-	3	-	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION AND DATA WAREHOUSING	**(9L+3P)**
Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation, Further Development, Data Warehousing to Data Mining **Practical Component:** 1 Build a data warehouse and query it using WEKA tool **Suggested Readings:** Operational Databases	**CO-1** **BTL-3**

MODULE 2: DATA PREPROCESSING, LANGUAGE, ARCHITECTURES (9L+3P)

Why Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept - Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures **Practical Component:** 1.Perform preprocessing on a data set using weka tool 2. Normalize the data set using weka tool **Suggested Readings:** Data Objects and Attribute types	**CO-2** **BTL-3**
MODULE 3: ASSOCIATION RULES (9L+3P)	
Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases. **Practical Component:** 1.Implement the steps in association rule mining using Weka tool 2.Identify the frequent item set matching in a transactional database using weka tool **Suggested Readings:** Pattern Mining	**CO-3** **BTL-3**
MODULE 4 : CLASSIFICATION AND CLUSTERING (9L+3P)	
Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, Outlier Analysis. **Practical Component:** 1.Implement classification of data using weka tool 2.Implement clustering algorithms to perform cluster analysis using weka tool **Suggested Readings:** Model Evaluation and Selection, Evaluation of Clustering	**CO-4** **BTL-3**
MODULE 5: RECENT TRENDS (9L+3P)	
Web Mining – Text Mining – Spatial Mining –Applications of Data Mining **Practical Component:** 1.Implement web mining using weka tool 2. Implement text mining using weka tool **Suggested Readings:** Data mining Applications	**CO-5** **BTL-3**
TEXT BOOKS	
1.	J. Han, M. Kamber(2012), "*Data Mining: Concepts and Techniques*", Harcourt India / Morgan Kauffman
2	Margaret H.Dunham(2006), "*Data Mining: Introductory and Advanced Topics*", Pearson Education
REFERENCE BOOKS	
1.	Alex Bezon, Stephen J.Smith(2010), "*Data Warehousing, Data Mining & OLAP*", McGraw- Hill
E BOOKS	
1.	http://charuaggarwal.net/Data-Mining.pdf
MOOC	
1.	https://nptel.ac.in/courses/106105174/

COURSE TITLE	DATA ANALYSIS TECHNIQUES			CREDITS	4
COURSE CODE	CAD01007	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION 1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3	

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The ability to analyze data is a powerful skill that helps you make better decisions. This course focuses on data analysis techniques to solve and explore decision -making based on available data.
Course Objective	1. To acquire the basic knowledge in statistics and scientific methods . 2. To understand the ways of collecting data 3. To summarize the data 4. To understand the fundamentals of various formulas in excel 5. To create aggregate reports using formula-based techniques.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the statistics and scientific methods for data analysis 2. Compare and contrast the data and describe the data collection methods 3. Explain the ways of summarizing. 4. Apply the various excel formulas 5. Generate reports using formulas

Prerequisites: Office tools

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO1	2	1	1	1	1	2	2	2	2
CO2	2	2	1	1	1	2	2	1	2
CO3	2	1	2	2	1	2	1	2	1
CO4	2	2	1	1	1	2	2	1	2
CO5	2	2	1	1	1	2	1	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	**(9L+3P)**
Statistics and scientific methods**,** why study statistics? Current applications of statistics, Types of data, Data analysis as a process, Data Analysis as a cycle, Ways of analyzing qualitative data and quantitative data. **Practical component:** 1.Write a python script to read and write csv and excel file file using python 2.Write a python script to find the statistical parameters of the data set **Suggested Reading :** Statistical methods for data analysis	**CO-1** **BTL-3**
MODULE 2: COLLECTING DATA	**(9L+3P)**

Using surveys and experimental studies to gather data -Introduction to abstract research study -observational studies-Sampling designs for survey-Experimental Studies-Designs for experimental studies-Research study **Practical component:** 1.Identify the ways of data collection using python 2. Implement the different types of studies using python **Suggested Readings:** Various designs of data collection	**CO-2** **BTL-3**
MODULE 3: SUMMARIZING DATA	**(9L+3P)**
Data description- Introduction and abstract of research study -Calculators, Computers and software systems- Describing data on a single variable-Graphical methods ,measures of central tendency-measures of variability-summarizing data from more than one variable. **Practical component:** 1 Write a python script find the measures of central tendency and measures of variability 2 Perform data summarization using python **Suggested Readings:** Describing data	**CO-3** **BTL-3**
MODULE 4: STATISTICAL MEASURES	**(9L+3P)**
Statistical measures – Mean, Variance, Percentiles, Quartiles - Pearson correlation – Spearman's Rank correlation – Parametric tests – test for single population mean , equality of mean for two independent sample , paired t test, testing correlation coefficient, Non parametric tests – Mann Whitney U test, Wilcoxon signed rank test – Kruskal Wallis test – One way ANOVA – Simple and Multiple Linear regression 1 Compute mean ,variance, percentiles, Pearson correlation for data set using python 2 Implement the creation of ANOVA table **Practical component:** **Suggested Readings:** Create ANOVA table	**CO-4** **BTL-3**
MODULE 5: MACROS	**(9L+3P)**
VBA Macro - Introduction to VBA Macro -Recording Macro & Understanding Code Behind - Editing, Writing VBA Code and Saving as Macro. **Practical component**: 1.Implement VBA macro and recording macro 2. Editing and writing a macro code **Suggested Readings:** Writing VBA Code and Saving as Macro.	**CO-5** **BTL-3**
TEXT BOOKS	
1.	R. Lyman Ott (2022), *An Introduction to Statistical Methods and Data Analysis* 7th Edition, Cengage Learning, Inc
REFERENCE BOOKS	
1	Wayne L. Winston (2011), *Microsoft Excel 2010 Data Analysis and Business Modeling ,* Microsoft Press publisher
E BOOKS	
1.	https://spreadsheetplanet.com/best-excel-books/
MOOC	

1.	https://www.edx.org/course/spreadsheet
2.	https://www.coursera.org/courses?query=spreadsheet

COURSE TITLE		R PROGRAMMING			CREDITS	4
COURSE CODE		CAD01008	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course describes about the basics of R programming, scalars, vectors, matrices, data frames, lists, functions, factors and tables. It enables to implement the concepts using classes, objects and interfaces
Course Objective	1. To learn about basics of R programming 2. To implement scalars, vectors and Matrices 3. To understand and apply Lists and Data Frames 4. To implement functions, factors and tables with real time problems 5. To understand and apply classes, objects and interfaces
Course Outcome	Upon completion of this course, the students will be able to 1 Learn about basics of R programming 2 Implement scalars, vectors and Matrices 3 Apply Lists and Data Frames 4 Implement functions, factors and tables with real time problems 5 Apply classes, objects and interfaces

Prerequisites: Basics programming skills

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO- 5	PO-6	PSO-1	PSO-2	PSO-3
CO1	1	1	2	-	-	-	1	1	1
CO2	2	1	3	2	2	1	1	1	2
CO3	1	2	3	2	2	1	2	1	2
CO4	2	2	3	2	2	1	2	1	3
CO5	1	2	2	2	2	3	2	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9L+3P)

Introducing to R – Evolution of R-Environmental set up - R command prompt- Data types -Data Structures of R – List – Arrays: types of Arrays- High Dimensional Arrays – Factors – Variables – Operators: Types of operators- Conditional statements -Functions in R	**CO-1 BTL-3**

Practical component: 1 Implement the Data Structures using R 2 Implement Lists and arrays using R **Suggested Readings:** Evolution of R-Environmental set up	
MODULE 2: SCALARS, VECTORS AND MATRICES	**(9L+3P)**
Scalars – Vectors – Common Vector Operations: Declarations – Recycling –– Using all and any – Vectorized operations: NA & NULL values – Filtering – Vectorized if-then else – Vector Element names. Matrix creation – operations of Matrices –Applying function to Matrices-Matrix and Vector distinction – Dimension reduction **Practical component:** 1 Write a R program for Matrix creation and perform matrix operations 2 Apply function to Matrices-Matrix and Vector distinction using R **Suggested Readings:** Scalars – Vectors	**CO-2** **BTL-3**
MODULE 3: LISTS AND DATA FRAMES (9L+3P)	
List – Introduction, Creation of List –List operations –List Components & Values –List functions- recursive List. Merging Lists, Conversion of List to Vector. Data Frames creation – Operations of Data Frames: like, merging –functions to Data Frames – dplyr package - dplyr Grammar – installation of dplyr package and its functions: select(), filter(), arrange(), rename(), mutate(), group by(), %>%. **Practical component:** 1. Implement operations of Data Frames: like, merging, conversion etc. using R 2. Use select(), filter(), arrange(), rename(), mutate(), group by(), %>% in a data set using R **Suggested Readings:** Conversion of List to Vector	**CO-3** **BTL-3**
MODULE 4: FUNCTIONS, FACTORS AND TABLES (9L+3P)	
Factors & Tables – Factors & levels –Functions with factors – Working with tables – Other factors & table related functions – Default Values for arguments – Return Boolean Values – Functions are objects – Writing Upstairs – Recursion – Replacement functions – Tools for Composing function code. **Practical component:** 1 Implement tables using R 2 Apply all the able related functions in R **Suggested Readings:** Factors & Tables	**CO-4** **BTL-3**
MODULE 5: CLASSES, OBJECTS AND INTERFACES (9L+3P)	
S3 & S4 Classes – objects management – Input/output functions– through keyboard and monitor –files – accessing the internet – String Manipulations – Graphics – Creating Graphs – Customizing Graphs – Graphs to files saving – Creating Three-Dimensional plots, Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model –	**CO-5** **BTL-3**

Generalized Linear models – Non-linear Models – Time Series and Auto-Correlation – Clustering. **Practical component:** 1 Perform the basic Input/output functions– through keyboard and monitor –files using R 2 implement time series and auto correlation using R **Suggested Readings:** Linear Model – Generalized Linear models – Non-linear Models	
TEXT BOOKS	
1.	Norman Matloff(2011), —*The Art of R Programming: A Tour of Statistical Software Design*, No Starch Press.
2.	Jared P. Lander(2013), —*R for Everyone: Advanced Analytics and Graphic*s, Addison-Wesley Data & Analytics Series.
REFERENCE BOOKS	
1.	HabiburRahma(2016) *R For Data Science*, O'REILLY.
2.	Roger D.Peng (2018). *R Programming for Data Science*. Lean Publishing.
E BOOKS	
1.	https://www.academia.edu/40968525/R_For_Data_Science
MOOC	
1.	https://www.coursera.org/learn/r-programming

COURSE TITLE	DATA MODELLING LABORATORY			CREDITS	2
COURSE CODE	CAD01401	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
VERSION 1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	This course gives insights into data handling and modelling of large amount of data. The fundamental scientific challenge is that how to model the data in a way that computational tools can analyze the data efficiently and effectively, revealing insight and make predictions. This course aims to provide a hands-on practice and experience
Course Objective	1. To have hands – on experience on decision making. 2. To understand the basics in Excel Data Analysis 3. To prepare reports 4. To create and design Business Modelling.
Course Outcome	Upon completion of the course, students will be able to: 1. Apply the "best practice" platform meeting many organizational and project analytical needs. 2. Implement data analysis software for data modelling. 3. Perform relational data base construction 4. Integrate the use of Pivot Tables and Descriptive Statistics. 5. Perform trend analyses (i.e., multiple regression, exponential smoothing, etc.) as well as advanced Excel functions.

Prerequisites: Data base concepts

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO1	PSO2	PSO3
CO-1	3	3	1	1	1	1	3	2	3
CO-2	3	3	1	1	1	1	3	2	3
CO-3	3	3	2	1	1	1	2	3	3
CO-4	2	3	2	1	1	1	3	3	3
CO-5	3	3	1	1	1	1	3	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

List of Experiments

1. Analyze the data of scores of students in a competitive examination using descriptive statistics (use sample data). Find the following

   - What is the total number of students available?
   - What is the average score in the exam and what is the score that divides the scores in to two equal halves when the scores are sorted from lowest to highest? What is the typical variability of scores in the data?
   - Draw a pie chart to indicate the number of respondents with different degrees in the data?

- Draw bar chart to indicate male and female respondents in the data

2. Correlation Analysis

Ram is doing a statistics paper in his post-graduation course. He met his friend Amal who is a textile engineer. Ramesh, who is doing his internship at BELL Researchers, is interested in a question. He poses this question to Amal and tries to find if he can answer. The question is as follows: The data regarding sales of soft- drinks and sales of cotton clothes in a place during the last 12 months are available in below table. Find if there is any association between sales of soft drinks and sales of cotton clothes. Also explain the reason if there is any relationship. (Use sample data)

3.Regression Analysis

Ram is a researcher in Bell Limited. He is working on an assignment to study the performance of students in exams. He is faced with a situation here ha has to study the variables causing good or bad performance of students. He studies two casual variables for performance in the exams and finds them particularly important. These are number of hour's studied and intelligence of students. He has the following data.Help Raju arrive at the conclusion if there is a casual relationship between performance in the exam and number of hours studied per week and Intelligence. (use sample data)

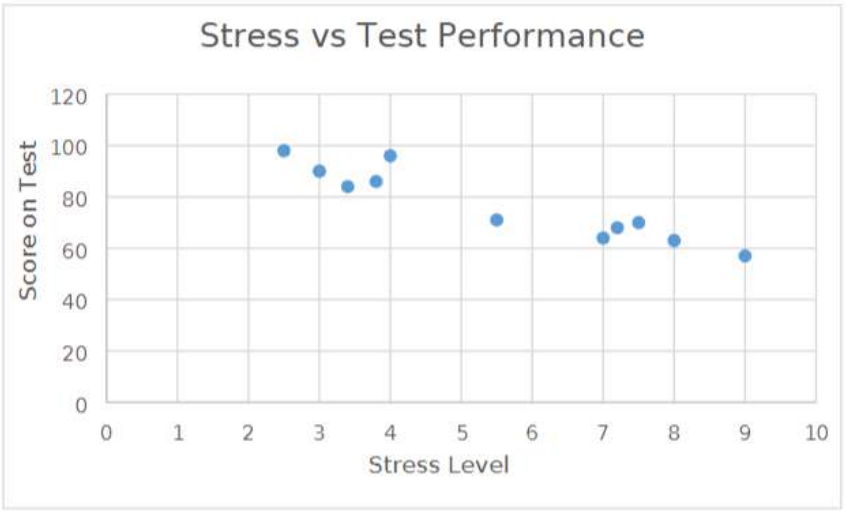
4.Consider the height and weight of 10 subjects given below.Determine if there is a correlation between a person's height and weight.

x=height (in)	69	71	70	67	75	66	71	71	67	65
y-weight (lbs)	151	159	163	153	198	126	163	185	133	140

- Is there correlation? If so is it positive or negative? Is it strong or weak?
- b. Draw a line of best fit that goes through the points (,) and (,) and find the equation of the line in slope intercept form (hint: y=mx+b)
- What does the slope represent?
- Use your line of best fit to predict a person's weight who is 68 inches tall

5.A Math teacher is interested in studying the relationship between the level of stress before an exam and the score on the exam. The following data gives the stress level and the students' score on the exam

Stress test Score (x)	6.5	4	2.5	7.2	8	3.4	5.5	9	7.5	3.8	7	3
Final Exam score (y)	81	96	98	68	63	84	71	57	70	86	64	90



- Draw a line of best fit that goes through the points (,) and (,). Now let's find the equation of the line in slope intercept form (hint: y=mx+b)
- What does the slope represent?
- Use your line of best fit to predict the final exam score for a student with a stress score of 10.

6.A sample of seven households was obtained, and information on their income and food expenditures for the past month was collected. The data (in hundreds of dollars) are:

Income ($100s) (x)	22	32	16	37	12	27	17
Food Expend ($100s) (y)	7	8	5	10	4	6	6

(a) Make a scatterplot of the points using EXCEL
(b) What is the correlation (positive, negative, neither)?
(c) Find the equation of line of best fit that describes Income to Food Expenditures
(d) Write a sentence that interprets the estimated slope.
(e) Use your line of best fit to predict the food expense for a family with $5200.

7.The following table presents data on x= the number of oil changes per year and y = the cost of repairs for a sample of 10 cars from a given region:

Number of oil changes per year (x)	3	5	2	3	1	4	6	4	3	0
Cost of Repairs $ (y)	300	300	500	400	700	400	100	250	450	600

- Make a scatterplot of the points in EXCEL
- What is the correlation (positive, negative, neither)?

- Find the equation of line of best fit that describes the cost on the number of oil changes in EXCEL
- Write a sentence that interprets the estimated slope.
- Use your line of best fit to predict the cost of car repairs for a car that had 7 oil changes per year.

8.A student wonders whether people of similar heights tend to date each other. She measures herself, roommate and 4 other girlfriends. Then she measures the next man each woman dates. (Heights are recorded in inches)

Height of Woman (x)	66	64	66	65	67	65
Height of Man (y)	72	68	70	68	72	67

- Make a scatterplot of the points in EXCEL
- What is the correlation (positive, negative, neither)?
- Find the line of best fit that describes the relationship between heights of Woman and Men.
- (d) Use your line of best fit to predict the height of a man if a woman were 50 inches

BOOKS	
1.	Carlo-Vercellis(2009), "*Business Intelligence Data Mining and Optimization for Decision-Making*", Wiley Publisher, First Edition.
REFERENCE BOOKS	
1.	Drew Bentely(2017), "*Business Intelligence and Analytics*", Library Pres., ISBN: 978-1-9789- 2136-8.
2.	Larissa T. Moss & Shaku Atre(2003), "*Business Intelligence Roadmap: The Complete Project Lifecycle For Decision-Support Applications*", First Edition, Addison-Wesley Professional.
E BOOKS	
1.	https://www.academia.edu/40285447/Business_Intelligence_and_Analytics
MOOC	
1.	https://www.coursera.org/learn/business-intelligence-data-analytics

SEMESTER-III

COURSE TITLE		COMPUTER VISION			CREDITS	4
COURSE CODE		CAD01009	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course provides an introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching. In this course students will learn basic principles of image formation, image processing algorithms and different algorithms for 3D reconstruction and recognition from single or multiple images(video). This course emphasizes the core vision tasks of scene understanding and recognition.
Course Objective	1. To introduce students the major ideas, methods, and techniques of computer vision. 2. To understand the basic principles of image formation, image processing algorithms 3. To develop your understanding of the basic principles and techniques of image processing and image understanding. 4. To understand the basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion
Course Outcome	1. Describe the fundamental image processing techniques required for computer vision 2. Apply Image formation models and perform shape analysis 3. Estimate motion and analysis of images 4. Extract features form Images and do analysis of Images 5. Develop applications using computer vision techniques

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	-	1	1	3	2	3
CO-2	1	2	1	-	1	1	1	2	2
CO-3	3	1	2	1	1	1	3	1	2
CO-4	2	1	1	-	1	1	2	1	2
CO-5	2	1	1	-	1	1	2	1	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	**(9L+3P)**
Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level ,Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics,	**CO-1 BTL-3**

Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality **Practical Component**: 1. Installation of Python libraries/MATLAB and exploration of various methods. 2. Read a color image and convert to grey-scale and HSV color format. 3. Implement noise reduction using Smoothing algorithms. 4. For a given image, draw Histogram and perform Histogram Smoothing.	
MODULE 2:IMAGE FORMATION MODELS	**(9L+3P)**
Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection,Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus , Construction of 3D model from images **Practical Component**: 1. Implementation of camera projection using python 2. Perform various Morphological operations on the given image using MATLAB/python. 3. Implement 3D Models using MATLAB/python	**CO-2** **BTL-3**
MODULE 3: IMAGE RPOCESSING and FEATURE EXTRACTION	**(9L+3P)**
Image preprocessing, Image representations (continuous and discrete) , Edge detection **Practical Component**: 1. Implementation of pre-processing algorithm using MATLAB/Python 2. Implementation of Edge detection algorithms using MATLAB/Python	**CO-3** **BTL-3**
MODULE 4: MOTION ESTIMATION	**(9L+3P)**
Regularization theory, Optical computation, StereoVision, Motion estimation, Structure from motion **Practical Component**: **1**. Implementation of Motion estimation using MATLAB/Python **2**.Implementation of optical computation using MATLAB/Python	**CO-4** **BTL-3**
MODULE 5: APPLICATIONS	**(9L+3P)**
Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians **Practical Component**: **1**. Implementation of Face Recognitions systems using MATLAB/Python **2**. implementation of Vehicle vision system using MATLAB/Python	**CO-5** **BTL-3**
TEXT BOOKS	

1.	D. Forsyth and J. Ponce(2012),*Computer Vision - A modern approach*, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw
REFERENCE BOOKS	
1.	E. R. Davies(2012), *Computer & Machine Vision*, Fourth Edition, Academic Press.
E BOOKS	
1.	Richard Szeliksy(2021) "*Computer Vision: Algorithms and Applications*" (http://szeliski.org/Book/)

COURSE TITLE	BUSINESS INTELLIGENCE		CREDITS	4
COURSE CODE	CAD01010	COURSE CATEGORY: PC	L-T-P-S	3-0-2-0
VERSION: 1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course will help the learners to identify the business and technical requirements, and consult, architect and manage Business Intelligence solutions.
Course Objective	1. Be exposed with the basic rudiments of business intelligence system 2. understand the modelling aspects behind Business Intelligence 3. understand of the business intelligence life cycle and the techniques used in it 4. Be exposed with different data analysis tools and techniques
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the fundamentals of business intelligence. 2. Link data mining with business intelligence. 3. Apply various modeling techniques. 4. Describe the data analysis and knowledge delivery stages. 5. Apply business intelligence methods to various situations.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	1	1	1	3	2	2
CO-2	2	3	2	1	1	1	2	3	2
CO-3	2	2	2	1	1	1	2	2	2
CO-4	2	2	2	1	1	1	2	2	2
CO-5	2	2	2	1	1	1	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO BUSINESS INTELLIGENCE	**(9L+3P)**
Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence. **Practical Component**: 1 Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system. 2 Perform the Extraction Transformation and Loading (ETL) process to construct the database in the SqlServer / Power BI.	**CO-1** **BTL-3**
MODULE 2: KNOWLEDGE DELIVERY	**(9L+3P)**
The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service	**CO-2** **BTL-3**

Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message. **Practical Component:** 1. Parameterized Reports and Self-Service Reporting using Python 2.Use a python tool to implement visualization and integrated analytics 3. Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart	
MODULE 3: EFFICIENCY	**(9L+3P)**
Efficiency measures – The CCR model: Definition of target objectives groups – Identification of good operating practices; cross efficiency ana virtual inputs and outputs – Other models. Pattern matching – cluster an outlier analysis **Practical Component:** 1. Implementation of Pattern matching using python 2. Find the efficiency of cluster analysis using python	**CO-3** **BTL-3**
MODULE 4: BUSINESS INTELLIGENCE APPLICATIONS	**(9L+3P)**
Marketing models – Logistic and Production models – Case studies. **Practical Component:** 1. Implement classification algorithm using R programming .	**CO-4** **BTL-3**
MODULE 5: FUTURE OF BUSINESS INTELLIGENCE	**(9L+3P)**
Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology. **Practical Component:** 1. Extract insights from text and identify patterns using power BI or python	**CO-5** **BTL-3**
TEXT BOOKS	
1.	Efraim Turban, Ramesh Sharda, DursunDelen, (2013) "*Decision Support and Business Intelligence Systems*", 9 th Edition, Pearson.
2.	Swain Scheps (2008), Business Intelligence for Dummies, Wiley Publishing.
REFERENCE BOOKS	
1.	David Loshin Morgan, Kaufman(2012), "*Business Intelligence: The Savvy Manager's Guide",* Second Edition.
2.	Carlo Vercellis(2009), "Business Intelligence: *Data Mining and Optimization for Decision Making*", Wiley Publications.
3.	Larissa T. Moss, S. Atre(2003), "*Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making*", Addison Wesley.
E BOOKS	
1.	https://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg245747.pdf
MOOC	
1.	https://www.edx.org/learn/business-intelligence

COURSE TITLE		SEARCH ENGINE OPTIMIZATION			CREDITS	4
COURSE CODE		CAD01011	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details			LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Search Engine Optimization is a technique to generate quality and relevant traffic on website throughout search engines. It is a powerful technique of digital marketing to promote a business or website on internet media.
Course Objective	1. To provide the search engine management and optimization 2. To identify SEM as an effective form of internet or digital marketing 3. To promote the websites in terms of enhancing their visibility 4. To understand how SEO is about getting organic traffic on website from search engines.
Course Outcome	Upon completion of this course, the students will be able to 1. Demonstrate cognitive knowledge of the skills required in conducting online search and research on online markets, as well as in identifying, assessing and selecting digital market opportunities. 2. Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks. 3. Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked. 4. Comprehend the importance of conversion and working with digital relationship marketing. 5. Explain the social benchmarking

Prerequisites: Knowledge of Computers and Knowledge of Web Browsers.

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	-	2	2	2	-	-
CO-2	2	2	-	-		-	1	1	-
CO-3	-	1	-	1	2	1	1	-	1
CO-4	2	-	1	1	-	-	-	1	-
CO-5	-	-	-	-	2	1	1	-	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE1 : SEARCH ENGINE MARKETING	**(9L+3P)**
SEM: Introduction to SEO, Introduction to Ad Words (About Google and Google Ad Words, Ad Words fundamentals, Overview of search ad positions, Introduction to the Google network);Account management (	**CO-1 BTL-3**

Setting up an Ad Words account, Account management); Campaign and ad group management(Campaign strategy, Campaign set-up, Managing campaigns); Introduction to ad group management Keyword targeting (Introduction to keyword targeting, Keyword management & troubleshooting, Keywords and the display network). **Practical Component** 1. Implementation of Organizational sub-systems. 2. Introduce new ads in Google Ad words **Suggested Reading** Basics of Information systems.	
MODULE 2: SEM TERMINOLOGIES	**(9L+3P)**
Introduction to SEM Terminologies: Payper Click (PPC), Cost Per Click (CPC), Search Engine Results Page (SERP), Click-Through Rate (CTR), Impressions (served and viewable), Split Testing(Multivariate and A/B Testing); Development of PPC ads, CPM and CPA campaigns, Retargeting. Comparison between SEO and SEM, SEO: Understanding Search Engine Optimization, Features of SEO, Significance of SEO, Inverted Pyramid in SEO. **Practical Component** 1. Implementation of Optimization techniques. 2. Types of online media purchasing (case study **Suggested Reading** Business data processing.	**CO-2** **BTL-3**
MODULE 3 : SEO	**(9L+3P)**
On-Page SEO- Keyword Research with Google Keyword Planner, Difference between keywords stuffing & KW placement, Selection of a Domain Name, Page Naming {URL Structuring} and Folder Naming Image Naming, Image Title and ALT Tags Creation. **Practical Component** 1. Implementation of Decision Support System. 2. Positioning the keywords such as page URL, headlines etc in google **Suggested Reading** Types of Information System.	**CO-3** **BTL-3**
MODULE4: META TAGS	**(9L+3P)**
Meaning of Meta Tags, Description. Robots, Keywords, Author Redirection Tags Headings Tags {H1 to H6}, Meaning of Content Writing, SEO Friendly Content Writing {Insert keywords in content}, Anchor Text, Link Title Internal linking Robot, text file use and creation HTML Sitemap creation, XML Site Map Creation Site Tracking Tools (Google Webmaster Tool, Google Analytics Tool) ,Alexa, Alexa Integration. **Practical Component** 1. Create a meta robot tag 2. Implementation of Activities in IS. 3. use Google Webmaster tool to create XML site map **Suggested Reading** Various MIS Categories.	**CO-4** **BTL-3**

MODULE5: OFF PAGE SEO	(9L+3P)
Off-Page SEO – Meaning of OFF-Page Optimization, Backlinks, Importance of Backlinks are Important , Getting Backlinks , Difference Between Do-Follow and No-Follow Backlinks, Meaning of Google Page Rank , Steps to Increase Page Rank Search Engine Submissions, Directory Submissions, Article Writing and submissions ,Press Release writing and submissions, Blog Posting and comment writing, Classifieds posting, Forum Posting, Business Listing, Social Bookmarking, Social Networking RSS, Feeds Do's and Dont's of link building, Easy link acquisition techniques, Domain Authority & How to Increase. **Practical Component** 1. Implementation of Technical solutions for Privacy Protection. 2. Implementation of Article writing and submissions in google page **Suggested Reading** Strategic Management Information System.	**CO-5** **BTL-3**

TEXT BOOKS	
1	Saleh, K. &Shukairy, A.(2010). *Conversion Optimization: The Art and Science of Converting Prospects to Customers*. United States :"O'Reilly Media, Inc.".
2	Diamond, S.(2019.)Digital Marketing *All-In-One For Dummies*. Sussex: John Wiley & Sons.
REFERENCE BOOKS	
1.	Jason Mc Donald.(2016), *SEO Fitness Workbook, The Seven Steps to Search Engine Optimization Success on Googl*e.
E BOOKS	
1.	https://cdn2.hubspot.net/hub/53/file-13204607-pdf/docs/introduction-to-seo-ebook.pdf
MOOC	
1.	https://www.udemy.com/course/seo-tutorial/
2.	https://www.coursera.org/specializations/seo

COURSE TITLE	FUNDAMENTALS OF IOT			CREDITS	4
COURSE CODE	CAD01012	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version 1.0	Approval Details		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	"The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction."
Course Objective	1. To identify, formulate, and solve complex engineering problems by applying principles 2. To provide leadership ability and create a collaborative and inclusive environment, 3. To apply engineering design to produce solutions that meet specified needs 4. To develop and conduct appropriate experimentation, analyze and interpret data. 5. To acquire and apply new knowledge as needed, using appropriate learning strategies.
Course Outcome	Upon completion of this course, the students should be able to 1. Recognize characteristics and physical design of IoT. 2. Identify suitable connectivity protocols. 3. Discuss IoT sensor networks at various use cases. 4. Demonstrate the functionalities of Arduino and Machine to Machine communication 5. Develop IoT enabled hardware setup to execute domain specific IoT application.

Prerequisites: Networking with Internet

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	3	-	3	2	3	2	3	-
CO-2	-	1	-	-	1	3	-	1	-
CO-3	-	1	1	1	-	-	-	1	1
CO-4	1	1	1	1	-	1	1	1	1
CO-5	2	2	1	2	2	2	2	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FUNDAMENTALS OF IOT	**(9L+3P)**
Introduction: Definition & Characteristics of IoT – Physical Design of IoT – Logical Design of IoT- IoT Enabling Technologies –IoT Applications – IoT Challenges- Sensors- Actuators. **Practical component:**	**CO-1** **BTL-3**

1. Networking with Internet using IoT protocol 2. Use sensors and read the sensed data and display using Arduino board **Suggested Readings:** Sensors and Actuators	
MODULE 2:IOT PROTOCOLS	**(9L+3P)**
6LoWPAN, MQTT, CoAP, XMAP, AMQP, IEEE 802.15.4, RFID, Zigbee, Bluetooth, NFC. **Practical component:** 1.Use MQTT to connect to IoT devices 2.Use CoAP to connect to IoT devices **Suggested Readings:** Zigbee, Bluetooth and NFC	**CO-2** **BTL-3**
MODULE 3: SENSOR NETWORKS (9L+3P)	
Wireless Sensor Networks: Application of WSN in IoT, WSN in Agriculture, wireless multimedia sensor networks, WSN challenges **Practical component:** 1.Design of any one application that uses sensor data for decision making process(Example: gas leakage, fire safety, motor On/OFF) **Suggested Readings:** Wireless Sensors and Multimedia Sensor	**CO-3** **BTL-3**
MODULE 4: ARDUINO INTERFACING& M2M COMMUNICATION	**((9L+3P)**
Arduino Programming: Features, Types, Board details, IDE. Setup, Function Libraries, Examples programs. M2M :Machine to Machine Communication Introduction- Difference between IoT and M2M- Software Defined Networking (SDN) **Practical component:** 1. Implement M2M using Arduino programming **Suggested Readings:** Arduino Interfacing& Machine	**CO-4** **BTL-3**
MODULE 5 DOMAIN SPECIFIC IOTS	**(9L+3P)**
Smart Lighting- Intrusion Detection - Weather monitoring- Indoor Air Quality Monitoring- Smart Irrigation. **Practical component:** 1. Analyze the weather data to monitor and prediction of future values 2. Implementation of Smart lighting **Suggested Readings:** Weather monitoring	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Arshdeep Bahga, Vijay Madisetti(2015) "*Internet of Things – A hands-on approach*", Universities Press.
2	Olivier Hersent, David Boswarthick, Omar Elloumi(2012) "*The Internet of Things – Key applications and Protocols"*, Wiley publisher
E BOOKS	
1	ttps://drive.google.com/file/d/1VMQdwIjDw-an9KA3Jwiw16hB1mhJ411m/view
MOOC	
1.	https://nptel.ac.in/courses/106105166/

COURSE TITLE	DATA VISUALIZATION TECHNIQUES		CREDITS	4
COURSE CODE	CAD01013	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course gives insights into data visualization, which is an art of of turning data into readable graphics. This course enables the students to design and create data visualizations based on data available and tasks to be achieved.
Course Objective	1 To understand the concept of data visualization 2 To explore the various distributions and proportions 3 To explain the principles of figure design 4 To implement data visualizations using matplotlib 5 To implement data visualizations using Pandas
Course Outcome	Upon completion of this course, the students will be able to 1 Design and create data visualization 2 Explain the directory of visualization 3 Describe the principles of figure design 4 Implement basic plotting using matplotlib 5 Implement basic plotting suing pandas

Prerequisites: Programming skills

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	-	1	-	2	-	2
CO-2	1	2	1	-	-	-	2	-	
CO-3	3	1	2	1	-	-	1	1	2
CO-4	2	2	1	-	1	1	1	-	
CO-5	3	1	1	-	-	-		-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 OVERVIEW OF DATA VISUALIZATION (9L+3T)	
Why visualize data? Visualizing data: Mapping data onto aesthetics, Aesthetics and types of data, Scales map data values onto aesthetics, Coordinate systems and axes, Color scales	**CO-1 BTL-2**
MODULE 2: DIRECTORY OF VISUALIZATIONS	**(9L+3T)**
Amount, Distributions, proportions, x-y relationships, geospatial data, uncertainty, visualizing amounts, proportions, trends, geospatial data and uncertainty	**CO-2 BTL-2**
MODULE 3:PRINCIPLES OF FIGURE DESIGN	**(9L+3T)**

Visualizations along linear axes, Visualizations along logarithmic axes, Direct area visualizations, Handling Overlapping points Partial transparency and jittering, 2D histograms, Contour lines	**CO-3 BTL-2**
MODULE 4:BASIC PLOTTING WITH MATPLOTLIB (9L+3T)	
Introduction-line plots-titles, labels and legends, plotting using CSV and TSV data source, scatter plot, Bar plots, Histograms, pie charts, stack plots	**CO-4 BTL-3**
MODULE 5: PANDAS FOR DATA VISUALIZATION (9L+3T)	
Introduction-loading datasets with Pandas, plotting Histograms with Pandas, Pandas Line plots, Pandas Scatter plots, Pandas Box plots, Hexagonal plots, Kernel Density plots, time aeries data visualization	**CO-5 BTL-3**
TEXT BOOKS	
1.	Claus O. Wilke(2019), *Fundamentals of Data Visualization*. OREILLY' publishers
REFERENCE BOOKS	
1.	Mario Dobler Tim Gromann(2019), *Data Visualization with Python: Create an impact with meaningful data insights using interactive and engaging visuals*, Packt Publishing.
2	AI publishing(2020)*,Python for Data Preprocessing for Beginners,* AI publishers
E-BOOKS	
1.	https://handsondataviz.org/
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc22_cs32/preview

COURSE TITLE		DATA VISUALIZATION LABORATORY			CREDITS	2
COURSE CODE		CAD01402	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	Data Visualization is a core component of the Business Analytics skillset. Data visualization techniques allow people to use their perception to better understand this data. The goal of this course is to introduce students to data visualization including both the principles and techniques. Students will learn the value of visualization, specific techniques in information visualization and scientific visualization, and how understand how to best leverage visualization methods
Course Objective	1. To Design and create data visualizations. 2. To conduct exploratory data analysis using visualization. 3. To understand the components involved in visualization design 4. To understand the type of data impacts the type of visualization.
Course Outcome	Upon completion of this course, the students will be able to 1. Read CSV and JSON files. 2. Describe the analysis and explore reading data 3. Explain the creation of data frames. 4. Implement the Visualization of data 5. Explain the various types of charts

Prerequisites: E3 – Data Mining

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	1	1	1	1	1	-
CO-2	1	1	-	1	1	1	-	-	-
CO-3	3	-	-	3	-	1	-	1	2
CO-4	2	3	2	1	1	1	2	-	-
CO-5	3	3	1	1	1	1	1	1	-

1: Weakly related, 2: Moderately related and 3: Strongly related

LAB /MINI PROJECT/FIELD WORK

- Various forms of data visualization
- Mapping data- Types of Data Scales Map Data Values onto Aesthetics
- Visualizing distributions
- Data Visualization through Graph Representations
- Graph Layout Techniques (Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Bipartite Graphs).
- color scales -Color to Represent Data Values, Color as a Tool to Highlight, Common Pitfalls of Color Use.
- High-Dimensional Data Visualization

1. Write a program to read a CSV data.
2. Write a program to clean a CSV data.
3. Write a program to check the missing values in CSV data.
4. Write a program to read a JSON file.
5. Write a program to explore and analyze CSV and JSON files.
6. Write a program to create a data frame from the CSV file.
7. Write a program to explore and analyze data frame.
8. Write a program to statistical analysis on data frame.
9. Write a program to draw a line plot
10. Write a program to draw a bar plot and pie plot.

TEXT BOOKS	
1.	Embarak, D. O., Embarak, &Karkal. (2018). *Data analysis and visualization using python.* Apress
2.	Healy, K. (2018). *Data visualization: a practical introduction*. Princeton University Press
REFERENCE BOOKS / Link	
1.	Freeman, M., & Ross, J. (2018). *Programming Skills for Data Science: Start Writing Code to Wrangle, Analyze, and Visualize Data with R*. Addison-Wesley Professional
MOOC	
1.	http://web.cse.ohio-state.edu/~shen.94/Melbourne/Slides/D3.pdf
2.	https://www.coursera.org/learn/datavisualization#syllabus

SEMESTER -IV

COURSE TITLE	BIG DATA ANALYTICS		CREDITS	4
COURSE CODE	CAD01014	COURSE CATEGORY: PC	L-T-P-S	3-0-2-0
VERSION: 1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Big Data is creating significant new opportunities for organizations to derive new value and create competitive advantage from their most valuable asset: information. For businesses, Big Data helps drive efficiency, quality, and personalized products and services, producing improved levels of customer satisfaction and profit. For scientific efforts, Big Data analytics enable new avenues of investigation with potentially richer results and deeper insights than previously available
Course Objective	1. To learn the concept of big data 2. To study about the Data Analytics Lifecycle 3. To understand about Basic Data Analytic Methods Using R 4. To study the Advanced Analytical Theory and Methods: Clustering 5. To understand the Advanced Analytical Theory and Methods: Association Rules
Course Outcome	Upon completion of this course, the students will be able to 1. Outline the importance of Big Data Analytics 2. Apply statistical techniques for big data Analytics. 3. Analyze problems appropriate to mining data streams. 4. Apply the knowledge of clustering techniques in data mining. 5. Perform Graph Analytics for Big Data and provide solutions

Prerequisites: Basics of Database

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	1	-	1	3	1-	-
CO-2	1	1	3	-	-	2	1-	-	-
CO-3	-	-	2	1	2	-	-	-	-
CO-4	-	-	2	-	-	1	3	2	1
CO-5	3	3	1-	-	2	1-	3	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9L+3P)

Introduction to Big Data Analytics-Big Data Overview-Big Data Overview-Analyst Perspective on Data Repositories-State of the Practice in Analytics-BI Versus Data Science-Comparing BI with Data Science-Current Analytical Architecture-Drivers of Big Data-Emerging Big Data Ecosystem and a New Approach to Analytics-Key Roles for the New Big Data Ecosystem	**CO-1 BTL-3**

Practical Component: 1. Perform a basic business operation using R 2. Develop a Hypothesis Test using R	
MODULE 2: DATA ANALYTICS LIFECYCLE	**(9L+3P)**
Data Analytics Lifecycle Overview-Key Roles for a Successful Analytics Project-Background and Overview of Data Analytics Lifecycle-Phase 1: Discovery-Phase 2: Data Preparation-Phase 3: Model Planning-Phase 4: Model Building-Phase 5: Communicate Results-Phase 6: Operationalize-Case Study **Practical Component:** 1. Perform data preprocessing on any database and display the processes data. 2. Develop a data model for preprocessed database.	**CO-2** **BTL-3**
MODULE 3: REVIEW OF BASIC DATA ANALYTIC METHODS USING R	**(9L+3P)**
Introduction to R-R Graphical User Interfaces-Data Import and Export-Attribute and Data Types-Descriptive Statistics-Exploratory Data Analysis-Statistical Methods for Evaluation **Practical Component:** 1. Perform Time-series Analysis for a database of your choice. 2. Implement Linear Regression using R language. 3. Implement Logistic Regression using R language and Exploratory Analysis	**CO-3** **BTL-3**
MODULE 4: CLUSTERING	**(9L+3P)**
Overview of Clustering-K-means-Use Cases-Overview of the Method-Determining the Number of Clusters-Diagnostics-Reasons to Choose and Cautions-Additional Algorithms **Practical Component:** 1. Implement K-means Clustering using R language for clustering student database. 2. Implement Naïve Bayesian Classifier using R language for classifying library database.	**CO-4** **BTL-3**
MODULE 5: ASSOCIATION RULES	**(9L+3P)**
Overview-Apriori Algorithm-Evaluation of Candidate Rules-Applications of Association Rules-An Example: Transactions in a Grocery Store-Rule Generation and Visualization-Validation and Testing-Diagnostics **Practical Component:** Apply Apriori algorithm to find the frequent item sets for the following databases: 1.Grocery store database 2.Healthcare database	**CO-5** **BTL-3**

TEXT BOOKS	
1.	EMC Education Services, (2015),"*Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data*" Inc. Indianapolis, Indiana.
REFERENCE BOOKS	
1.	AnandRajaraman and Jeffrey David Ullman(2012), "*Mining of Massive Datasets*", Cambridge University Press.
2.	Michael Berthold, David J. Hand(2007), "*Intelligent Data Analysis*", Springer.
MOOC	
1.	https://www.edx.org/course/big-data-analytics-2
2.	http://nptel.ac.in/courses/110106072/

COURSE TITLE		DEEP LEARNING			CREDITS	3
COURSE CODE		CAD01015	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Deep learning is a type of machine learning, which is a subset of artificial intelligence. It enables computers to solve more complex problems that require discovering hidden patterns in the data for use in decision making. Deep Learning has proved itself to be a possible solution in the field of natural language processing, Computer Vision tasks, image analysis and other fields. This course gives the basics and fundamentals concepts in deep learning and then the deep networks like deep feed forward networks, CNN and deep generative models like Autoencoders, Boltzmann machines. On completion of the course students will gain the knowledge of applying Deep Learning techniques to solve basic real-life problems.
Course Objective	1. To understand the preliminaries of deep learning 2. To understand the fundamental concepts in deep learning 3. To implement the deep networks using feed forward and CNN 4. To understand the concept of deep generative models 5. To understand and implement the various deep learning applications
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the fundamentals in deep learning 2. Describe the fundamental concepts in deep learning networks 3. Apply the deep networks like feed forward networks and CNN 4. Describe about the deep generative models 5. Apply the deep learning models in various applications

Prerequisites: Applied Mathematics, Machine learning

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	-	-	-	1	1	1
CO-2	2	1	3	2	2	1	1	1	2
CO-3	1	2	3	2	2	1	2	1	2
CO-4	2	2	3	2	2	1	2	1	3
CO-5	1	2	2	2	2	3	2	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 : INTRODUCTION	(9L)
Introduction to deep learning- from cognitive science to deep learning, deep learning applications in daily life, Characteristics of deep learning, Machine learning vs deep learning, Basic building blocks of deep learning	CO-1 BTL-2

Practical Component: Install and implement simple programs using python -Keras **Suggested Reading:** Basics of deep learning and machine learning	
MODULE 2: DEEP LEARNING FUNDAMENTALS	**(9L)**
Basics of neural networks – Basics of Neural Networks, Common Activation Functions-Sigmoid, ReLU and softmaxetc, Convolutional Neural Networks- Filters, CNN, pooling, padding, data augmentation, Recurrent Neural Networks-Recurrent neuron, RNN, vanishing gradient problem, Exploding gradient problem **Practical Component:** Implementation of CNN, RNN **Suggested Reading:** Deep learning using CNN and RNN	**CO-2** **BTL-2**
MODULE 3 : DEEP NETWORKS	**(9L)**
Deep feed forward networks- XOR problem, gradient based learning, Hidden units, architecture, convolutional networks -convolution operation, motivation, pooling, Data types, Efficient convolution algorithms, optimization for training deep models-challenges in neural networks optimization, Basic algorithms, parameter initialization strategies-algorithms with adaptive, convolutional networks **Practical Component:** Implementation of feed forward networks **Suggested Reading:**Feed forward Networks and Convolution algorithms	**CO-3** **BTL-3**
MODULE 4: DEEP GENERATIVE MODELS	**(9L)**
Deep generative models- Autoencoders, Boltzmann machines, Deep belief networks, variational encoder, Generative Adversarial Networks, Hidden Markov model, Flow based generative model **Practical Component:** Auto encoders, hidden Markov models **Suggested Reading:** Various Deep Generative models	**CO-4** **BTL-2**
MODULE 5: APPLICATIONS	**(9L)**
Large scale deep learning, Image Analysis, computer vision, speech recognition, natural language processing, visual art processing, mobile advertising, business applications, drug discovery, bio-informatics, Fraud detection and military **Practical Component:** Implementation of applications of Deep learning **Suggested Reading:** Applications of deep learning	**CO-5** **BTL-3**
TEXT BOOKS	
1.	Heaton, Jeffrey. Ian Goodfellow(2016), YoshuaBengio, and Aaron Courville: *Deep learning*: The MIT Press, 800 pp, ISBN: 0262035618.
REFERENCE BOOKS	
1.	Nikhil Buduma , Nicholas Locascio(2017), "Fundamentals of Deep Learning: *Designing Next-Generation Machine Intelligence Algorithms*", O'Reilly;
2.	Chao Pan(2016) "*Deep Learning Fundamentals, An Introduction for Beginners*" AI Sciences publisher.
E BOOKS	
1.	Rudolph Russell(2018) "*Deep Learning: Fundamentals of Deep Learning for Beginners*" CreateSpace Independent Publishing Platform.
MOOC	
1.	https://nptel.ac.in/courses/106/105/106105215/

COURSE TITLE		MOBILE APPLICATION DEVELOPMENT			CREDITS	4
COURSE CODE		CAD01016	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION	1.0	APPROVAL DETAILS			LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course covers mobile application development, its architecture and lifecycle, as well as its inherent design considerations. Students will learn about mobile application environments and platforms and how to design and develop applications to account for the limited screen size, memory, and access to the internet. Students will incorporate graphics, networking, security, media to create new, real world, practical applications. Development, design, implementation, testing, debugging, and maintaining these applications will also be covered. Students will use a variety of programming languages to create these applications. After developing applications in an emulation environment, students will install them on individual mobile devices as well as prepare them for marketplace distribution.
Course Objective	1. To help students to gain a basic understanding of Android application development 2. To understand different layout and user interfaces used for Android development 3. To connect Android application with the database 4. To implement the android application in the play stores.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the essential Android Programming concepts. 2. Apply the basic design concepts to create android applications 3. Develop various Android applications related to layouts with rich user interactive interfaces 4. Develop Android applications related to mobile related server-less database like SQLITE 5. Deploy applications to the Android marketplace for distribution

Prerequisites: Basics of Java Programming

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO1	1	2	-	-	-	-	1	1	-
CO2	-	-	3	2	-	1	2	-	3
CO3	1	-	1	-	2	-	-	1	-
CO4	-	-	2	1	-	2	1	-	2
CO5	-	2	-	1	-	-	1	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	**(9L+3P)**
Android: An Open Platform for Mobile Development- Android SDK	**CO-1**

Features- Introducing the Development Framework - Android Versions - Architecture of Android -Android Application Life Cycle - Features of Android - Android Development Tools - Creating Android Virtual Devices (AVDs) - Types of Android Applications- Creating Your First Android Application - Application Manifest - Android Activities - Activity Life Cycle. **Practical Component:** 1. Implement the steps needed for setting up Development Environment for Android application deployment. 2. Write an Android app for Saying "hello" to the user. **Suggested Readings:** Android Installation	**BTL-3**
MODULE 2: APPLICATION DESIGN ESSENTIALS	**(9L+3P)**
Intent: Linking Activities Using Intents - Calling Built-In Applications Using Intents- Displaying Notifications - Layouts: Views and View Groups – Linear Layout – Absolute Layout – Table Layout – Relative Layout – Frame Layout – Scroll View - Drawable Resources: Shapes, Colors, and Gradients - Composite Drawable **Practical Component:** Develop Android applications for the following: 1. Simple Calculator 2. Convert the given temperature Fahrenheit to Celsius and vice versa **Suggested Readings:** Display Orientation, Android Application Class, Resolution and Density Independence	**CO-2** **BTL-3**
MODULE 3: USER INTERFACE DESIGN ESSENTIALS	**(9L+3P)**
Views: Basic Views - Picker Views- List Views- Image Views to Display Pictures - Android Menu System - Menus with Views. **Practical Component:** 1. Implement the steps to add Location Awareness facility in a mobile application. 2. Develop an android app for using sensor data from the mobile (Motion, Position, Environment). **Suggested Readings:** WebView, Broadcast Receivers, Adapters	**CO-3** **BTL-3**
MODULE 4: DATABASES AND CONTENT PROVIDERS	**(9L+3P)**
Shared preferences - Android Databases – SQLite - Working with SQLite Databases – SQLiteOpenHelper - Querying a Database - Opening and closing a database, Working with Inserts, updates, and deletes - Content Providers. **Practical Component:** 1. Develop an android application for implementing Notifications and Broadcast Receivers. 2. Develop an android app to connect SQlite Database. **Suggested Readings:** File Management Tools, Maps, Location-Based Services	**CO-4** **BTL-3**
MODULE 5: :TESTING AND PUBLISHING ANDROID APPLICATIONS	**(9L+3P)**
Test automation of mobile application - JUnit for Android, Robotism - Preparing for Publishing - Deploying APK Files. **Practical Component:** 1. Implement the steps for Packaging and Debugging in Android mobile	**CO-5** **BTL-3**

application development. **2.** How testing is performed using Robotium in developing an mobile app. **Suggested Readings:** Distributing apps on mobile market place	
TEXT BOOKS	
1.	WeiMeng Lee (2012). *Beginning Android Application Development*, Wrox Publications.
2	Reto Meier. (2010). *Professional Android 2 Application Development*, Wiley India Pvt Ltd.
REFERENCE BOOKS	
1.	Dawn Griffiths, David Griffiths. (2015). *Head First Android Development*, O'Reilly SPD Publishers, 1st Edition.
2.	AnubhavPradhan, Anil V Deshpande. (2014). *Composing Mobile App, Learn | Explore Apply using Android*, Wiley, 1st Edition.
3	James C. Sheusi. (2013). *Android Application Development for Java Programmers,* Course Technology PTR, 1st Edition.
E BOOKS	
1.	https://www.packtpub.com/product/xamarin-mobile-application-development-for-android/9781783559169
MOOC	
1.	https://www.shawacademy.com/courses/technology/online-mobile-app-development-course/
2.	https://www.coursera.org/specializations/android-app-development

COURSE TITLE	DEEP LEARNING LABORATORY		CREDITS	2
COURSE CODE	CAD01403	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15 %	20%	50%

Course Description	Deep learning in short is part of the family of machine learning methods. It involves solving real word problems. Python is one of the precise and easy to code high level language to implement the deep learning techniques. This course introduces one of the most powerful and easy-to-use Python libraries for developing and evaluating deep learning models is Keras. It wraps the efficient numerical computation libraries Theano and TensorFlow. On completion of the course students can implement the deep learning methods and algorithms to solve basic real-life problems.
Course Objective	1. To understand the python libraries for deep learning 2. To familiarize with the software environment for deep learning algorithms 3. To train the neural networks 4. To understand the prediction and sentiment analysis using deep learning models 5. To understand and implement the various deep learning applications
Course Outcome	Upon completion of this course, the students will be able to 1. Apply python libraries for data visualization 2. Implement multi layers perceptron 3. Apply and design, models for simulation 4. Apply the neural networks to train the data set 5. Apply the deep learning models in various applications

Prerequisites: Machine learning, Python programming

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	2	1	2	3	1	-
CO-2	3	2	1	-	-	-	1	2	1
CO-3	2	-	2	2	1	2	2	1	-
CO-4	2	1	-	2	1	2	1	1	1
CO-5	2	1	2	-	1	-	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related	
LAB /MINI PROJECT/FIELD WORK	
1. Implementation of python libraries to visualize the data using python 2. Implementation of style transfer in images using python 3. Implementation to generate predictions on the training dataset using python 4. Implementation of text classification using python 5. Implementation of multi-layer perceptron for classification tasks using python 6. Implementation of DCGAN model to simulate realistic images using python 7. Implementation for the generation new text from TV scripts using sentiment analysis using python 8. Implementation of object recognition in photographs using CNN using python 9. Time Series Prediction using LSTM RNN 10. Implementation of Next-Word Prediction Using RNN	
TEXT BOOKS	
1.	Francois chollet(2017), "*Deep learning with python*" 1st Edition , Manning Publications
REFERENCE BOOKS	
1	Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr. D Karthika Renuka(2020) "*Deep Learning Using Python"* Wiley publishers
E BOOKS	
1.	Keras Tutorial: Deep learning in python. https://www.datacamp.com/community/tutorials/deep-learning-python?
2	https://keras.io/getting_started/learning_resources/
MOOC	
1.	https://www.udemy.com/course/deep-learning-with-python-and-keras/
2.	https://www.coursera.org/learn/introduction-to-deep-learning-with-keras

SEMESTER V

COURSE TITLE		COGNITIVE COMPUTING			CREDITS	4
COURSE CODE		CAD01017	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course focus leads to a highly interdisciplinary AI course where students gain skills and knowledge from a number of different areas such as mathematics, computer science, psychology and neuroscience combined with a core foundation of artificial intelligence.
Course Objective	1. To create artificial information systems that mimic biological systems 2. To use theoretical insights from AI and understand cognitive processing in humans. 3. To understand probabilistic programming language 4. To understand the applications of cognitive computing
Course Outcome	Upon completion of this course, the students will be able to 1.Describe Psychology within Cognitive Science 2.Relate Neuroscience and cognitive science 3. Describe the basics of probabilistic programming language 4.Implement the learning models of cognition 5.Describe the applications of cognitive computing

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	-	1	1	3	2	3
CO-2	1	2	1	-	1	1	1	2	2
CO-3	3	1	2	1	1	1	3	1	2
CO-4	2	1	1	-	1	1	2	1	2
CO-5	2	1	1	-	1	1	2	1	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: PHILOSOPHY AND PSYCHOLOGY	**(9L+3P)**
Philosophy: Mental-physical Relation – From Materialism to Mental Science – Detour before the naturalistic turn – The Philosophy of Science – The Mind in Cognitive Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science - Science of Information Processing **Practical Component**: 1 Write a python script to collect the basic details of a product and analyse it with large available data and recommend the products to the customer	**CO-1** **BTL-3**

2 Write a python script to find the highly demand products	
MODULE 2: NEUROSCIENCE	**(9L+3P)**
Neurosciences: Cognitive Neuroscience – Perception -Decision – Learning and Memory – Language Understanding and Processing. **Practical Component :** 1.Write a python script to perform string processing 2.Write a python script to extract useful information form a text	**CO-2** **BTL-3**
MODULE 3: PROBABILISTIC PROGRAMMING LANGUAGE	**(9L+3P)**
WebPPL Language – Syntax – Using JavaScript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations -Enumeration – Other basic computation. **Practical Component :** 1.Build a stochastic sampling function using WebPPL 2.Create a function (geometricCoin) that flips a coin. If it comes up heads, you call that same function (geometricCoin) and add 1 to the result. If it comes up tails, you return the number 1.	**CO-3** **BTL-3**
MODULE 4: IMPLEMENTING THE LEARNING MODELS OF COGNITION	**(9L+3P)**
Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models – Occam"s Razor – Learning (Deep) Continuous Functions – Mixture Models. **Practical Component :** 1.Implement the learning models using python	**CO-4** **BTL-3**
MODULE 5: COGNITIVE COMPUTING APPLICATIONS	**(9L+3P)**
Finance and investment firms, Healthcare and veterinary medicine, Travel, Health and wellness , Risk management **Practical Component :** 1**.** Write a Python script to predict and assess loan risks 2. Write a Python script to quickly access the health record of a patient with all the details	**CO-5** **BTL-3**
TEXT BOOKS	
1	Vijay V Raghavan, Venkat N. Gudivada, VenuGovindaraju(2016), *Cognitive Computing: Theory and Applications*: Volume 35, North Holland Publisher
2	Robert A. Wilson, Frank C. Keil(2001), "*The MIT Encyclopedia of the Cognitive Sciences*", The MIT Press
REFERENCE BOOKS	
1.	Noah D. Goodman, Joshua B. Tenenbaum(2016), *The ProbMods Contributors, "Probabilistic Models of Cognition",* Second Edition
E BOOKS	
1.	Vishal Jain, Akash Tayal , Jaspreet Singh, Arun Solanki(2021), *Cognitive Computing Systems Applications and Technological Advancement*s, CRC Press

COURSE TITLE	DIGITAL MARKETING			CREDITS	4
COURSE CODE	CAD01018	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version 1.0	Approval Details			LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course is designed for practical learning, therefore, most concepts will be linked with hands-on training, where students will be expected to work with marketing datasets, dummy display ads, virtual website optimization, SEO based on instructions in lectures and class discussions. The live experience of analyzing responses with analytical software, the launching of dummy display ads, creating optimization of website through Google Adwords are some of the key features of the programme.
Course Objective	1. To analyze the confluence of marketing, operations, and human resources in real-time delivery. 2. To demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets 3. To explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks 4. To investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked. 5. To interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.
Course Outcome	Upon completion of this course, the students will be able to 1. Recognize the importance of conversion and working with digital relationship marketing. 2. Analyse cross-cultural and ethical issues in globalised digital markets. 3. Describe the essential philosophies and practices of marketing and digital marketing technologies. 4. Identify the areas of digital marketing communications. 5. Describe methodologies, tools and technologies involved in digital marketing.

Prerequisites: Knowledge about the social media

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	1	1	-	1	1	-
CO-2	3	1	1	3	1	1	3	1	1
CO-3	2	1	-	2	1	-	2	1	-
CO-4	3	1	2	3	1	2	3	1	-
CO-5	2	1	-	2	1	-	2	1	-

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: INTRODUCTION	**(9L+3P)**
Digital marketing - different from traditional marketing -Ecommerce - new trends and current scenario of the world -marketing a boon or a Bane -digital marketing be a tool of success for companies - Categorization of digital marketing for the business -Understanding a website -Levels of websites -Diff b/w Blog, Portal and Website **Practical Component**: 1. Use APIS to connect applications using python **Suggested Readings:** Categorization of digital marketing for the business	**CO-1** **BTL-3**
MODULE 2: SEARCH ENGINE OPTIMIZATION (SEO)	**(9L+3P)**
SEO - On page optimization techniques – Off page optimization techniques -Reports **Practical Component**: 1.Implement SEO using python libraries 2.Apply Optimization techniques using python libraries **Suggested Readings:** SEO	**CO-2** **BTL-3**
MODULE 3: SOCIAL MEDIA OPTIMIZATION (SMO)	**(9L+3P)**
Social Media Marketing - Advanced Facebook Marketing - Word Press blog creation-Twitter marketing - LinkedIn Marketing - Google plus marketing - social media Analytical Tools. **Practical Component**: 1. Perform Marketing Analysis in Facebook using python 2.Perform marketing analysis in LinkedIn using python **Suggested Readings:** Advanced Facebook Marketing	**CO-3** **BTL-3**
MODULE 4: SEARCH ENGINE MARKETING (9L+3P)	
Introduction to Search Engine Marketing - Tools used for Search engine Marketing - PPC /Google Adwords Tool - Display advertising techniques - Report generation. **Practical Component:** 1.Implement adverting techniques using GoogeAds Keyword Planner 2. Generate a report about a web site **Suggested Readings:** Google Adwords Tool	**CO-4** **BTL-3**
MODULE 5: ADDITIONAL MODULE	**(9L+3P)**
Google Analytics - Online Reputation Management - EMail Marketing - Affiliate Marketing - Social Media Analytics - Ad designing **Practical Component:** **1**.Design an ad for marketing any product using any graphics design tools 2. Generate a report for the top landing pages **Suggested Readings:** E-mail Marketing	**CO-5** **BTL-3**
TEXT BOOKS	

1.	Ryan Deiss and Russ Hennesberry**,** **(**2017.)*Digital Marketing for Dummies,* publisher for Dummies
REFERENCE BOOKS	
1.	Cory Rabazinsky **(**2015.)*Google AdWords for Beginners: A Do-It-Yourself Guide to PPC Advertising,* Createspace Independent Pub; 1st edition
2.	Joe Pulizzi(2013), *Epic Content Marketing*, McGraw Hill Education.
E BOOKS	
1.	https://blog.hubspot.com/marketing/why-digital-marketing-ebook
MOOC	
1.	https://www.edx.org/course/digital marketing-fundamentals

COURSE TITLE		MINI PROJECT			CREDITS	5
COURSE CODE		CAD01800	COURSE CATEGORY	PC	L-T-P-S	0-0-10-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME	
CIA	ESE
50%	50%

Course Description	The course introduces a project, based on a problem-based learning approach, guided by realistic and challenging customer requirements. The project course is organized as group or an individual work under the direct supervision of an academic staff. Based on an idea, the students shall deliver a requirement and design specification of the system to be developed. The system, that consist of an already existing hardware and software platform shall be controlled by software. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and guide
Course Objective	1. To perform a literature review 2. To undertake detailed technical work 3. Develop a solution for the problem and develop an application by using relevant computer application concepts 4. To produce progress reports or maintain a professional journal to establish work completed and deliver a seminar on the general area 5. To present the work in a forum involving poster presentations
Course Outcome	Upon successful completion of the course, the students will be able to: 1. Acquire practical knowledge within the chosen area of technology for project development 2. Identify, analyze, formulate and handle projects with a systematic approach 3. Contribute as an individual or in a team in development of technical projects 4. Develop effective communication skills for presentation of project related activities 5. Report and present the findings of the study conducted in the preferred domain

Prerequisites: Software Engineering , Programming Skills

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO1	2	1	3	1	-	-	-	1	2
CO2	1	1	3	1	-	-	-	2	2
CO3	1	2	3	2	2	-	2	3	3

CO4	**1**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**
CO5	**2**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**

1: Weakly related, 2: Moderately related and 3: Strongly related

Mini Project

Design and develop practical solutions to real life problems related to needs of the society. The theoretical knowledge gained from the subject should be applied to develop effective solutions to various computing problems. Submit a complete report of the project work carried out.

Review #	Agenda	Description	Weightage
1	Confirmation of project title or synopsis/ project proposal	• Identification of Problem • Domain and Detailed Analysis	50%
2	Literature Review on the project	• Study of Existing systems and feasibility of project proposal • Objectives and methodology of the proposed work Design methodology	
3	Modules & Algorithm Explanation	• Planning of project work (time frame) • Demonstration of the work done so far and presentation • Incorporation of suggestions	
4	Project Demonstration	• Project demonstration presentation • Project report -description of concept and technical details • Conclusion and discussion project • Regularity	
5	ESE Examination	• Presentation • Viva voce	50%

SEMESTER VI

COURSE TITLE		PREDICTIVE ANALYTICS			CREDITS	4
COURSE CODE		CAD01019	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
VERSION	1.0	APPROVAL DETAILS			Version	1.0

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with extensive data analysis and the concepts involved in prediction. Predictive analytics also includes the data mining and machine learning concepts which helps in predicting the unknown events.
Course Objective	1. To know the basics of predictive analytics and modeling. 2. To observe the insights of data visualization. 3. To understand the importance of descriptive modeling. 4. To comprehend the fundamentals of predictive modeling. 5. To learn about model ensembles and text mining.
Course Outcome	pon completion of this course, the students will be able to 1. Describe the basics of predictive analytics and modeling. 2. Brief the concepts of data visualization and data preparation. 3. Analyze the clustering algorithms and its importance. 4. Understand predictive modeling and its role in machine learning. 5. Familiarize with the concepts of model ensembles and text mining.

Prerequisites: Data Mining (E3, 3rd Sem), Data Visualization (C12, 4th Sem)

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	3	1	1	1	1	2
CO-2	2	3	2	1	2	3	1	1	1
CO-3	3	2	2	1	2	1	2	3	2
CO-4	2	2	1	1	2	2	1	1	1
CO-5	1	2	3	2	1	2	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO PREDICTIVE ANALYSIS AND MODELING	**(9L+3P)**
Overview of Predictive Analytics – About predictive analytics – Predictive analytics vs. Business Intelligence – Predictive Analytics vs. Statistics – Predictive Analytics vs. Data Mining – Challenges in Predictive Analytics – Predictive Analytics processing steps – Business understanding - Defining data for predictive modeling – Defining the target variable – Defining measures of success for predictive models – Predictive modeling out of order . **Practical component:** 1.Implement the measures for predictive modeling using python 2.Implement the analysis processing steps using python **Suggested Readings:** Fundamentals of predictive analytics	**CO-1** **BTL-3**

MODULE 2: DATA VISUALIZATION AND DATA PREPARATION (9L+3P)	
Data Understanding – Single variable summaries – Data visualization in one dimension – Histograms – Multiple variable summaries – Data visualization two or higher dimensions – Value of statistical significance – Data Preparation – Variable cleaning – Feature creation. **Practical component:** 1.Perform basic data visualization using an open-source tool. 2.Visualize the data using various visualizations techniques **Suggested Readings:** Overview of data visualization techniques	**CO-2** **BTL-3**
MODULE 3: DESCRIPTIVE MODELING (9L+3P)	
Data preparation issues with descriptive modeling – Principal component analysis – Clustering algorithms – Interpreting Descriptive Models – Standard cluster model interpretation. **Practical component:** 1.Implement principal component analysis using python 2.Implement clustering using python **Suggested Readings:** Introduction to clustering algorithms	**CO-3** **BTL-3**
MODULE 4: PREDICTIVE MODELING (9L+3P)	
Decision trees – Logistic regression – Neural networks – K-Nearest neighbor – Naïve Bayes – Regression models – Linear regression – Other regression algorithms – Assessing Predictive Models – Batch approach to model assessment – Assessing regression models. **Practical component:** 1.Implement logistic regression using Python 2.Implement regression algorithm using python **Suggested Readings:** Machine learning algorithms for beginners	**CO-4** **BTL-3**
MODULE 5: MODEL ENSEMBLES AND TEXT MINING (9L+3P)	
Model ensembles – Motivation for ensembles – Bagging – Boosting – Improvements to bagging and boosting – Model ensembles and Occam's razor – Interpreting model ensembles - Text Mining – Motivation for text mining – Predictive modeling approach to text mining – Structured vs. unstructured data – Data preparation steps – Text mining features – Modeling with text mining features – Regular expressions – Model deployment. **Practical component:** 1.Perform text mining using an open source tool. 2.Deploy a text mining model **Suggested Readings:** A guide to learning ensemble techniques	**CO-5** **BTL-3**
TEXT BOOKS	
1.	Dean Abbott. (2014). *Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst*, John Wiley & Sons Inc., 1st Edition, pp. 1 – 432.
REFERENCE BOOKS	
1.	Anasse Bari, Mohamed Chaouchi, Tommy Jung. (2016). *Predictive Analytics for*

	Dummies, 2nd Edition, pp. 1 – 464.
E BOOKS	
1.	https://www.predictiveanalyticsworld.com/book/pdf/Predictive_Analytics_by_Eric_Siegel_Excerpts.pdf
2.	Learning_Data_Mining_Techniques_for_Better_Predictive_Modeling_and _Analysis _ of_Big_Data_Second_Edition
MOOC	
1.	https://www.edx.org/search?q=predictive%20analytics
2.	Top Predictive Analytics Courses - Learn Predictive Analytics Online | Coursera

COURSE TITLE	PROJECT WORK		CREDITS	10
COURSE CODE	CAD01801	COURSE CATEGORY: PC	L-T-P-S	0-0-20-0
VERSION: 1.0	APPROVAL DETAILS:		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

CIA	ESE
50%	50%

Course Description	The project work is introduced to improve the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. The students in a group of 3 to 4 works on a topic under the guidance of a faculty member and prepares a comprehensive project report after completing the work. The progress of the project is evaluated based on a minimum of three reviews. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.
Course Objective	1 To perform a literature review 2 To undertake detailed technical work 3 Develop a solution for the problem and develop an application by using relevant computer application concepts 4 To produce progress reports or maintain a professional journal to establish work completed and deliver a seminar on the general area 5 To present the work in a forum involving poster presentations
Course Outcome	Upon successful completion of the course students will be able to: 1. Identify a issue and derive problem related to society, environment, economics, energy and technology 2. Formulate and Analyze the problem and determine the scope of the solution chosen 3. Design solutions to complex problems utilizing a systems approach. 4. Find solution by formulating proper methodology 5. Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metric

Prerequisites: Software Engineering , Programming Skills

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO1	2	1	3	1	-	-	-	1	2
CO2	1	1	3	1	-	-	-	2	2
CO3	1	2	3	2	2	-	2	3	3
CO4	1	3	3	2	2	2	2	3	3
CO5	2	3	3	3	2	2	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

Project

The students should finalize their Project immediately before commencement of 4th semester.

The types of projects may include:

1. Industrial case study
2. Preparation of a feasibility report
3. Design and development of application
4. The overhauling of existing application
5. Creation of New facilities

Identification of Topic: The selection of topic is of crucial importance. It should be field of interest. It is advisable to choose the project can be completed on time and within the budget and resources. The topic should be clear, directional, focussed and feasible. The project should be challenging but manageable within the resources and time available. Students should undergo reviews during the internal assessment. Time table for IA should include project review. The guide should monitor the progress of Project work periodically and it should be finally evaluated. The IA marks will be evaluated based on oral presentation and assessment by the internal guide by adopting Rubrics given. Real time problems, Industry related problems, should be chosen and it is a Responsibilities of the project committee / Project coordinator.

Rubrics for Major Project Evaluation

Review #	Agenda	Criteria	Assessment	Overall Weightage
1	Synopsis and Proposal Evaluation	• Identification of Problem Domain and Detailed Analysis • Study of Existing systems and feasibility of project proposal • Objectives and methodology of the proposed work	20	80%
2	Midterm Assessment Project Evaluation	• Design methodology • Planning of project work (time frame) • Demonstration of the work done so far and presentation	20	
3	Project and Project Report Evaluation	• Incorporation of suggestions • Project demonstration presentation • Project report -description of concept and technical details • Conclusion and discussion	30	
4	Evaluation by guide	• Self-motivation and determination • Working within a team • Technical knowledge and awareness related to the project • Regularity	10	
5	ESE Examination	• Presentation • Viva voce	20	20%

Electives

COURSE TITLE	AUGMENTED AND VIRTUAL REALITY			CREDITS	3
COURSE CODE	CAD01500	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	In virtual reality (VR), the users' perception of reality is completely based on virtual information. In augmented reality (AR) the user is provided with additional computer-generated information within the data collected from real life that enhances their perception of reality.
Course Objective	1. To Understand the Virtual reality systems 2. To Apply techniques of creation and presentation of virtual environments in virtualReality 3. To evaluate VR systems in terms of 2D and 3D orientation. 4. To Create content for Augmented reality application. 5. To Apply augmented reality to a problem and evaluate.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the Virtual reality concepts illustrating with examples. 2. Describe the evolution of VR systems in correspondence with the fundamental basics of human vision and optics. 3. Distinguish 2D and 3D orientations of VR systems, rendering and perception. 4. Formulate contents for ant augmented reality application. 5. Recognize and to apply augmented reality to a real-world problem and thus to evaluate.

Prerequisites: Computer Graphics

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	2	1	1	2	1	2
CO-2	2	2	1	2	1	1	2	1	2
CO-3	2	2	1	2	1	1	2	1	2
CO-4	2	2	1	2	1	1	2	1	2
CO-5	2	2	1	2	1	1	2	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: VIRTUAL REALITY (9L)

Introduction to Virtual Reality- What is virtual reality? – Modern VR experiences- Virtual reality systems- hardware and Software-Geometry of virtual Worlds- Geometric Models-Changing position and Orientation-Axis-Angle Representations-Transformations. **Practical Component:** 1. Setting up a project for virtual reality platform.	**CO-1** **BTL-3**

2. Use button interface functions for a VR project **Suggested Reading:**https://nptel.ac.in/courses/106106138/	
MODULE 2: VIRUAL REALITY EVOLUTION	**(9L)**
Light and Optics- behavior of light- Optical Aberrations- cameras and displays- The physiology of human vision- Implications of VR- Visual Perception- Perception of Depth, Motion and Color. **Practical Component:**Develop a VR application for any real-life application **Suggested readings**: https://nptel.ac.in/courses/106106138/8	**CO-2** **BTL-3**
MODULE 3: EVALUATING VR SYSTEMS	**(9L)**
Tracking 2D and 3D orientation-Interaction- Locomotion-Interaction Mechanisms-Auditory Perception and Rendering. **Practical component:** Develop a gaze-based control for a VR application **Suggested Readings:** https://www.ronaldazuma.com/papers/cga99.pdf	**CO-3** **BTL-3**
MODULE 4: AUGMENTED REALITY	**(9L)**
What Is Augmented Reality- The Relationship between Augmented Reality and Other Technologies- How Does Augmented Reality Work- Ingredients of an Augmented Reality Experience. **Practical Component:** Experience existing VR and AR applications **Suggested reading**: https://nptel.ac.in/courses/106105195/13	**CO-4** **BTL-3**
MODULE 5: COMPONENTS OF AUGMENTED REALITY	**(9L)**
Augmented Reality Hardware and Software- Interaction- Mobile Augmented Reality- Reality Applications- Trends in Augmented Reality. **Practical Component:** 1. Installation and familiarizing game engine environment 2. Installation and setting up of AR Toolkit 3. Create a simple diorama with game objects 4. Build Hello World in AR Toolkit **Suggested reading**: https://electricalfundablog.com/augmented-assisted-reality-technology-components-types-applications/	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Alan B Craig, William R Sherman and Jeffrey D Will(2009), "*Developing Virtual Reality Applications: Foundations of Effective Design*", Morgan Kaufmann, Elsevier.
2.	Alan B Craig(2013), "*Understanding Augmented Reality-Concepts and Applications*", Morgan Kaufmann, Elsevier.
RENCE BOOKS	
1.	Jason Jerald(2015), *"The VR Book: Human-Centered Design for Virtual Reality"*, ACM Publications
E BOOKS	
1.	http://vr.cs.uiuc.edu/vrbookbig.pdf
2.	https://arbook.icg.tugraz.at/Schmalstieg-2016-AW
MOOC	
1.	https://nptel.ac.in/courses/106/106/106106138/
2.	https://www.coursera.org/learn/ar

COURSE TITLE		NATURAL LANGUAGE PROCESSING			CREDITS	3
COURSE CODE		CAD01501	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course explains the basic concepts of NLP, Morphological and semantical analysis techniques. It also describes context free grammars and word disambiguation methods
Course Objective	1. To familiarize the concepts and techniques of Natural language Processing for analyzing words based on Morphology and CORPUS. 2. To Perform POS tagging for a given natural language using modeling technique based on the structure of the language. 3. To relate mathematical foundations, Probability theory with Linguistic essentials such as syntactic and semantic analysis of text. 4. To apply the Statistical learning methods and cutting-edge research models from deep learning. 5. To Check a current method for statistical approaches to machine translation.
Course Outcome	Upon completion of this course, the students will be able to 1. Apply the principles and Process of Human Languages such as English and other Indian Languages using computers. 2. Realize semantics and pragmatics of English language for text processing and Create CORPUS linguistics based on digestive approach (Text Corpus method) 3. Perform POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language. 4. Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology. 5. Develop a Statistical Methods for Real World Applications and explore deep learning-based NLP and Check current methods for statistical approaches to machine translation.

Prerequisites: a. Linear algebra
b. Probability and Statistics
c. Programming in any high-level language, preferably python or MATLAB.
d. Concepts like stemming, Bagging, vectorizing, extracting sentiment, classifying comments

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	-	2	1	2	3	3	1
CO-2	3	3	1	-	3	3	3	1	3
CO-3	3	3		3	3	3	2	1	2

CO-4	**3**	**3**	**-**		**3**	**3**	**3**	**3**	**3**
CO-5	**3**	**3**	**2**	**-**	**3**	**3**	**2**	**3**	**1**
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: NLP INTRODUCTION AND TEXT PREPROCESSING	**(9L)**
Introduction to NLP - Various stages of NLP –The Ambiguity of Language: Why NLP Is Difficult Parts of Speech: Nouns and Pronouns, Words: Determiners and adjectives, verbs, Phrase Structure. Statistics Essential Information Theory: Entropy, perplexity, the relation to language, Cross entropy. Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis. **Practical component:**Word Analysis, Word Generation **Suggested Readings:** https://people.cs.umass.edu/~mccallum/courses/inlp2007/syllabus.html https://nlp-iiith.vlabs.ac.in/References.html?domain=ComputerScience	**CO-1** **BTL-3**
MODULE 2: MORPHOLOGY AND LANGUAGE MODELING	**(9L)**
Inflectional and Derivation Morphology, Morphological analysis and generation using Finite State Automata and Finite State transducer- Words: Collocations- Frequency-Mean and Variance –Hypothesis testing: The t test, Hypothesis testing of differences, Pearson's chi-square test, Likelihood ratios. Statistical Inference: n-gram Models over Sparse Data: Bins: Forming Equivalence Classes- N gram model - Statistical Estimators- Combining Estimators **Practical component:**Morphology and N-Grams **Suggested Readings:** https://people.cs.umass.edu/~mccallum/courses/inlp2007/syllabus.html https://nlp-iiith.vlabs.ac.in/References.html?domain=ComputerScience	**CO-2** **BTL-3**
MODULE 3: WORD SENSE DISAMBIGUATION AND MARKOV MODEL	**(9L)**
Supervised Disambiguation: Bayesian classification, An information theoretic approach, Dictionary-Based Disambiguation: Disambiguation based on sense, Thesaurus based disambiguation, Disambiguation based on translations in a second-language corpus. Hidden Markov model, Fundamentals, Probability of properties, Parameter estimation, Variants, Multiple input observation- Applying HMMs to POS tagging, Applications of Tagging . **Practical component:**POS-Tagging: Hidden Markov Model. **Suggested Readings:** https://people.cs.umass.edu/~mccallum/courses/inlp2007/syllabus.html https://nlp-iiith.vlabs.ac.in/References.html?domain=ComputerScience	**CO-3** **BTL-3**
MODULE 4: CONTEXT FREE GRAMMARS AND DISCOURSE STRUCTURE ANALYSIS	**(9L)**
The Probability of a String, Problems with the Inside-Outside Algorithm, parsing for disambiguation, Tree banks, parsing models vs. language models, Phrase structure grammars and dependency, Lexicalized models using derivational histories, Dependency-based models- Discourse- Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure. **Practical component:**Chucking, Building Chunker **Suggested Readings**: https://people.cs.umass.edu/~mccallum/courses/inlp2007/syllabus.html	**CO-4** **BTL-3**

https://nlp-iiith.vlabs.ac.in/References.html?domain=ComputerScience	
MODULE 5: SYNTAX, SEMANTICS AND RECENT TRENDS (9L)	
Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, WordNet, Thematic Roles, Semantic Role Labelling with CRFs. Statistical Alignment and Machine Translation, Text alignment, Word alignment, Information extraction, Text mining, Information Retrieval, NL interfaces, Sentimental Analysis, Question Answering Systems, Social network analysis. Recent Trends in NLP. **Practical Component:** Sentiment Analysis using Python **Suggested Readings:** https://people.cs.umass.edu/~mccallum/courses/inlp2007/syllabus.html https://towardsdatascience.com/a-beginners-guide-to-sentiment-analysis-in-python-95e354ea84f6?gi=77c48b25216e	**CO-5** **BTL-3**

TEXT BOOKS	
1	James Allen(2004)– "*Natural Language Understanding* ", Pearson Education, 2004.
2	Daniel Jurafsky and James H Martin(2018)" *Speech and Language Processing: An introduction to Natural Language Processing,* Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition.
REFERENCE BOOKS	
1	NitinIndurkhya, Fred J. Damerau(2010) "H*andbook of Natural Language Processing",* Second Edition, CRC Press.
2	Hobson lane, Cole Howard, Hannes Hapke(2019), "*Natural language processing in action*" MANNING Publications.
E BOOKS	
1.	https://karczmarczuk.users.greyc.fr/TEACH/TAL/Doc/Handbook%20Of%20Natural%20Lan guage%20 Processing, %20Second%20Edition%20Chapman %20&%20Hall%20Crc%20Machine%20Learning%20&%20Pattern%20Recognition %202010.pdf
MOOC	
1.	https://analyticsindiamag.com/top-rated-moocs-for-learning-natural-language-processing
2.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-864-advanced-natural-language-processing-fall-2005/lecture-notes/

COURSE TITLE	GAMING TECHNOLOGY		CREDITS	3
COURSE CODE	CAD01502	COURSE CATEGORY: DE	L-T-P-S	3-0-0-0
Version: 1.0	Approval Details:		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course aims to build a generalizable understanding of the theory of virtual interactive simulations, while also more specifically developing intermediate competence in programmatic problem solving within the Unity Game Engine
Course Objective	1. To illustrate an understanding of the language and concepts of game development technology and techniques. 2. To apply mathematical and game programming knowledge and skills to solve development tasks. 3. To build familiarity and appreciation of the programmatic components of an industry standard game development engine. 4. To seek new knowledge of games development through self-directed study. 5. To Develop the Games using various tools.
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the game architecture 2. Build the Games with Looping / Caching. 3. Design User Interface for Games. 4. Write programs Using Lua. 5. To Develop the Games Using Scratch and Blender.

Prerequisites: Multimedia Tools

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	-	2	-		-	3	-	1
CO-2	-	2	-	3	2	-	-	2	1
CO-3	1	-	2	-	-	2	2	-	-
CO-4	2	-	-	1	-	-	-	-	3
CO-5	-	-	2	-		1	3	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: GAME ARCHITECTURE	(9L)
Game Programming Style, Game Architecture, Application Layer, Game Logic, Game Views for AI Agents, Networked Game Architecture. **Practical Component:** (i)Graphics Display (ii)User Interface **Suggested reading:** Game View for the Human Player	**CO-1** **BTL-3**
MODULE 2: GAME BUILDING	**(9L)**

Creating a Game Project, building a Game, Creating Build Scripts, Game Initialization, Game Shutdown, Game Actors and Component Architecture, Gamming with Loop, Loading and Caching Game Data, Resource Files, Resource Cache. **Practical Component:** (i)Building Games with Actor (ii)Building Games with Components **Suggested readings:** Coding Tidbits and Style	**CO-2** **BTL-3**
MODULE 3: GAMING INTERFACE	**(9L)**
Using XInput or DirectInput, working with a Game Controller, Working with the Keyboard, User Interface Programming. **Practical Component:** (iii) Control Properties – Hot Keys, Tooltips, Dragging, Sounds and Animation. **Suggested readings:** Game Events	**CO-3** **BTL-3**
MODULE 4: SCRIPTING WITH LUA, AN INTRODUCTION TO GAME AI	**(9L)**
Lua – Comments, Variables, Functions, Tables, Flow Control, Operators, Binding Lua to C++, Lua C API, tolua++, Lua Development and Debugging, Gamming with AI Techniques. **Practical Component:**Game with Path Finding. **Suggested readings:**Gaming with Finite State Machines	**CO-4** **BTL-3**
MODULE 5: GAME DEVELOPMENT	**(9L)**
Introduction to Scratch – Game design using scratch- Introduction to Blender – Game design using blender **Practical Component**: (i) Simple Interactive Game Development using scratch and blender (ii) Puzzle games, Single Player games, Multi Player game Development using scratch and blender	**CO-5** **BTL-3**
T BOOKS	
1.	Mike McShaffrfy(2017), "*Game Coding Complete*", Charles River Media.
ERENCE BOOKS	
1.	Ernest Adams and Andrew Rollings(2009), "*Fundamentals of Game Design*", 2 nd Edition Prentice Hall / New Riders.
2.	Jesse Schell(2008), *The Art of Game Design: A book of lenses*, 1 st Edition, CRC Press.
E BOOKS	
1.	http://canvas.projekti.info/ebooks/Game%20Coding%20Complete%20-%204th%20Edition.pdf
2	http://graphics.cs.cmu.edu/nsp/course/15-462/Fall04/slides/GameProg.pdf
MOOC	
1.	https://www.coursera.org/specializations/game-development?
2.	https://nptel.ac.in/courses/106/106/106106182/

COURSE TITLE	ARTIFICIAL INTELLIGENCE AND BLOCK CHAIN		CREDITS	3
COURSE CODE	CAD01503	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course helps to apply Artificial Intelligence to Blockchain applications
Course Objective	1. To Solve problems using informed and uninformed search strategies 2. To Discuss the basics of Blockchain 3. To Construct Machine learning model for Blockchain 4. To Identify Consensus mechanism for Blockchain Application 5. Apply Artificial intelligence techniques for Blockchain use cases
Course Outcome	Upon completion of this course, the students will be able to 1. Solve problems using informed and uninformed search strategies 2. Discuss the basics of Blockchain 3. Construct Machine learning model for Blockchain 4. Identify Consensus mechanism for Blockchain Application 5. Apply Artificial intelligence techniques for Blockchain usecase

Prerequisites: Fundamentals of Computer Science.

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	2	1	1	2	3	3
CO-2	3	3	3	2	1	1	2	2	2
CO-3	3	3	3	2	1	1	2	2	2
CO-4	3	3	3	2	1	1	2	2	2
CO-5	3	3	3	2	1	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO ARTIFICIAL INTELLEGENCE (9L)	
Introduction-History and foundation of Artificial Intelligence- Agents and Environments – Categories of Artificial Intelligence-Types of Agent program-properties of environment-Problem solving using searching-Uninformed and Informed search. **Practical component:** Construction of simple reflex agent with sensor and actuator	**CO-1 BTL-3**
MODULE 2: BLOCKCHAIN BASICS (9L)	
Introduction to Blockchain-Generations of Blockchain- Structure of Blockchain- Building Blocks of Blockchain-Database-Block-Hash-Minor-Transaction-Smart contracts-Consensus Mechanisms **Practical component:** Study of Blockchain development frame works (Truffle/Hyperledger fabric).	**CO-2 BTL-3**

MODULE 3: MACHINE LEARNING	(9L)
Machine Learning Fundamentals –Types of Machine Learning - Supervised, Unsupervised, Reinforcement- The Machine Learning Process-Machine Learning Algorithms-Linear Regression-Support Vector Machine-K Nearest Neighbors-K means clustering-Neural network. **Practical component:** Design a model to predict the housing price from Boston Dataset using Linear Regression.	**CO-3** **BTL-3**
MODULE 4: CONSENSUS ALGORITHMS **(9L)**	
Introduction to Consensus Methods-Proof of Work(PoW)-Proof of Stake(PoS)-Proof of Burn(PoB)-Proof of Activity(PoA)-Proof of Elapsed Time(PoET) **Practical Component:** Prepare comparison study report of various Consensus methods for financial transaction.	**CO-4** **BTL-3**
MODULE 5: ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN	**(9L)**
Artificial Intelligence and Blockchain driven use cases -Data Management-Fraud Detection-Empowering blockchain using AI-The future of AI with Blockchain **Practical component:** Develop a Machine Learning Model to detect Fraudulent activity in Blockchain Transactions	**CO-5** **BTL-3**
T BOOKS	
1.	Stuart Russell, Peter Norvig(2010), "*Artificial Intelligence – A Modern Approach*", 3rd Edition, Pearson Education / Prentice Hall of India.
ERENCE BOOKS	
1.	Brojo Kishore Mishra , Sanjay Kumar Kuanar(2020) "*Handbook of IoT and Blockchain: Methods, Solutions, and Recent Advancements (Internet of Everything (IoE)*) ", CRC Press; 1st edition
2.	Ganesh Prasad Kumble, Anantha Krishnan(2020)," *Practical Artificial Intelligence and Blockchain: A guide to converging blockchain and AI to build smart applications for new economies*.
E BOOKS	
1.	https://www.researchgate.net/publication/337649428_Handbook_of_IoT_and_Blockchain_-_Methods_Solutions_and_Recent_Advancements
MOOC	
1.	https://www.coursera.org/learn/blockchain-business-models
2.	https://www.coursera.org/learn/introduction-to-ai

COURSE TITLE		IoT ANALYTICS			CREDITS	3
COURSE CODE		CAD01504	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the components of the IoT data flow with technical needs and general strategies required to extract value from the flood of data. This course helps to build a strong analytics capability from simple visualizations to machine learning predictive models.
Course Objective	1 To have knowledge for facing challenges that come with IoT huge volume of data sets. 2 To be familiarized with IoT networking protocols. 3 To analyze and handle the IoT data 4 To perform IoT data analyzation with machine learning methods 5 To organize and manage IoT data
Course Outcome	Upon completion of this course, the students will be able to 1 Describe the challenges that come with IoT data from the volume of data to issues with time and space that are not normally a concern with internal company data sets. 2 Familiarize with categories of devices and networking protocol strategies. 3 Recognize the advantages to cloud-based infrastructure for handling and analyzing IoT data 4 Perform standard machine learning methods and ARIMA forecasting on IoT data using R. 5 Explicate the concept of Linked Analytical Datasets and explain how to balance maintainability with data scientist

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	1	1	2	2	2	2
CO-2	3	2	1	1	1	1	1	1	1
CO-3	2	2	1	2	2	2	1	2	1
CO-4	1	2	1	1	1	1	2	1	1
CO-5	2	1	2	1	2	1	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1:DEFINING IOT ANALYTICS AND CHALLENGES (9L)

Defining IoT Analytics- Defining Analytics, Defining the Internet of Things, IoT Analytics Challenges – the data volume, Problem with time, Problem with Space, Data Quality , Analytics Challenges.	**CO-1 BTL-3**

Practical component: Application of temperature sensor **Suggested Readings:** Evolution of IoT	
MODULE 2: IOT NETWORKING CONNECTIVITY PROTOCOLS	**(9L)**
Connectivity Protocols- Bluetooth Low Energy, 6LoWPAN, Zigbee-Advantages of Zigbee, Disadvantages of Zigbee, IoT network data messaging protocol-Message Queue Telemetry Transport, HTTP, Constrained application protocol (CoAP) **Practical component:** Implementation of Bluetooth relay shield **Suggested Readings:** IoT Architecture	**CO-2** **BTL-3**
MODULE 3: IOT ANALYTICS FOR THE CLOUD	**(9L)**
Cloud security and Analytics- Public/Private Keys, Public versus Private subnets, Access restrictions, Securing customer data, the AWS overview-AWS key concepts, AWS key services for IoT Analytics **Practical component:** Analyze the utilization and throughput of smart Fridge. **Suggested Readings:** Cloud computing, AWS	**CO-3** **BTL-3**
MODULE 4:DATA SCIENCE FOR IOT ANALYTICS	**(9L)**
Machine Learning- Evaluation of Machine Learning-optimization, Feature Engineering with IoT data- dealing with missing values, centering and scaling, time series handling, validation methods-cross Validation, Test set, Precision, recall, and specificity. **Practical component:** Implementation of GSM shield **Suggested Readings:** Machine learning	**CO-4** **BTL-3**
MODULE 5:STRATEGIES TO ORGANIZE DATA FOR ANALYTICS	**(9L)**
Linked Analytical Datasets-Analytical data set, building analytic data set, Managing data lakes- Data refineries, data retention strategy. **Practical component:** Implement word count / frequency programs using MapReduce **Suggested Readings:** Data Analytics	**CO-5** **BTL-3**
TEXT BOOKS	
1.	Andrew Minteer (2017).*Analytics for the Internet of Things (IoT): Intelligent analytics for your intelligent devic*es.1st Edition.
REFERENCE BOOKS	
1.	HwaiyuGeng(2016),*Internet of Things and Data Analytics*, Wiley Publications
2.	Oliver Hersent, David Boswarthick, Omar Elloumi (2012), *The Internet of Things: Applications and Protocols,* Author(s): Wiley publications
E BOOKS	
1.	https://libribook.com/ebook/6403/analytics-internet-things-iot-pdf
MOOC	
1.	https://www.edx.org/course/introduction-to-the-internet-of-things-iot
2.	https://www.coursera.org/browse/data-science/data-analysis

COURSE TITLE		ROBOTICS AND AUTOMATION			CREDITS	3
COURSE CODE		CAD01505	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS			LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This core course of Computer Science and Engineering and focuses on Operating System concepts.
Course Objective	1. To understand the basic functionalities and components of Robotic Systems. 2. To understand robotic kinematics and degrees of freedom. 3. To gain knowledge of drives actuators and controls. 4. To understand various robotic effectors. 5. To comprehend on programming the robots
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the basics of Robotic concepts. 2. Explicate kinematics behind robots and degrees of freedom 3. Identify actuator systems for a given scenario. 4. Identify effectors systems for a given scenario. 5. Write programs for robotic controls

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	1	-	1	2	2	2
CO-2	2	1	-	-	1	-	2	2	2
CO-3	2	2	1	-	-	--	2	2	2
CO-4	2	2	2	-	-	-	2	2	2
CO-5	3	3	3	2	2	2	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO ROBOTICS	**(9L)**
Introduction to Robotics- Laws of Robotics, Classification of Robots- Components of industrial robots-Components of mobile robots- Applications	**CO-1 BTL-2**
MODULE 2 : ROBOTICS KINEMATICS	**(9L)**
Position, Orientation and Frames. Mappings: Changing descriptions from frame-to-frame Operators: Translations, Rotations and Transformations - Forward and Reverse Kinematics - Kinematics Of Three Degree of Freedom Robot Arm-Homogeneous Transformations	**CO-2 BTL-2**
MODULE 3: DRIVE ACTUATORS AND CONTROLS	**(9L)**

Functions of Drive Systems- Introduction to Pneumatic Systems-Introduction to Electrical Drives- Piezoelectric Actuators-Stepper Motor-Drive Mechanisms		**CO-3 BTL-3**
MODULE 4: ROBOTS AND EFFECTORS		**(9L)**
Robot End Effectors-Drive System for Gripper-Mechanical Gripper-Magnetic Gripper-Vacuum Grippers-Adhesive Grippers -Active and Passive Grippers		**CO-4 BTL-2**
MODULE 5: ROBOT PROGRAMMING AND APPLICATIONS		**(9L)**
Robot Languages-Classification-Computer Control and Robot Software-VAL Systems and Languages-Applications: Capabilities of Robot-Robotic Applications		**CO-5 BTL-2**
TEXT BOOKS		
1.	Deb S. R. and Deb S.(2010), "*Robotics Technology and Flexible Automation*", Tata McGraw Hill Education Pvt. Ltd.	
REFERENCE BOOKS		
1.	Mikell P. Groover et. al(2013)., "*Industrial Robots - Technology, Programming and Applications*", McGraw Hill, New York.	
2.	John J.Craig(2009) , "Introduction to Robotics", Pearson.	
3.	A.K Gupta, S.K. Arora(2013), *Industrial Automation and Robotics*, Laxmi Pubilaction (P) Ltd.	
MOOC		
1.	http://wiki.ros.org/Events/ICRA2010Tutorial	
2.	https://in.udacity.com/course/introduction-to-operating-systems--ud923	

COURSE TITLE		WEB ANALYTICS			CREDITS	3
COURSE CODE		CAD01506	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
VERSION	1.0	APPROVAL DETAILS			LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course provides the critical elements of web and search engine content analytics so that one can optimize the organization's capacity to make highly-informed business decisions
Course Objective	1. To provide the basics of web analytics 2. To acquire the knowledge of qualitative analysis 3. To understand the fundamental of web analytics 4. To provide the basics of foundational metrics 5. To understand the search analysis
Course Outcome	Upon completion of course , the students will be able to 1 Explain the basics of web analytics and data collection 2 Describe the critical components of successful web analytics 3 Explain the ways of capturing data, selection of tools and best practices 4 Describe the foundational metrics and standard reports 5 Explain search engine optimization and competitive intelligence analytics

Prerequisites: Programming skills

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	-	1	-	2	-	2
CO-2	1	2	1	-	-	-	2	-	
CO-3	3	1	2	1	-	-	1	1	2
CO-4	2	2	1	-	1	1	1	-	
CO-5	3	1	1	-	-	-		-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 INTRODCUTION	**(9L)**
Introduction- A brief history of web analytics, current landscape and challenges, Traditional web analytics, measuring both what and the why, Data Collection-clickstream data, Outcomes data, research data.	**CO-1 BTL-2**
MODULE 2: OVERVIEW OF QUALITATIVE ANALYSIS	**(9L)**
The Essence of Customer centricity -Lab usability testing-Heuristic Evaluations-Site visits-surveys- critical components of a successful web analytics -Focus on customer centricity- Solve for business questions-Folow the 10/90 rule	**CO-2 BTL-2**
MODULE 3:WEB ANALYTICS FUNDAMENTALS	**(9L)**

Capturing data-Selecting your optimal web analytics tools-understanding clickstream data quality- Implementing best practices	**CO-3 BTL-2**
MODULE 4:CORE WEB ANALYTICS CONCEPTS	**(9L)**
Preparing to understand the basics-revisiting foundational metrics-understanding standard reports-using website content quality and navigation report-	**CO-4 BTL-3**
MODULE 5: SEARCH ANALYTICS	**(9L)**
Performing internal site search analytics-search engine optimization-measuring SEO efforts-Analyzing pay per click effectiveness -competitive intelligence analytics -competitive traffic reports-search engine reports	**CO-5 BTL-3**
TEXT BOOKS	
1.	Avinash Kaushik(2009*), Web Analytics,* Wiley Publisher
REFERENCE BOOKS	
1	Brian Clifton(2012), *Advanced Web Metrics with Google Analytics*, 3rd Edition,Wiley publisher
E-BOOKS	
1.	Avinash Kaushik(2009), Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, Sybex Publisher
MOOC	
1.	https://www.futurelearn.com/courses/digital-skills-web-analytics
2	https://www.coursera.org/courses?query=web%20analytics

COURSE TITLE	REINFORCEMENT LEARNING		CREDITS	3
COURSE CODE	CAD01507	COURSE CATEGORY	PE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course covers foundational models and algorithms used in RL, as well as advanced topics such as scalable function approximation using neural network representations and concurrent interactive learning of multiple RL agents.
Course Objective	1. To understand basic reinforcement learning techniques 2. To Understand value functions for optimal decision-making 3. To implement dynamic programming as an efficient solution approach 4. To Formalize problems as Markov Decision Processes 5. To implement Q-learning
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the basic & advanced reinforcement learning techniques. 2. Identification of suitable learning tasks to which these learning techniques can be applied. 3. Explain the connections between Monte Carlo and Dynamic Programming and TD. 4. Describe and apply the space of RL algorithms (Temporal-Difference learning) 5. Implement and apply Expected Sarsa and Q-learning

Prerequisites: Artificial Intelligence

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	CO-1	2	1	3	1	-	-	1	2
CO-2	CO-2	1	1	3	1	-	-	2	2
CO-3	CO-3	1	2	3	2	2	2	3	3
CO-4	CO-4	1	3	3	2	2	2	3	3
CO-5	CO-5	2	3	3	3	2	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	**(9L)**
Reinforcement Learning- Elements of Reinforcement Learning- Limitations and Scope- Tic-Tac-Toe- History of Reinforcement Learning . **Practical Component:** Design a simple reinforcement learning **Suggested Readings:** Elements of Reinforcement Learning	**CO-1** **BTL-3**
MODULE 2: MULTI-ARMED BANDITS, MARKOV DECISION PROCESSES (9L)	
k-armed Bandit Problem. Action-value Methods incremental	**CO-2**

Implementation- Tracking a Non-stationary Problem - Optimistic Initial Values- Upper-Confidence-Bound Action Selection. Gradient Bandit Algorithms- Associative Search (Contextual Bandits) The Agent–Environment Interface - Goals and Rewards - Returns and Episodes - Unified Notation for Episodic and Continuing Tasks- Policies and Value Functions - Optimal Policies and Optimal Value Functions - Optimality and Approximation. **Practical Component:** Design and conduct an experiment to demonstrate the difficulties that sample-average methods have for non-stationary problems **Suggested Readings:** Policy, rewards	**BTL-3**
MODULE 3: DYNAMIC PROGRAMMING, MONTE CARLO METHODS (9L)	
Policy Evaluation (Prediction) - Policy Improvement - Policy Iteration- Value Iteration - Asynchronous Dynamic Programming - Generalized Policy Iteration - Efficiency of Dynamic Programming Monte Carlo Prediction - Monte Carlo Estimation of Action Values - Monte Carlo Control- .Monte Carlo Control without Exploring Starts - policy Prediction via Importance Sampling - Incremental Implementation - policy Monte Carlo Control - Discounting-aware Importance Sampling - Per-decision Importance Sampling **Practical Component:** Write a program for policy iteration and re-solve in a car rental problem **Suggested Readings:** Monte Carlo Estimation of Action Values	**CO-3** **BTL-3**
MODULE 4: TEMPORAL-DIFFERENCE LEARNING	**(9L)**
TD Prediction - Advantages of TD Prediction Methods - Optimality of TD(0) - Sarsa: On-policy TD Control Q-learning: Off policy TD Control- Ex Maximization Bias and Double Learning - Games, Afterstates, and Other Special Cases **Practical Component:** Re-solve the windy grid-world assuming eight possible actions, including the diagonal moves, rather than the usual four. **Suggested Readings:** Sarsa, Q-learning	**CO-4** **BTL-3**
MODULE 5: CASE STUDIES	**(9L)**
TD-Gammon, Samuel's Checkers Player, Watson's Daily-Double Wagering, Optimizing Memory Control, Human-level Video Game Play, Personalized Web Services, Thermal Soaring **Practical Component**: Implement a Personalizing web services such as the delivery of news articles or advertisements **Suggested Readings**: Applications of Reinforcement Learning	**CO-5** **BTL-3**
TEXT BOOKS	
1.	Richard S. Sutton and Andrew G. Barto(2018), *Reinforcement Learning*, The MIT Press.
REFERENCE BOOKS	
1.	https://www.springer.com/gp/book/9780792392347
E BOOKS	
1.	https://web.stanford.edu/class/psych209/Readings/SuttonBartoIPRLBook2n

	dEd.pdf
MOOC	
1.	https://www.coursera.org/learn/fundamentals-of-reinforcement-learning?specialization=reinforcement-learning

COURSE TITLE		**SOCIAL MEDIA ANALYTICS**			**CREDITS**	**3**
COURSE CODE		**CAD01508**	**COURSE CATEGORY**	**DE**	**L-T-P-S**	**3-0-0-0**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**		**BTL-3**

ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project**	**Surprise Test / Quiz**	**Attendance**	**ESE**
15%	**15%**	**10%**	**5%**	**5%**	**50%**

Course Description	The course will introduce students to the science and social science of network analysis. Through real world examples, including analysis of their own social networks, students will develop skills for describing and understanding the patterns and usage of services like Facebook, Twitter, YouTube, and others.
Course Objective	In this course, you will gain experience measuring the success of social media efforts and analyzing social media data to prepare you to meet the demands of today's industry. You will: 1. To understand the role of social media data and analytics in helping organizations achieve their goals and understand their publics; 2. To identify and select key performance indicators to accurately measure the success of social media efforts; 3. To analyze social media data using native analytics (e.g. Facebook, Twitter, Instagram) and social media measurement tools. 4. To draw meaningful insights and provide actionable and strategic recommendations based on thorough social media data analysis; 5. To develop social media measurement plans and analytics reports, and communicate findings and recommendations effectively;
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the basic concepts of social network analysis 2. Collaborative with peers to apply these methods to a variety of social media 3. Describe the link between qualitative and quantitative methods of social network analysis 4. Explain how these social technologies impact society and vice versa 5. Examine the ethical and legal implications of leveraging social media data
Prerequisites: Python, Social Media Insights	

CO, PO AND PSO MAPPING									
CO	**PO -1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	**2**	**1**	**2**	**3**	**1**	**1**	**1**	**1**	**2**
CO-2	**2**	**3**	**2**	**1**	**2**	**3**	**1**	**1**	**1**
CO-3	**3**	**2**	**2**	**1**	**2**	**1**	**2**	**3**	**2**
CO-4	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**1**
CO-5	**1**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**2**
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: INTRODUCTION TO SOCIAL MEDIA ANALYTICS (SMA)	**(9L)**
Introduction to Social Media Analytics (SMA): Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas . **Network fundamentals and models:** The social networks perspective - nodes, ties and influencers, social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization **Practical component:** Implement a Google Sheet template which lets your setup and run automated collection of search results from Social Media (Twitter) - "TAGS"	**CO-1** **BTL-3**
MODULE 2: CONNECTIONS & WEB ANALYTICS TOOLS	**(9L)**
Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools: Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-Text Analysis **Practical component: E**xtract relevant information from various sources such as blogs, YouTube, and Twitter with the tool “Info extractor”	**CO-2** **BTL-3**
MODULE 3: SOCIAL ANALYTICS (FACEBOOK, INSTAGRAM, TWITTER)	**(9L)**
Facebook Analytics: Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. 9 (LinkedIn, Instagram, YouTube Twitter etc. Google analytics. Introduction. (Websites) **Practical component:** Identify and analyze your brand’s top influencers and strongest communities and use these insights to improve your Marketing, Sales, and Customer Service efforts using “Digimind”	**CO-3** **BTL-3**
MODULE 4: PROCESSING AND VISUALIZING DATA	**(9L)**
Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics. Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration **Practical component:** An easy-to-use Python library for accessing the Twitter API with **TWEEPY**	**CO-4** **BTL-3**
MODULE 5: CASE STUDY IMPLEMENTATION	**(9L)**
Practical component: CASE STUDY Students should analyze the social media of any ongoing campaigns and present the findings.	**CO-5** **BTL-2**
TEXT BOOKS	

1.	Marshall Sponder(2017), Social Media Analytics, McGraw Hill, Latest edition
REFERENCE BOOKS	
1	Jim Sterne(2021), Social Media Metrics: How to Measure and Optimize Your Marketing Investment, Wiley Latest Edition.
E BOOKS	
1.	https://libribook.com/ebook/6316/python-social-media-analytics-pdf
MOOC	
1.	https://www.coursera.org/learn/social-media-data-analytics

COURSE TITLE		**CYBER ANALYTICS**			**CREDITS**	**3**
COURSE CODE		**CAD01509**	**COURSE CATEGORY**	**DE**	**L-T-P-S**	**3-0-0-0**
VERSION	**1.0**	**APPROVAL DETAILS**		**LEARNING LEVEL**		**BTL-3**

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course provides a foundational platform for Cyber Security Aspirants by providing Cyber Security Awareness and Training that heighten the chances of catching a scam or attack before it is fully enacted, minimizing damage to the resources and ensuring the protection of information technology assets.
Course Objective	1. To provide knowledge to secure corrupted systems, protect personal data, and secure computer networks in an organization. 2. To practice with an expertise in academics to design and implement security solutions. 3. To understand key terms and concepts in Cryptography, Governance and Compliance. 4. To develop cyber security strategies and policies 5. To understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the broad set of technical, social & political aspects of Computer Security. 2. Describe the operational and psychology security Aspects. 3. Explain Authentication Methods and Intrusion detection system. 4. Describe the Cyber Crime Strategy analysis . 5. Apply the Concepts of Cyber Crime and Digital Forensics in Real Time Scenarios.

Prerequisites:- Networks and Data Analysis

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	1	1	2	2	2	2
CO-2	3	2	1	1	1	1	1	1	1
CO-3	2	2	1	2	2	2	1	2	1
CO-4	1	2	1	1	1	1	2	1	1

CO-5	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: INTRODUCTION TO CYBER FORENSICS	**(9L)**
Introduction to Cyber Forensics - Cyber Threads and Vulnerabilities - Concept of Cyber Security, Cyber Crimes and Cyber-attack. Current Threads and Trends – Confidentiality – Cyber Hate Crimes. **Practical component:** Detection of various cyber-attacks using Wireshark. **Suggested Readings:** Evolution of cyber security	**CO-1** **BTL-3**
MODULE 2: CYBER CRIME	**(9L)**
National Security Strategy – Organized Crime Strategy – Cyber Crime Strategy - Policy Cyber Crime – International Response – National Cyber Security Structure – Strategic Policy Requirements – Police and Crime Commissioners. **Practical component:** Study the steps for installing Wireshark, the packet-sniffing tool for performing Network analysis. **Suggested Readings:** Advances in Cyber Security: Principles, Techniques, and Applications	**CO-2** **BTL-3**
MODULE 3: CYBER SECURITY AND THREADS	**(9L)**
User, Group, and Role Management - Password Policies - Single Sign-On - Security Controls and Permissions - Preventing Data Loss or Theft - The Remote Access Process - Remote Access Methods. - Network-Based IDSs - Host-Based IDSs Intrusion Prevention Systems. **Practical component:** Study of working with captured packets. **Suggested Readings:** Best practices for Cyber security standards	**CO-3** **BTL-3**
MODULE 4: CYBER SECURITY	**(9L)**
Security Policies, Security Procedures, Standards, and Guidelines - Security Awareness and Training - Interoperability Agreements - The Security Perimeter - Physical Security - Environmental Issues - Wireless - Electromagnetic Eavesdropping - People—A Security Problem - People as a Security Tool. **Practical component:** Security analysis and reporting using Wireshark. **Suggested Readings:** Cyber-attacks, countermeasures and protection schemes	**CO-4** **BTL-3**
MODULE 5: SECURITY SPACE	**(9L)**
Intrusion Detection System (IDS) and Intrusion Protection System (IPS). Web Based Automated System for Cyber Analytics Using Natural Language Processing (WASCA-NLP): Collection of Links, Scraping of Information, Structuring Information, Analysis of Data. **Practical component:** Study of Operating System Fingerprinting. **Suggested Readings:** Next-generation digital forensics	**CO-5** **BTL-3**

TEXT BOOKS	
1.	W.A.Coklin, G.White(2016) *Principles of Computer Security*: Fourth Edition, McGrawHill
REFERENCE BOOKS	
1.	Thomas Halt, Adam M. Bossler and Kathryn C.SeigfriedSpellar(2017), *Cybercrime and Digital Forensics: An Introduction‖, Routledge* Taylor and Francis Group.

2.	William, Stallings. (2018). *Effective Cyber security: A Guide to Using Best Practices and Standards*, Addison - Wesley Professional Publishers, 1st Edition.
E BOOKS	
1.	cybersecurity ebooks (newhorizons.com)
MOOC	
1.	https://www.edx.org/course/cybersecurity-fundamentals
2.	https://www.coursera.org/specializations/cyber-security