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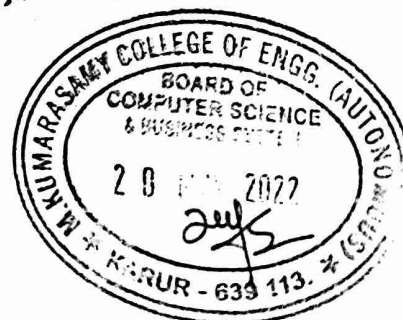Thalavapalayam, Karur - 639 113.

KR

CURRICULUM AND SYLLABUS

REGULATION 2018

B.Tech- Computer Science and Business Systems

Semester I to VI

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Thalavapalayam, Karur, Tamilnadu.

CURRICULUM AND SYLLABUS
REGULATION 2018

Programme: B.Tech – Computer Science and Business Systems

Vision of the Department:

To produce competent industry relevant education, skilful research, technical and innovative computer science professionals acquaintance with managerial skills, human and social values.

Mission of the Department:

M1: To impart technical knowledge through innovative teaching, research, and consultancy.

M2: To develop and to promote student ability thereby to compete globally through excellence in education.

M3: To facilitate the development of academic-industry Collaboration.

M4: To produce competent engineers with professional ethics, technical competence and a spirit of innovation and managerial skills.

Programme Educational Objectives (PEOs):

PEO1: To acquire technical knowledge and proficiency required for the carrier advancement and higher education in the contemporary areas of computer science, business systems and various issues in the society.

PEO2: To apply their competency in design and development of innovative solutions to adapt various emerging technological challenges for real world problems.

PEO3: To demonstrate leadership qualities with high ethical standards and collaborated with other industries for the socio-economical growth of the country.

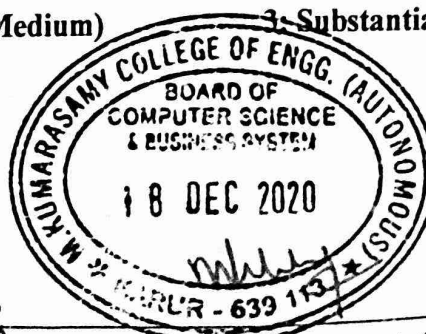### Mapping of Programme Educational Objectives with Mission of the Department:

PEOs / Department Mission Statements	M1	M2	M3	M4
PEO1	3	3	2	3
PEO2	3	2	2	2
PEO3	3	3	2	2

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

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Programme Outcomes (POs):

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

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
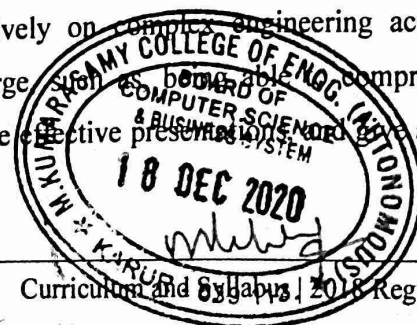
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

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PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs):

PSO1: Ability to apply the analytical and business skills to provide sustainable solutions as an engineer/researcher for the real-time applications using Machine Learning, Internet of Things and Data analytics.

PSO2: Ability to practice ethical and human values with soft-skills qualities in computer science and business disciplines to emerge as an entrepreneur for the growth and development of the society.

Mapping of Programme Educational Objectives with Programme Outcomes and Programme Specific Outcomes:

PEOs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	2	2	2	3	2	2	3	3	1	2	3	2	3	2
PEO2	2	2	3	2	2	3	3	2	2	3	2	3	3	1
PEO3	3	3	2	3	3	1	1	3	3	2	3	1	1	3

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

Programme Articulation

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
I	18MAB103T	Discrete Mathematics	✓	✓											✓	
I	18MAB104T	Calculus, Statistics and Probability	✓	✓		✓								✓	✓	
I	18PYB102J	Physics for Computing Science	✓	✓	✓						✓	✓			✓	
I	18EEB102J	Principles of Electrical Engineering	✓	✓	✓											
I	18CBB101J	Problem Solving and C Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
I	18CBH101J	Business Communication & Value Science – I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
I	18LEM101T	Constitution of India							✓	✓	✓	✓	✓	✓		
I		Induction Program														
II	18MAB105T	Linear Algebra	✓	✓	✓	✓		✓					✓	✓	✓	
II	18MAB106J	Statistical Methods	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
II	18ECB101J	Principles of Electronics	✓	✓	✓	✓	✓	✓	✓			✓			✓	
II	18CBC101J	Data Structures & Algorithms	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
II	18MBS101T	Fundamentals of Economics	✓	✓					✓				✓	✓		
II	18CBH102J	Business Communication & Value Science – II		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
II	18LEM102T	Value Education	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓	
II	18GNM101L	Physical & Mental Health using Yoga						✓							✓	
III	18CBC201T	Formal Language and Automata Theory	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	
III	18CBC202T	Computer Organization & Architecture	✓	✓	✓	✓	✓								✓	✓
III	18CBC203T	Object Oriented Programming	✓	✓	✓	✓									✓	✓
III	18CBC204J	Computational Statistics	✓	✓	✓	✓									✓	✓
III	18CBC205J	Software Engineering	✓	✓	✓	✓							✓		✓	✓
III	18MAB209T	Operations Research	✓	✓											✓	
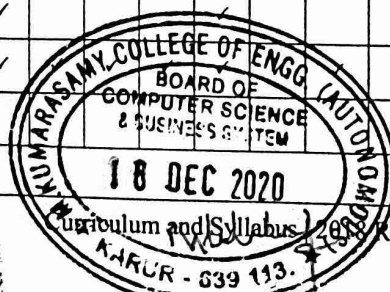
Seme ster	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
III	18CBC206L	Object Oriented Programming Laboratory	✓	✓	✓	✓	✓					✓			✓	✓
III	18MBM201L	Competencies in Social Skills	✓								✓	✓				
III / IV	18CYM201T	Environmental Science		✓		✓		✓	✓	✓						
IV	18CBC207T	Database Management Systems	✓	✓	✓	✓									✓	✓
IV	18CBC208J	Operating Systems	✓	✓												✓
IV	18CBC209J	Software Design with UML	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IV	18CBH103J	Business Communication & Value Science – III									✓	✓		✓		
IV	18MBS201T	Fundamentals of Management	✓	✓					✓				✓	✓		✓
IV	18MBS202T	Introduction to Innovation, IP Management & Entrepreneurship	✓	✓					✓				✓	✓		✓
IV	18CBC210L	Database Management Systems Laboratory	✓	✓	✓	✓	✓								✓	✓
IV	18MBM202L	Critical and Creative Thinking Skills	✓									✓				
III / IV	18LEM103T	Indian Tradition and Heritage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
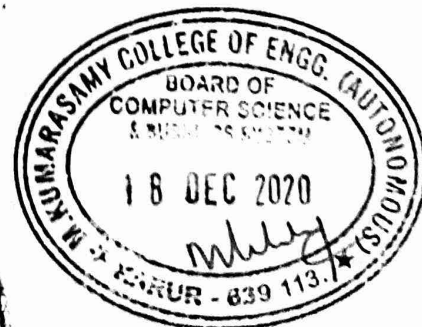
Structure of Curriculum

S.No.	Category	Credits
1	Humanities and Social Sciences courses (H)	11
2	Basic Science courses including basics of Electrical / Electronics / Computer courses (B)	32
3	Engineering Science courses including Management/Innovation & Entreprenurship course (S)	28
4	Professional core courses (C)	61
5	Professional Elective courses relevant to chosen specialization/branch (E)	22
6	Open Electives - Electives offered to other Departments (O)	-
7	Project work, Minor project, seminar and internship in industry or elsewhere (P)	7
8	Mandatory Courses (M) [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	4
	Total Credits	**165**

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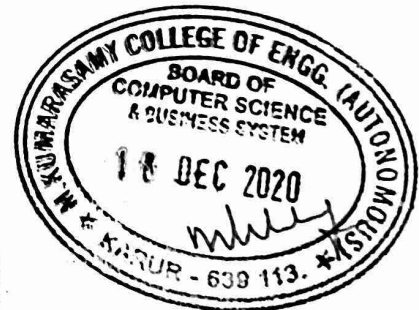
1. Humanities and Social Sciences courses (H)

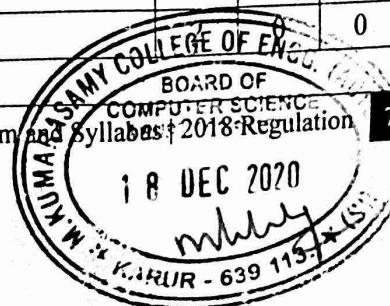| S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18CBH101J	Business Communication & Value Science – I	2	0	2	3
2	18CBH102J	Business Communication & Value Science – II	2	0	2	3
3	18CBH103J	Business Communication & Value Science – III	1	0	2	2
4	18CBH104J	Business Communication & Value Science – IV	2	0	2	3
					Total Credits	11

L-Lecture   T-Tutorial   P-Practical

2. Basic Science courses including basics of Electrical / Electronics / Computer courses (B)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18MAB103T	Discrete Mathematics	3	1	0	4
2	18MAB104T	Calculus, Statistics and Probability	3	0	0	3
3	18MAB105T	Linear Algebra	3	1	0	4
4	18MAB106J	Statistical Methods	3	0	2	4
5	18PYB102J	Physics for Computing Science	3	0	2	4
6	18EEB102J	Principles of Electrical Engineering	2	0	2	3
7	18ECB101J	Principles of Electronics	2	0	2	3
8	18CBB101J	Problem Solving and C Programming	3	0	2	4
9	18MAB209T	Operations Research	3	0	0	3
					Total Credits	32

L-Lecture   T-Tutorial   P-Practical

3. Engineering Science courses including Management/Innovation & Entreprenurship course (S)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18MBS101T	Fundamentals of Economics	2	0	0	2
2	18MBS201T	Fundamentals of Management	2	0	0	2
3	18MBS202T	Introduction to Innovation, IP Management & Entrepreneurship	3	0	0	3
4	18MBS301T	Financial & Cost Accounting	2	0	0	2
5	18MBS302T	Business Strategy	2	0	0	2
6	18MBS303J	Design Thinking	2	0	2	3
7	18MBS304T	Financial Management	2		0	2

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
8	18MBS401T	Marketing Research & Marketing Management	2	0	0	2
9	18MBS402T	Human Resource Management	2	0	0	2
10	18MBS403J	Services Science & Service Operational Management	3	0	2	4
11	18MBS404J	IT Project Management	3	0	2	4
				Total Credits		28

L-Lecture   T-Tutorial   P-Practical

4. Professional core courses (C)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18CBC101J	Data Structures & Algorithms	3	0	2	4
2	18CBC201T	Formal Language and Automata Theory	3	1	0	4
3	18CBC202T	Computer Organization & Architecture	3	0	0	3
4	18CBC203T	Object Oriented Programming	3	0	0	3
5	18CBC204J	Computational Statistics	3	0	2	4
6	18CBC205J	Software Engineering	3	0	2	4
7	18CBC206L	Object Oriented Programming Laboratory	0	0	2	1
8	18CBC207T	Database Management Systems	3	0	0	3
9	18CBC208J	Operating Systems	3	0	2	4
10	18CBC209J	Software Design with UML	3	0	2	4
11	18CBC210L	Database Management Systems Laboratory	0	0	2	1
12	18CBC301T	Design and Analysis of Algorithms	3	0	0	3
13	18CBC302J	Compiler Design	3	0	2	4
14	18CBC303L	Design and Analysis of Algorithms Laboratory	0	0	2	1
15	18CBC304T	Computer Networks	3	0	0	3
16	18CBC305J	Information Security	3	0	2	4
17	18CBC306J	Artificial Intelligence	3	0	2	4
18	18CBC307L	Computer Networks Laboratory	0	0	2	1
19	18CBC401J	Usability Design of Software Applications	2	0	2	3
20	18CBC402J	IT Workshop Skylab / Matlab	2	0	2	3
				Total Credits		61

L-Lecture   T-Tutorial   P-Practical

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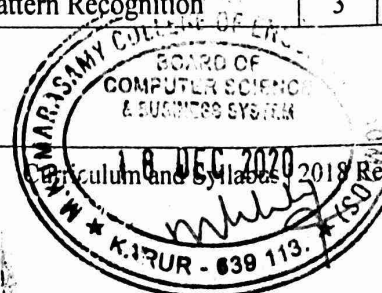ISO 9001:2015 Certified Institution
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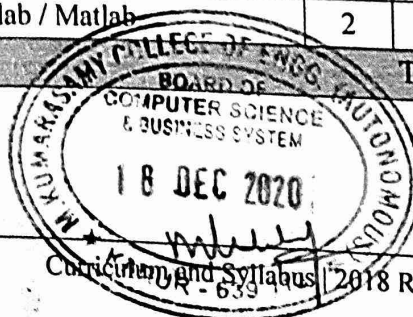
5. Professional Elective Courses relevant to chosen specialization/branch (E) (Any 6 Courses)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1		Elective - 1	3	0	2	4
2		Elective – 2	3	0	2	4
3		Elective – 3	3	0	0	3
4		Elective – 4	3	0	2	4
5		Elective – 5	3	0	0	3
6		Elective - 6	3	0	2	4
					Total Credits	22

S.No	Course Code	Course Name	Hours / Week			C
			L	T	P	
		Elective – 1				
1	18CBE001J	Coversational Systems	3	0	2	4
2	18CBE002J	Cloud, Microservices and Application	3	0	2	4
3	19CBE003J	Machine Learning	3	0	2	4
		Elective - 2				
4	18CBE004J	Robotics and Embedded Systems	3	0	2	4
5	18CBE005J	Modern Web Applications	3	0	2	4
6	18CBE006J	Data Mining and Analytics	3	0	2	4
		Elective - 3				
7	18CBE007T	Cognitive Science and Analytics	3	0	0	3
8	18CBE008T	Introduction to IoT	3	0	0	3
9	18CBE009T	Cryptology	3	0	0	3
		Elective - 4				
10	18CBE010J	Quantum Computation and Quantum Information	3	0	2	4
11	18CBE011J	Advanced Social, Text and Media Analytics	3	0	2	4
12	18CBE012J	Mobile Computing	3	0	2	4
		Elective - 5				
13	18CBE013T	Behavioral Economics	3	0	0	3
14	18CBE014T	Computational Finance and Modelling	3	0	0	3
15	18CBE015T	Psychology	3	0	0	3
		Elective - 6				
16	18CBE016J	Enterprise Systems	3	0	2	4
17	18CBE017J	Advance Finance	3	0	2	4
18	18CBE018J	Image Processing and Pattern Recognition	3	0	2	4

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6. Open Electives - Electives offered to other Departments (O)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18CBO001T	Usability Design of Software Applications	3	0	0	3
2	18CBO002T	IT Workshop Skylab / Matlab	3	0	0	3
3	18CBO003T	Software Design with UML	3	0	0	3
4	18CBO004T	Modern Web Applications	3	0	0	3
5	18CBO005T	Data Mining and Analytics	3	0	0	3
					Total Credits	15

L-Lecture   T-Tutorial   P-Practical

7. Project work, minor project, seminar and internship in industry or elsewhere (P)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18CBP301L	Mini Project	0	0	2	1
2	18CBP401L	Project Evaluation I	0	0	4	2
3	18CBP402L	Project Evaluation II	0	0	8	4
					Total Credits	7

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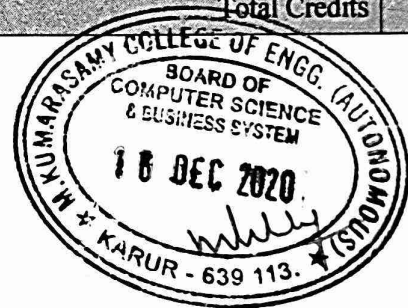
8. Mandatory Courses (M)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18LEM101T	Constitution of India	1	0	0	Nil
2	18LEM102T	Value Education	1	0	0	Nil
3	18GNM101L	Physical & Mental Health using Yoga	0	0	2	Nil
4		Induction Program	2	0	0	Nil
5	18MBM201L	Competencies in Social Skills	0	0	2	1
6	18MBM202L	Critical and Creative Thinking Skills	0	0	2	1
7	18CYM201T	Environmental Science	1	0	0	Nil
8	18LEM103T	Indian Tradition and Heritage	1	0	0	Nil
9	18MBM301L	Analytical and Logical Thinking Skills	0	0	2	1
10	18MBM302L	Employability Skills and Practices	0	0	2	1
11	18LEM301T	Indian Art Forms	1	0	0	Nil
12	18LEM302T	Self Development and Entrepreneurship	1	0	0	Nil
		Total Credits				4

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B.Tech. – Computer Science and Business Systems

S.No	Category	Course Code	Course Name	L	T	P	C
Semester I
1	B	18MAB103T	Discrete Mathematics	3	1	0	4
2	B	18MAB104T	Calculus, Statistics and Probability	3	0	0	3
3	B	18PYB102J	Physics for Computing Science	3	0	2	4
4	B	18EEB102J	Principles of Electrical Engineering	2	0	2	3
5	B	18CBB101J	Problem Solving and C Programming	3	0	2	4
6	H	18CBH101J	Business Communication & Value Science – I	2	0	2	3
Mandatory Courses							
7	M	18LEM101T	Constitution of India	1	0	0	Nil
8	M		Induction Program	2	0	0	Nil
						Total Credits	21

Semester I — *Hours / Week: L, T, P*

S.No.	Category	Course Code	Course Name	L	T	P	C
Semester II
1	B	18MAB105T	Linear Algebra	3	1	0	4
2	B	18MAB106J	Statistical Methods	3	0	2	4
3	B	18ECB101J	Principles of Electronics	2	0	2	3
4	C	18CBC101J	Data Structures & Algorithms	3	0	2	4
5	S	18MBS101T	Fundamentals of Economics	2	0	0	2
6	H	18CBH102J	Business Communication & Value Science – II	2	0	2	3
Mandatory Courses							
7	M	18LEM102T	Value Education	1	0	0	Nil
8	M	18GNM101L	Physical & Mental Health using Yoga	0	0	2	Nil
						Total Credits	20

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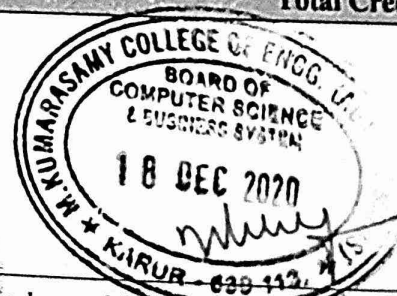
Semester III

S.No.	Category	Course Code	Course Name	Hours / Week L	T	P	C
1	C	18CBC201T	Formal Language and Automata Theory	3	1	0	4
2	C	18CBC202T	Computer Organization & Architecture	3	0	0	3
3	C	18CBC203T	Object Oriented Programming	3	0	0	3
4	C	18CBC204J	Computational Statistics	3	0	2	4
5	C	18CBC205J	Software Engineering	3	0	2	4
6	B	18MAB209T	Operations Research	3	0	0	3
Laboratory Course							
7	C	18CBC206L	Object Oriented Programming Laboratory	0	0	2	1
Mandatory Courses							
8	M	18MBM201L	Competencies in Social Skills	0	0	2	1
9	M	18CYM201T / 18LEM103T	Environmental Science / Indian Tradition and Heritage	1	0	0	Nil
						Total Credits	23

Semester IV

S.No.	Category	Course Code	Course Name	Hours / Week L	T	P	C
1	C	18CBC207T	Database Management Systems	3	0	0	3
2	C	18CBC208J	Operating Systems	3	0	2	4
3	C	18CBC209J	Software Design with UML	3	0	2	4
4	H	18CBH103J	Business Communication & Value Science – III	1	0	2	2
5	S	18MBS201T	Fundamentals of Management	2	0	0	2
6	S	18MBS202T	Introduction to Innovation, IP Management & Entrepreneurship	3	0	0	3
Laboratory Course							
7	C	18CBC210L	Database Management Systems Laboratory	0	0	2	1
Mandatory Courses							
8	M	18MBM202L	Critical and Creative Thinking Skills	0	0	2	1
9	M	18LEM103T / 18CYM201T	Indian Tradition and Heritage / Environmental Science	1	0	0	Nil
						Total Credits	20

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S.No.	Category	Course Code	Course Name	L	T	P	C
			Semester V				
1	C	18CBC301T	Design and Analysis of Algorithms	3	0	0	3
2	C	18CBC302J	Compiler Design	3	0	2	4
3	S	18MBS301T	Financial & Cost Accounting	2	0	0	2
4	S	18MBS302T	Business Strategy	2	0	0	2
5	S	18MBS303J	Design Thinking	2	0	2	3
6	E		Elective I — Professional / open	2	0	2	3
			Laboratory Course	3	0	2	4
7	C	18CBC303L	Design and Analysis of Algorithms Laboratory	0	0	2	1
8	P	18CBP301L	Mini Project	0	0	2	1
			Mandatory Courses				
9	M	18MBM301L	Analytical and Logical Thinking Skills	0	0	2	1
10	M	18LEM301T / 18LEM302T	Indian Art Forms / Self Development and Entrepreneurship	1	0	0	Nil
			Total Credits				21

S.No.	Category	Course Code	Course Name	L	T	P	C
			Semester VI				
1	C	18CBC304T	Computer Networks	3	0	0	3
2	C	18CBC305J	Information Security	3	0	2	4
3	C	18CBC306J	Artificial Intelligence	3	0	2	4
4	S	18MBS304T	Financial Management	2	0	0	2
5	H	18CBH104J	Business Communication & Value Science – IV	2	0	2	3
6	E		Elective II — Professional / open	3	0	2	4
			Laboratory Course				
7	C	18CBC307L	Computer Networks Laboratory	0	0	2	1
			Mandatory Courses				
8	M	18MBM302L	Employability Skills and Practices	0	0	2	1
9	M	18LEM301T / 18LEM302T	Indian Art Forms / Self Development and Entrepreneurship	1	0	0	Nil
			Total Credits				22
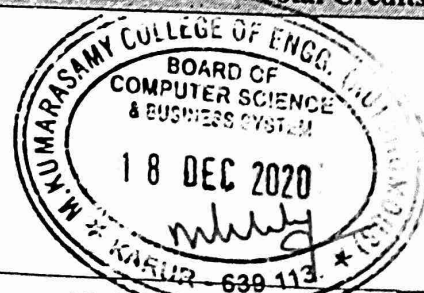
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Regulation 2018			Semester V	Total Hours			45
Category	Course Code		Course Name	Hours / Week			C
				L	T	P	
C	18CBC301T		DESIGN AND ANALYSIS OF ALGORITHMS	3	0	0	3

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

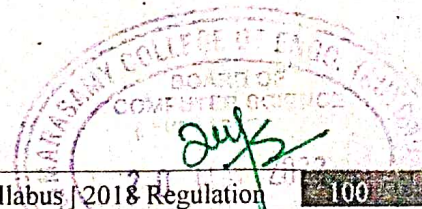| 1	Learn and understand the algorithm analysis techniques and complexity notations.
2	Become familiar with the different algorithm design techniques for effective problem solving in computing.
3	Learn to apply the design techniques in solving various kinds of problems in an efficient way.
4	Understand the limitations of algorithm power.
5	Solve variety of problems using different approximation algorithms.

Course Outcome (s) (COs):

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

CO 1	Understand the basic techniques such as space & time complexity, asymptotic notations for analyzing the algorithms
CO 2	Analyze the fundamentals of Algorithmic strategies for problem solving in computing.
CO 3	Apply the Graph and Tree algorithms on computing Problems.
CO 4	Determine the computability of an algorithms
CO 5	Choose the approximation algorithms, randomized algorithms for an optimization problem.

CO-PO Mapping

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

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

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UNIT 1	INTRODUCTION	9

Characteristics of Algorithm. Analysis of Algorithm: Performance Measurements of Algorithm, Time and Space Trade-Offs, Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior; Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

UNIT 2	FUNDAMENTALS OF ALGORITHMIC STRATEGIES	9

Brute-Force, Heuristics, Greedy, Dynamic Programming, Branch and Bound and Backtracking methodologies; Illustrations of these techniques for Problem Solving, Bin Packing, Knapsack, Travelling Salesman Problem.

UNIT 3	GRAPH AND TREE ALGORITHMS	9

Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms; Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT 4	TRACTABLE, INTRACTABLE PROBLEMS	9

Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT 5	ADVANCED TOPICS	9

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms.

	Total Periods	45

Text Book (s)

1	E. Horowitz and S. Sahni., "Fundamental of Computer Algorithms", Second Edition, Computer Science Press, 2008.
2	A. Aho, J. Hopcroft and J. Ullman, "The Design and Analysis of Computer Algorithms", Fourth edition, Pearson India, 2009.

Reference (s)

1	T. H. Cormen, C. E. Leiserson and R. L. Rivest, "Introduction to Algorithms", Third Edition, MIT Press, 2009.
2	S. Baase, "Computer Algorithms: Introduction to Design and Analysis", Third Edition, Pearson, 2000.
3	D. E. Knuth, "The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3", Third Edition, Mathematical Science Publishers, 1997.
4	Michael A. Nielsen and Isaac L. Chuang ,"Quantum Computation and Quantum Information",2006
5	Anany Levitin," Introduction To The Design And Analysis Of Algorithm"3rd Edition, Pearson, 2012.

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Regulation 2018			Semester V		Total Hours		60
Category	Course Code		Course Name		Hours / Week		
					L	T	P	C
C	18CBC302J		COMPILER DESIGN		3	0	2	4

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Learn the design principles of a Compiler
2	Solve variety of problems using parsing techniques and different levels of translation
3	Identify the semantic analysis and symbol table.
4	Implement Architecture dependent code improvement
5	Analyze how to optimize and effectively generate machine codes.

Course Outcome (s) (COs):

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

CO 1	Infer fundamentals of compiler and identify the relationships among different phases of the compiler.
CO 2	Apply the concepts of grammars and utilize different types of parsing techniques.
CO.3	Illustrate the Semantic Analysis and Symbol table.
CO 4	Construct Intermediate code generation and outline storage organization
CO 5	Examine various code optimization Techniques

CO-PO Mapping

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

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

UNIT 1	INTRODUCTION TO COMPILERS	9
Introduction Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex).		

UNIT 2	SYNTAX ANALYSIS	9
Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL (1) grammars and top-down parsing, operator grammars, LR (O), SLR (1), LR (1), LALR (1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR (1) parser generator (yacc, bison).		

UNIT 3	SEMANTIC ANALYSIS	9
Semantic Analysis- Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree, Symbol Table: Basic structure, symbol attributes and management.		

UNIT 4	RUN-TIME ENVIRONMENT AND CODE GENERATION	9
Run-time environment- Procedure activation, parameter passing, value return, memory allocation, Scope. Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Register allocation and target code generation.		

UNIT 5	CODE OPTIMIZATION	9
Code Improvement (optimization)- control-flow, data-flow dependence etc.; Local optimization, Global optimization, loop optimization, peep-hole optimization etc Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory).		

	Total Periods	45

	LIST OF EXPERIMENTS	15
1	Implementation of lexical analyzer using C and LEX TOOL	
2	Implementation of a calculator that takes an expression (with digits, + and *), computes and prints its value, using YACC.	
3	Implementation of Predictive parsing.	
4	Implementation of Shift Reduce Parsing Algorithm.	
5	Implementation of LR parsing.	
6	Implementation of Symbol Table	
7	Implementation of Three Address Code	
8	Implementation of Code Optimization	

Text Book (s)

1	Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers –Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007.
2	Dick Grune Henri E.Bal,Ceriel J.H.Jacobs "Modern Compiler Design" ,Published ,2000

Reference (s)

1	Doug Brown, John Levine, and Tony Mason, "Lex & Yacc Second Edition, O'Reilly &Associates, 1995.
2	Steven S. Muchnick, Advanced Compiler Design and Implementationl, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.
3	V. Raghavan, Principles of Compiler Designl, Tata McGraw Hill Education Publishers,2010.
4	Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003.

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Regulation 2018			Semester V		Total Hours			30
Category	Course Code		Course Name		Hours / Week			C
					L	T	P	
S	18MBS301T		FINANCIAL AND COST ACCOUNTING		2	0	0	2

Prerequisite course

NIL

Course Objective (s):
The purpose of learning this course is to:

1	Understand the importance of financial and cost accounting in organization financial statements
2	Explain the corporate financial under different conditions and describe the financial statements in different manner.
3	Describe the main elements of Financial Accounting information – assets, liabilities, revenue and expenses
4	Fabricate Awareness about cost accounting, different types costing and cost management
5	Create an awareness about the importance and the usefulness of the accounting concepts and their managerial implications

Course Outcome (s) (COs):
At the end of this course, learners will be able to:

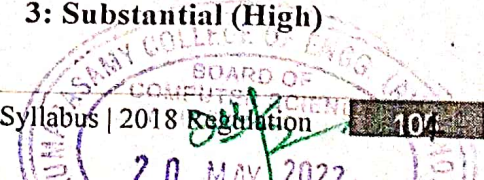| CO 1	Remembering the importance and usefulness of the accounting concepts and their managerial implications.
CO 2	Illustrate the book keeping of account and learn about the cash and subsidiary book entry.
CO 3	Applying the financial statement concepts and its underlying principles & learn to interpret financial statement
CO 4	Analyzing the cash flow and fund flow statement by using its techniques and finding the difference between the cash and fund flow statement
CO 5	Interpret the costing accounting system , different types of costing and cost management

CO-PO Mapping

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

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

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UNIT 1	ACCOUNTING CONCEPTS	6
Introduction-Techniques and Conventions, Financial Statements-Understanding & Interpreting Financial Statements.		
UNIT 2	ACCOUNTING PROCESS	6
Book Keeping, and Record Maintenance-Fundamental Principal and Double entry-Journal, Ledger, Trail Balance, Balance Sheet, Final Accounts –Cash Book and subsidiary Book-Rectification of Errors		
UNIT 3	FINANCIAL STATEMENTS	6
Form and Contents of Financial Statements, Analyzing and interpreting Financial Statements, Accounting Standards		
UNIT 4	CASH FLOW AND FUND FLOW TECHNIQUES	6
Introduction- How to prepare, Difference between them (cash flow and fund flow techniques)		
UNIT 5	COSTING SYSTEMS	6
Element of Cost-Cost behavior, Cost allocation, OH allocation- Unit costing, Process Costing, Job Costing-Absorption Costing, Marginal Costing, Cost Volume Profit Analysis-Budgets, ABC Analysis.		
	Total Periods	30

Text Book (s)

1	Robert N Anthony, David Hawkins, Kenneth Marchant, "Accounting: Texts and Cases, McGraw-Hill", 13th edition, 2017.
2	John Wiley & sons," Accounting Principles", published, 2007.

Reference (s)

1	Textbook of Financial Cost and Management Accounting by Periasami P,2010
2	Cost Accounting For Dummies – By Kenneth W. Boyd,2013
3	Fundamentals Of Cost Accounting – By William Lanen, Shannon Anderson Et.A1,2012
4	Cost Accounting Made Simple – By Mike Piper,2008

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Regulation 2018		Semester V		Total Hours	30
Category	Course Code	Course Name		Hours / Week	
				L	T	P	C
S	18MBS302T	BUSINESS STRATEGY		2	0	0	2

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Expose students to various perspectives and concepts in the field of Business Strategy
2	The course would enable the students to understand the principles of strategy formulation, implementation and control in organizations
3	Help students develop skills for applying these concepts to the solution of business problems
4	Help students master the analytical tools of strategic management
5	Enhanced ability to identify strategic issues and design appropriate courses of action.

Course Outcome (s) (COs):

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

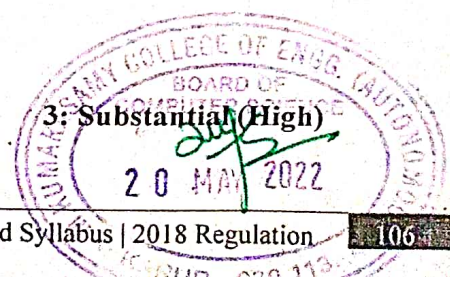| CO 1	Understand the theory and concepts of strategic management.
CO 2	Understand the Internal environment firm's intellectual assets.
CO 3	Apply the External environment concept of strategy groups.
CO 4	Analyze complex, unstructured qualitative and quantitative problems using tools.
CO 5	Identify the strategic control and corporate governance business strategy.

CO-PO Mapping

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

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

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UNIT 1	INTRODUCTION TO STRATEGIC MANAGEMENT	6
	Importance of strategic management- Vision and Objectives- School of thought in strategic Management- Strategy Content, Process and practice- Fit concept and configuration Perspective in Strategic Management.	
UNIT 2	INTERNAL ENVIRONMENT OF FIRM- RECOGNIZING A FIRM'S INTELLECTUAL ASSETS	6
	Core competence as the root of Competitive advantage – Source of Sustained Competitive advantage-Business Processes and Capabilities-based approach to strategy.	
UNIT 3	EXTERNAL ENVIRONMENT OF FIRM-COMPETITIVE STRATEGY	6
	Five forces of Industry Attractiveness that Shape Strategy-The Concept of Strategic Groups, and Industry life cycle- Generic Strategies and the Value Chain.	
UNIT 4	CORPORATE STRATEGY AND GROWTH STRATEGIES	6
	The Motive for Diversification-Related and Unrelated Diversification-Business Portfolio Analysis-Expansion, Integration and Diversification-Strategic Alliances, Joint Ventures and Mergers and Acquisitions.	
UNIT-5	STRATEGY IMPLEMENTATION: STRUCTURE AND SYSTEMS	6
	The 7's Frame Work-Strategic Control and Corporate Governance.	
	Total Periods	30

Text Book (s)

1	Robert M. Blackwell, "Grant Contemporary Strategic Management", 7th Edition,2012
2	W.Chain Kim & Renee Mauborgne "Blue Ocean Strategy" reviewed in 2015

Reference (s)

1.	Blue Ocean Strategy, How to Create Uncontested Market Space and Make the Competition Irrelevant by W. Chan Kim and Renée Mauborgne,2005
2.	The Story of Innovation and Customer Choice by Clayton M. Christensen, Karen Dillon, Taddy Hall and David S. Duncan,2019
3	Why Some Companies Make the Leap and Others Don't by Jim Collins,2001
4	"How Strategy Really Works" by A.G. Lafley and Roger L. Martin,2013

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Regulation 2018			Semester V		Total Hours			45
Category	Course Code		Course Name		Hours / Week			C
					L	T	P	
C	18MBS303J		DESIGN THINKING		2	0	2	3

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Recognize the importance of Design Thinking.
2	Use doodling and storytelling in presenting ideas and prototypes.
3	Develop value proposition statements as part of their presentations.
4	Recognize how Agile and DT complement each other to deliver customer satisfaction
5	Comprehend the applications of design thinking in politics & society, business, health & science and law.

Course Outcome (s) (COs):

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

CO 1	Understand the empathize phase of Design Thinking.
CO 2	Understand the Knowledge on system thinking and its digital process.
CO3	Apply the steps in the ideate phase of Design Thinking.
CO 4	Apply the prototype created through a Design Thinking process for online business.
CO 5	Analyze the applications of design thinking in politics, society, business, health, Science and law.

CO-PO Mapping

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

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

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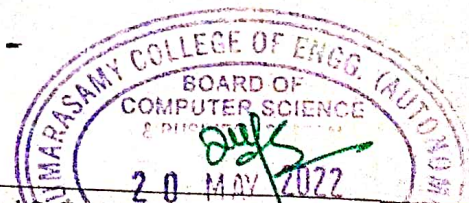Thalavapalayam, Karur – 639 113.

UNIT 1	INTRODUCTION	6

Recognize the importance of Design Thinking - Design thinking and business – Design Thinking and product - Design thinking process.

UNIT 2	CREATE PEARSONAS	6

Explanation on personas creation - Create personas in design phase - Importance of problem statements - Recognize the steps to create problem statements.

UNIT 3	PROTOTYPE PHASES	6

Importance of prototype phase in design thinking - How to create prototype - Examples on prototype - Explanation on development of prototype.

UNIT 4	TESTING PHASE	6

Introduction to testing phase - Recognize the best practices of the testing phase – Define Functional work - Recognize how design thinking can help in function work.

UNIT 5	TECHNOLOGY CREATIVITY	6

Expanding the politics of civic engagement - Managing Gridlocked Debates – Implementing a Strategic Technology Creativity in the Culinary Arts - Empathy as a means to innovate in a pharmaceutical company, Visioning, listening and diagramming at a university.

	Total Periods	30

LIST OF EXPERIMENTS

		15
1	Experimental activity on the products they like and dislike based on their experience - Identify the steps in the Design thinking process - Explanation of Stanford Model D -Steps in empathize phase of design thinking - Explanation on target activity	
2	Target activity related to empathy - Steps in immersion activity - Explanation on Moccasin walk -Steps in immersion activity - Flow charts and handouts -	
3	Moccasin walk activity on stepping in to the shoes of another person	
4	Immersion activity by groups - Define the problem statements - Define the key problem statements - Recognize the steps in the ideate phase of Design thinking - Idea on Six thinking hats	
5	Creating person a based on the immersion activity using A4 pages - Recognize how decoding can help to express ideas - Learn doodle - Importance of Storytelling- Importance of presenting ideas	
6	Peer review activity	
7	Six thinking hats game - Combining immersion and persona creation to create prototype - Defining problem statement and ideating to create prototypes - Define service value proposition - Create a value proposition statement	
8	Million dollar idea game - Visualization of the personnel - Understand Lean AEIOU - Know what is problem space - Know what is solution space	
9	Activity on doodling	
10	Story telling activity - Agile thinking definition - Define customer perception and expectations - Define Product and customer satisfaction - How design thinking and agile thinking complement each other to customer satisfaction	
11	Activity on prototyping - Learn the elements of systems thinking, Actual level and desired level - Review, gap and corrective action - Working of systems thinking & mindset of a system thinker - Differentiate system thinking and design thinking	
12	Test the prototype	

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r3	Apply design thinking to create a prototype to improve any existing product or service - Problem definition - Groups need to complete all phases of Stanford design thinking model.

Textbooks(s)

1	Michael Lewrick, Patrick Link, Larry Leifer, "The Design Thinking Toolbox", April 2020.
2	Falk uebernickel ,Li jiang Walter Brenner,Britta Pukall,Therese Naef,Bern hard Schindlholzer "Design Thinking :The Handbook",publication August 2020

WEB RESOURCES

1	Eyal - "Hooked by" – URL https://www.youtube.com/watch?v=iw1x0zos8Jo
2	Rod Judkins (2015) – "The Art of Creative Thinking" - Hachette Book Publishing
3	Senor and Saul singer (2011) – "Start-up Nation" - Twelve; Reprint edition
4	Simon Sinek – "Start with why" – URL https://www.youtube.com/watch?v=u4ZoJKF_VuA
5	laude Diderich (2020) – "Design Thinking for Strategy Innovation Towards Competitive Advantage" – Springer International Publishing
6	Kumar, DivyaZindani and J.PauloDavim (2020) – "Design Thinking to Digital Thinking" – Springer International Publishing
7	Michael Lewrick, Patrick Link and Larry Liefer (2018) – "The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems" – Wiley
8	Pressman (2018) – "Design Thinking: A Guide to Creative Problem Solving forEveryone"–Routledge
9	Walter Brenner and Falk Uebernickel (2016) – "Design thinking for Innovation: Research and Practice" – Springer International Publishing
10	The Field Guide to Human Centered Design" – IDEO.org – First Edition , 2015
11	Roger L Martin (2009) – "The Design of Business: Why Design Thinking is the Next Competitive Advantage" – Harward Business School Press Web References

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Regulation 2018		Semester V		Total Hours			15
Category	Course Code	Course Name		Hours / Week			
				L	T	P	C
C	18CBC303L	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY		0	0	2	1

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Learn the concept of Greedy techniques
2	Implement various Dynamic Programming techniques
3	Understand the optimization algorithms
4	Learn and implement Graph algorithms
5	Understand and implement the Back Tracking algorithms

Course Outcome (s) (COs):

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

CO 1	Design and implement greedy algorithms for job scheduling.
CO 2	Design and implement dynamic programming for finding the shortest path and knapsack Problem
CO 3	Design and implement optimization algorithm and randomization algorithm
CO 4	Design and implement graph algorithms for Tree-traversals.
CO 5	Design and implement back tracking algorithms to solve n queen's problem.

CO-PO Mapping

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

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

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LIST OF EXPERIMENTS		15
1	Program to implement N-queens problem using backtrack method.	
2	Program for finding shortest path for multistage graph using dynamic programming.	
3	Implementation of Optimal merges patterns.	
4	Program to implement job sequencing with deadlines using greedy method	
5	Program to implement knapsack problem using greedy method	
6	Find a subset of a given set S = {sl, s2,..........., sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1, 8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.	
7	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.	
8	Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.	
9	Compute the transitive closure of a given directed graph using Warshall's algorithm.	
10	Print all the nodes reachable from a given starting node in a digraph using BFS method.	

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Regulation 2018			Semester V		Total Hours		30
Category	Course Code		Course Name		Hours / Week		C
					L	T	P	
P	18CBP301L		MINI PROJECT		0	0	2	1

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Develop their own innovative prototype of ideas.
2	Train the students in preparing mini project reports and examination.

Course Outcome (s) (COs):

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

CO 1	Identify and formulate a technical problem to reach substantiated conclusion using basic technical knowledge.
CO 2	Design/Develop prototype /model for societal needs applying the basic engineering knowledge.
CO 3	Evaluate the performance of the developed solution using appropriate techniques and tools.
CO 4	Apply management principles to function as a team.
CO 5	Communicate the technical information effectively.

CO-PO Mapping

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

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

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Regulation 2018			Semester V		Total Hours			30
Category	Course Code		Course Name		Hours / Week			C
					L	T	P	
M	18MBM301L		ANALYTICAL AND LOGICAL - THINKING SKILLS		0	0	2	1

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Sharpen problem solving skills and to improve thinking capability of the students
2	Drive the students to use language with great commitment and cooperation
3	Expertise the creative thinking and presentation skills to meet the company needs

Course Outcome (s) (COs):

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

CO 1	Solve both analytical and logical problems in a fruitful manner
CO 2	Organize and convey the information in such an incomparable way
CO 3	Improve their presentation skills

UNIT 1	Module – 1	6

Aptitude: Alligations or Mixtures - Blood Relations.
Communication: How to set Goals - Interpersonal Relationships - JOHARI Window - Work &Business Etiquette

UNIT 2	Module - 2	6

Aptitude: Partnership - Statement and Assumptions.
Communication: Transition to Corporate World - Career opportunities in Various Sectors and know your industry.

UNIT 3	Module - 3	6

Aptitude: Arithmetic and Geometric Progressions - Syllogisms.
Communication: Time Management - Anger and Stress Management - Conflict Management.

UNIT 4	Module - 4	6

Aptitude: Permutations and Combinations - Statements & Conclusions.
Communication: Launch a Product - Telephonic Etiquette.

UNIT 5	Module - 5	6

Aptitude: Geometric Problems.
Communication: Presentation Skills - Oral presentation and public speaking skills, Business presentations.

	Total Periods	30

Text Book(s)

1	Dr.R.S.Agarwal "Quantitative Aptitude",S.Chand & Company Limited,2015
2	Dr.R.S.Agarwal, "A Modern approach to verbal & non-verbal Reasoning", S.Chand & company Limited, 2015.

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UNIT 1	-	INDIAN ARTS	3

Introduction to art (aesthetics, taste)- fine arts - applied arts –Terminology - Subject matter - Art as propaganda - Purposes/uses of art.

UNIT 2		THEATRE & DRAMA	3

History of Theatre and Drama- Traditional Theatre forms- Modern Theatre and its characteristics- Puppetry – different forms and elements of drama.

UNIT 3		MUSICS AND DANCES OF INDIA	3

Origin of Music and Dance- Classical music and Carnatic Music- Regional Music – Musical Instruments-Regional Classical Dances.

UNIT 4		ARCHITECTURE, SCULPTURE, PAINTING	3

History of architecture, sculpture, painting -Indo-Islamic Architecture- Temple Architecture– different types of Sculptures and its characteristics-Painting and its different styles.

UNIT 5	-	LITERARY ARTS	3

Ancient Indian Literature- Early Dravidian Literature- Medieval Literature- Modern Indian Literature-Contemporary Literature.

		Total Periods	**15**

Text Book(s)

1	Partha Mitter ,"Indian Art",2001
2	Pratima Sheh, " Dictionary of Indian Art and Artists",2007

Reference (s)

1	Dhar, Parul Pandya, ed., " Indian Art History Changing Perspectives", New Delhi: D.K. Print world and National Museum Institute (Introduction), 2011,
2	Guha-Thakurta, Tapati, "The making of a new modern Indian art: Aesthetics and nationalism in Bengal", 1850-1920, Cambridge University Press, 1992
3	Huntington, Susan, " The Art of Ancient India: Hindu, Buddhist, Jain, Weatherhill", 1985
4	Mitter, Partha, "Indian Art, Oxford History of Art series", Oxford University Press, 2001

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Regulation 2018			Semester V	Total Hours			15
Category	Course Code		Course Name	Hours / Week			C
				L	T	P	
M	18LEM302L		SELF DEVELOPMENT AND ENTREPRENEURSHIP	1	0	0	-

Prerequisite course

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Develop entrepreneurship and self-employment abilities to start any venture plan, use, and monitor and control resources optimally and economically.
2	Know the Micro, small and medium industries Registration Process.
3	Study about product selection and development.
4	Learn about the Project report preparation.
5	Analysis the Enterprise risk management.

Course Outcome (s) (COs):

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

CO 1	Identify entrepreneurial quality.
CO 2	Know the entrepreneurial support agencies.
CO 3	Prepare project setup planning and project report
CO 4	Select appropriate agencies for technical and financial support.
CO 5	Explain SWOT analysis and strategies to achieve goals.

CO-PO Mapping

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

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

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UNIT 1	INTRODUCTION TO SELF-EMPLOYMENT AND ENTREPRENEURSHIP DEVELOPMENT	3
	Introduction of self-employment – Characteristics- Creativity. Entrepreneurship development-Qualities of entrepreneur and Characteristics of Diploma holder as a self-employer like developing networking and personal contacts, importance of productivity, quality, cost consciousness and customers' satisfaction. Types of enterprise-Sole partnership -Partnership firm- Joint stock company- Co-operative society.	
UNIT 2	ENTREPRENEURIAL SUPPORT AGENCIES	3
	Definition Micro, small and medium industries-Registration process of an enterprise with Government agencies-Name, type and role of state and national-level support agencies. Current state & National Level Promotional Schemes for establishment of new..	
UNIT 3	PROJECT SET UP PLANNING	3
	Product Selection: importance- Product development stages. Process Selection: Factors affecting process selection - Technology lifecycle. Process Conversion-Capacity Planning: Basic method to assess / estimate capacity. Selection of location and layouts: Factors affecting selection of location - Objectives and types of plant layout.	
UNIT 4	PROJECT PROPOSAL PLANNING	3
	7-M resources- Marketing- definition, need for enterprise, 4Ps channels- Market survey. Methods -Project report preparation for mechanical feature based product: Meaning of project planning and report: Feasibility study. Details required for preparing project plan. Project cost estimation.	
UNIT 5	ENTERPRISE AND RISK MANAGEMENT	3
	Concept of risk in the context of enterprise/ project-Uncertainty and certainty of project elements-Decision making under risk-Methods of risk management-Strength, Weakness, Opportunity and Threat (SWOT) analysis.	
	Total Periods	**15**

Text Book(s)

1	Cal Newport,"So Good They Can't Ignore You",2016
2	Greg McKeown, "Essentialism ",2014

Reference (s)

1	Clifford and Bombak, JosephR. Momanso ,"Entrepreneurship & Venture Management",second edition,1986
2.	Karmakar.M.B. ,"Small Industries management",2009
3	Pradeep Khandwala, "Creativity",2014
4	R.K.Singal, S.K.Kataria Sons, "Entrepreneurship development and Management",2013

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Regulation 2018			Semester VI		Total Hours			45
Category	Course Code		Course Name		Hours / Week			C
					L	T	P	
C	18CBC304T		COMPUTER NETWORKS		3	0	0	3

Prerequisite courses

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Study the concepts of data communications and functions of different layers of ISO/OSI reference Architecture
2	Understand the error detection and correction methods and types of LAN.
3	Realize the concepts of sub netting and routing mechanisms.
4	Empathize with the different types of protocols and network components.
5	Gain Knowledge and configure Switches and Routers.

Course Outcome (s) (COs):

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

CO 1	Infer the fundamentals of data communications and functions of layered architecture.
CO 2	Interpret LAN and various techniques for Bandwidth Utilization
CO 3	Apply the error detection and correction methods and understand the different network technologies in Data link layer and MAC.
CO 4	Analyze the various Network and Transport layer Protocols.
CO 5	Summarize the application layer protocols and also the use of cryptography and network security.

CO-PO Mapping

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

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

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UNIT I	INTRODUCTION	9

Introduction: Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures. **Data communication Components:** Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media.

UNIT II	LAN AND BANDWIDTH UTILIZATION	9

LAN: Wired LAN, Wireless LAN, Virtual LAN. **Techniques for Bandwidth utilization:** Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT III	DATA LINK LAYER	9

Data Link Layer and Medium Access Sub Layer: Fundamentals of Error Detection and Error Correction, Block coding- Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back- N ARQ, Selective Repeat ARQ, Sliding Window ,Piggybacking, Random Access, Multiple access protocols - PureALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

UNIT IV	NETWORK AND TRANSPORT LAYER	9

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP Delivery, Forwarding and Unicast Routing protocols **Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques -Leaky Bucket and Token Bucket algorithms.

UNIT V	APPLICATION LAYER AND NETWORK SECURITY	9

Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.
Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.

	Total Periods	45

Text Book (s)

1	Behrouz A. Forouzan, "Data communication and Networking Update ", Tata McGraw-Hill,Fourth Edition
2.	William Stallings , "Data and Computer Communication"(10th Edition) ,2013

Reference (s)

| 1	Network Security, Kaufman, R. Perlman and M. Speciner, 22 April 2002
2	UNIX Network Programming, Vol. 1,2 & 3, W. Richard Stevens, 1990
3	Computer Networking: A Top-Down Approach (6th Edition),2012
4	Network Warrior (2nd Edition),2011

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UNIT I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE & PROBLEM SOLVING	9

Problems of AI, AI technique, Tic -Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. Defining the problem as state space search- production system-problem characteristics-issues in the design of search programs.

UNIT II	SEARCH TECHNIQUES	9

Problem solving agents, searching for solutions; uniform search strategies: breadth first search-depth first search- depth limited search-bidirectional search- comparing uniform search strategies. Heuristic search strategies Greedy best-first search- A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT III	CONSTRAINT SATISFACTION PROBLEMS	9

Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT IV	KNOWLEDGE & REASONING	9

Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge

UNIT V	PROBABILISTIC REASONING & EXPERT SYSTEMS	9

Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques. Representing and using domain knowledge, expert system shells, and knowledge Acquisition.

LIST OF EXPERIMENTS	15

1. Implement Water-Jug problem
2. Implement Monkey Banana Problem
3. Implement Hill Climbing algorithm.
4. Implementation of Constraint Satisfaction Problems.
5. Implementation of Greedy heuristic search algorithm
6. Implementation of Simulated Annealing Heuristic Search
7. Implementation of KNN for an application.
8. Implementation of SVM for an application.
9. Implementation of Decision Tree for an application
10. Implementation of simple chatbot for an application.

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UNIT I	INTRODUCTION	9

Overview of Security Parameters: Confidentiality-integrity and availability; Security violation and threat; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.

UNIT II	ACCESS CONTROL MODELS	9

Access Control Models: Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and Spatio-temporal models.

UNIT III	SECURITY POLICIES	9

Security Policies: Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, International standards.

UNIT IV	SYSTEM-DESIGN	9

Systems Design: Design principles, representing identity, control of access and information flow, Confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems.

UNIT V	LOGIC BASED SYSTEM	9

Logic-based System: Malicious logic, vulnerability analysis, auditing, intrusion detection. **Applications:** Network security, operating system security, user security, program security. **Special Topics:** Data privacy, introduction to digital forensics, enterprise security specification. **Operating Systems Security:** Security Architecture, Analysis of Security in Linux/ Windows. **Database Security:** Security Architecture, Enterprise security, Database auditing.

	Total Periods	45
	LIST OF EXPERIMENTS	15

1. Analysis of security in Unix/Linux.
2. Implement SHA-1 algorithm
3. Implement MD5 algorithm for practical applications.
4. Implementing Digital Signal Standard (DSS).
5. Crack passwords using John the Ripper.
6. Demonstrate intrusion detection system (IDS) using Snort
7. Administration of users, password policies, privileges and roles

Text Book (s)

1	M. Bishop, Pearson Education, "Computer Security: Art and Science", November 2018
2	M. Stamp, "Information security Principles & practices", 16th September 2021

Reference (s)

1	C.P. P fleeger, S.L. P fleeger, J. Margulies, "Security in Computing", January 2015
2	David Wheeler, "Secure Programming HOWTO", 1999
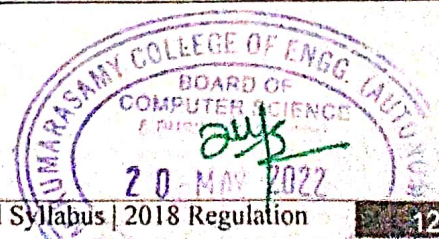
Text Book(s)

1.	Stuart Russell, "Artificial Intelligence – A Modern Approach", 3 Edition.2010
2	John D Kelleher, Brian Mac Namee, "Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies",2015

Reference (s)

1	Giarranto, "Expert Systems", VIKAS.2001
2	Patterson, "Introduction to artificial intelligence and Expert system", PHI.1997
3	Russell, pearson, "Artificial intelligence",1998
4	Russell & peter norvig, "Artificial intelligence : A modern approach",2005

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Regulation 2018		Semester VI		Total Hours	30
Category	Course Code	Course Name		Hours / Week	
				L	T	P	C
S	18MBS304T	FINANCIAL MANAGEMENT		2	0	0	2

Prerequisite courses

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Importance of Financial Management to make good business decisions
2	Significance of Financial market and its linkage with business
3	Long Term Sources available for a firm
4.	Importance of Cost of Capital and Capital Structure for financing decisions
5	Importance of Liquidity and Dividend decisions

Course Outcome (s) (COs):

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

CO 1	Understand and learn the importance of financial management for financial decision making.
CO 2	Analyze the securities value and its Risk & Return.
CO 3	Discover basic understanding of various sources of finance.
CO 4	Apply Capital Budgeting and Working Capital Management.
CO 5	Apply working capital concepts to maintain liquidity and to learn the aspects of dividend Decisions.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	1	-	-	-	1	-	-	-	2	-	1	2
CO2	-	2	-	-	1	-		-	-	-	2	-	2	-
CO3	-	3	2	-	2	-	1	-	-	-	2	-	2	-
CO4	-	3	-	-	-	-	1	-	-	-	2	-	1	2
CO5	-	2	-	-	1	-	1	-	-	-	2	-	1	-
CO (Avg)	-	3	2	-	2	-	1	-	-	-	2	-	2	2

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

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UNIT I	Introduction	6

Introduction to Financial Management - Goals of the firm - Financial Environments. **Time Value of Money:** Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

UNIT II	Valuation of Securities and Risk & Return	6

Valuation of Securities: Bond Valuation Preferred Stock-Valuation, Common Stock Valuation, Concept of Yield and YTM. **Risk and Return:** Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

UNIT III	Operating & Financial Leverage	6

Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study. **Cost of Capital:** Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital 4L

UNIT IV	Capital Budgeting and Working Capital Management	6

Capital Budgeting: The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods. **Working Capital Management:** Overview, Working Capital Issues, Financing-Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

UNIT V	Cash and Accounts Receivable Management	6

Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring. **Accounts Receivable Management:** Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period. 4L

	Total Periods	30

Text Book (s)

1	Chandra, Prasanna ," Financial Management - Theory & Practice", 1 November 2007
2	Tata McGraw Hill, "Financial Management: Theory & Practice", 15th Edition,2015

Reference (s)

1	Srivastava, Misra, "Financial Management". OUP, Apr 26, 2012
2	Van Horne and Wachowicz , "Fundamentals of Financial Management", Prentice Hall/ Pearson Education.1998
3	Eugene F. Brigham, "Fundamentals of Financial Management ",2016
4	Taxmann, "Fundamentals of Financial Management: Concise Edition" , 9th edition,2017

Syllabus | 2018 Regulation

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Regulation 2018		Semester VI		Total Hours		60
Category	Course Code	Course Name		Hours / Week		C
				L	T	P	
11	18CBI1104J	BUSINESS COMMUNICATION AND VALUE SCIENCE – IV		2	0	2	3

Prerequisite courses

NIL.

Course Objective (s):

The purpose of learning this course is to:

1	Recognize the best practices of communicative writing
2	Understand the importance of emotional intelligence in personal and professional lives
3	Study the importance of corporate social responsibility (CSR)
4	Empathize with how stress impacts life and work
5	Use the best practices to manage stress & Public Speaking.

Course Outcome (s) (Cos):

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

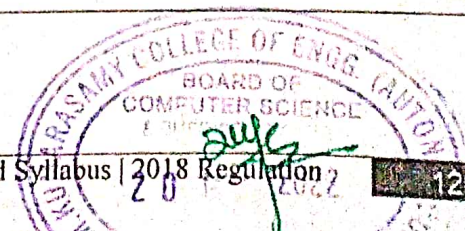| CO 1	Recognize the best practices of communicative writing
CO 2	Apply emotional intelligence in real life scenarios
CO 3	Recognize the attributes needed to function and grow in a corporate environment
CO 4	Identify the best practices to manage stress
CO 5	Identify the best practices of public speaking

CO-PO Mapping

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

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

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UNIT I	COMMUNICATIVE WRITING	9
	Writing: Principles of Communicative Writing – Formal and Business letters – Writing Proposals – Use of Charts and graphs in Communicative Writing – Intelligence: Understand what emotional intelligence – Importance of Public Speaking – To apply public speaking in real life scenarios. Activity: identify topics related to the key words – Introduce the concept of Diversity in corporate environments through an activity – Ask students to write a business Proposals in group – Ask students to note down the names of at least two movies in their Satori slam book, in which the characters display Emotional Intelligence.	
UNIT II	CORPORATE SOCIAL RESPONSIBILITY (CSR)	9
	Corporate Social Responsibility (CSR): Recognize the importance of corporate social responsibility – Hear CSR stories – Tell a CSR story – Attributes required for work and life – Recognize the attributes needed to function and grow in a corporate environment – Activity: Activity – Groups will research in class, prepare and present CSR activity of Tata Steel, Microsoft, Google, TCS, Starbucks, Titan, Tata Chemicals and TOMS Shoes.	
UNIT III	EMOTIONAL INTELLIGENCE	9
	Concepts: Concepts of Emotional Intelligence – Its importance in human life and professional life – difference between emotional quotients and intelligent quotients – Corporate Etiquette activity – Any two Abubhaav activities – 10 ways to build emotional intelligence by Daniel Golonem – Mock Interview.	
UNIT IV	CONFLICT MANAGEMENT	9
	Concepts conflicts – Corporate and work place conflicts – Reason and impact of conflicts – guidelines for conflicts Teams – Role of team players – Stress – Stress Management – Importance of Feedbacks – Time Management – Activity – Creating Posters with Stress Management Tips – Open House Discussions on Challenges of Time Management – Tracking Time Activity.	
UNIT V	DESIGN THINKING AND PUBLIC SPEAKING	9
	Concepts: Design Thinking – Importance of Startups – Proof of Concepts for Startups – Best Practices – Act of Public Speaking Activity: Pitch in Startup Idea – Listening Videos of Public Speaking – Finding Similarities among World famous speeches – Listening Swami Vivekananda's Speech – Martin Luther King's My Dream Speech – Dr. Abdul Kalam's Speech.	
	Total Periods	45

LIST OF EXPERIMENTS		15
1.	Introduce the concept of Diversity in corporate environments through an activity	
2.	Ask students to write a business Proposals in group	
3	Ask students to note down the names of at least two movies in their Satori slam book, in which the characters display Emotional Intelligence.	
4	Groups will research in class, prepare and present CSR activity of Tata Steel, Microsoft, Google, TCS, Starbucks, Titan, Tata Chemicals and TOMS Shoes.	
5	Creating Posters with Stress Management Tips	
6.	Open House Discussions on Challenges of Time Management	
7	Tracking Time Activity.	
8	Watching Videos of Public Speaking	
9	Finding Similarities among World famous speeches	
10	Watching Swami Vivekananda's Speech – Martin Luther King's My Dream Speech – Dr. AbdulKalam's Speech	

Reference (s)	
1	Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman,1995
2	Putting Emotional Intelligence To Work by Ryback David,1998
3	How to Develop Self Confidence and Improve Public Speaking – Time – Tested Methods of Persuasion by Dale Carnegie,2018
4	TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations,2016

Web References:

1	https://www.tata.com/about-us/tata-group-our-heritage
2	https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms

Online Resources:

1	https://youtu.be/reu8rzD6ZAE
2	https://youtu.be/Wx9v_J34Fvo
3	https://youtu.be/F2hc2FLOdhI
4	https://youtu.be/wHGgp8lz36c
5	https://youtu.be/hxS5He3KVEM
6	https://youtu.be/nMPqsjuXDmE

Regulation 2018			Semester VI	Total Hours			15
Category	Course Code		Course Name	Hours / Week			C
				L	T	P	
C	18CBC307L		COMPUTER NETWORKS LABORATORY	0	0	2	1

Prerequisite courses

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Gain knowledge in the concepts of data communications and functions of different layers of ISO/OSI reference architecture.
2	Understand the error detection and correction methods and types of LAN.
3	Examine the concepts of sub netting and routing mechanisms.
4	Empathize with the different types of protocols and network components.
5	Study and configure Switches and Routers

Course Outcome (s) (Cos):

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

CO 1	Understand the fundamentals of data communications and functions of layered architecture.
CO 2	Practice the error detection and correction methods and understand the different network technologies in Data link layer and MAC.
CO 3	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and routing technologies.
CO 4	Configure Routers and Switches for efficient Data Transfer.
CO 5	Understand the application layer protocols and also the use of cryptography and network security.

CO-PO Mapping

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

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

-	LIST OF EXPERIMENTS	15
1	Study of system administration and network administration	
2	Implementation of Sliding window protocol and stop and wait protocol	
3	Write a code simulating PING and TRACEROUTE commands	

4	Applications using TCP Sockets like
	   ○ File transfer
	   ○ Remote command execution
	   ○ Chat
	   ○ Concurrent services	

5	Create a socket for HTTP for webpage upload and download	
6	Implementation of Sub netting Applications a. DNS b. SNMP	
7	Study of PUTTY (NETWORK FILE TRANSFER APPLICATION	
8	Perform a case study about ETTERCAP (NETWORK SECURITY TOOL).	

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Regulation 2018			Semester VI	Total Hours		30
Category	Course Code		Course Name	Hours / Week		C
				L	T	P	
M	18MBM302L		EMPLOYABILITY SKILLS AND PRACTICES	0	0	2	1

Prerequisite courses

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Learn the application of mathematical or statistical models to different real-world contexts
2	Focus on writing & speaking skills through vigorous practices.
3	Enhance soft skills and analytical ability of students
4	Defeat the fear while communicating in group and to master the effective communication

Course Outcome (s) (Cos):

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

CO 1	Solve both analytical and logical problems in a productive manner
CO 2	Launch their ability of comprising and delivering the information
CO 3	Upgrade their communication quality in near future

UNIT I	Module – 1	6

Aptitude: Time and Distance (Speed, Streams) – Problems on Trains – Arrangements and Blood Relations.
Communication: Job Application – Cover letter, Bio-data, Resume & CV building.

UNIT II	Module – 2	6

Aptitude: Time and Work – Pipes & Cisterns – Situation Reaction Test & Data Interpretations.
Communication: Writing practices on circulars, notices, memos, Agenda preparation and Minutes of meeting.

UNIT III	Module – 3	6

Aptitude: Ages – Averages – Probability – Profit and Loss. Communication: Email Etiquette –Essay writing.

UNIT IV	Module – 4	6

Aptitude: Mensuration - SI & CI - Cause and Effect Analysis - Statement, Assumptions & Conclusions.
Communication: Group Discussion and guidelines.

UNIT V	Module - 5	6

Aptitude: Permutation and Combinations - Partnership - Alligations or Mixtures.
Communication: Interview skills - General instructions, Review of interview questions, Mock Interviews.

	Total Periods	30

Reference(s)

1	Employability Skills by y Arihant Experts,2017
2	An Introduction to Employability Skills' published by Macmillan,2018
3	https://bharatskills.gov.in/pdf/EmployabilitNew.pdf
4	https://iti.directory/books/iti-employability-skills-books-i-year
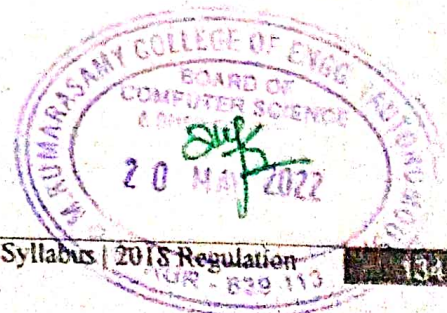
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Regulation 2018			Semester V		Total Hours			60
Category	Course Code		Course Name		Hours / Week			
					L	T	P	C
Elective	18CBE001J		CONVERSATIONAL SYSTEMS		3	0	2	4

Prerequisite course

Nil

Course Objective (s):

The purpose of learning this course is to:

1	Learn the basic knowledge about conversational systems.
2	Understand the different techniques of natural language processing
3	Explore the working knowledge of a chat bot and the prerequisite knowledge
4	Study the fundamental role of machine learning in building conversational systems
5	Explicate the various applications of conversational systems and its future developments

Course Outcome (s) (COs):

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

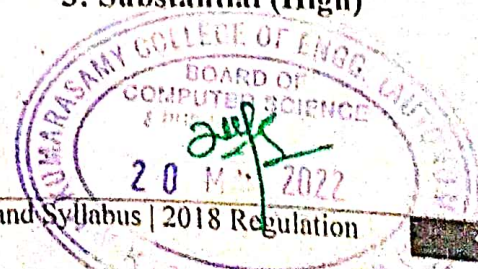| CO 1	Understand the basic technologies required for building a conversational system.
CO 2	Confer the NLTK tool kit and the pre-processing techniques of natural language processing.
CO 3	Expound basic concepts and architecture of chat bots and build a chat bot for any application and deploy it.
CO 4	Involve AI in building conversational system and build advanced systems that can be cognitively inclined towards human behavior.
CO 5	Develop a real time working conversational system for social domain that can intelligently process inputs and generate relevant replies.

CO-PO Mapping

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

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

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UNIT I	FUNDAMENTALS OF CONVERSATIONAL SYSTEMS	9

Introduction: Overview, Case studies, Explanation about different modes of engagement for a human being. History and impact of AI. Underlying technologies: Natural Language Processing, Artificial Intelligence and Machine Learning, NLG, Speech-To-Text; Text-To-Speech, Computer Vision etc. Introduction to Top players in Market – Google, MS, Amazon &Market trends. Messaging Platforms (Facebook, WhatsApp) and Smart speakers – Alexa, Google Home and other new channels. Ethical and Legal Considerations in AI Overview.

UNIT II	NATURAL LANGUAGE PROCESSING	9

Introduction: Brief history, Basic Concepts, Phases of NLP, Application of chatbots etc. General chatbot architecture, Basic concepts in chatbots: Intents, Entities, Utterances, Variables and Slots, Fulfilment Lexical Knowledge Networks (WordNet, Verbnet, PropBank, etc). Lexical Analysis, Part-of-Speech Tagging, Parsing/Syntactic analysis, Semantic Analysis, Word Sense Disambiguation. Information Extraction, Sentiment Analysis, NLP using Python - libraries like NLTK, spaCy, Stanford NLP, Affective NLG.

UNIT III	BUILDING A CHATBOT/CONVERSATIONAL AI SYSTEMS	9

Fundamentals of Conversational Systems (NLU, DM and NLG), Chatbot framework & Architecture, Conversational Flow & Design, Intent Classification (ML and DL based techniques), Dialogue Management Strategies, Natural Language Generation UX design, APIs and SDKs, Usage of Conversational Design Tools. Introduction to popular chatbot frameworks – Google Dialog flow, Microsoft Bot Framework, Amazon Lex, RASA Channels: Facebook Messenger, Google Home, Alexa, WhatsApp, Custom Apps. Overview of CE Testing techniques, A/B Testing, Introduction to Testing Frameworks - Botium /Mocha ,Chai. Security &Compliance – Data Management, Storage, GDPR, PCI

UNIT IV	ROLE OF ML/AI IN CONVERSATIONAL TECHNOLOGIES	9

Understanding on how Conversational Systems uses ML technologies in ASR, NLP, Advanced Dialog management, Language Translation, Emotion/Sentiment Analysis, Information extraction, etc. to effectively converse.

UNIT V	CONVERSATIONAL ANALYTICS AND THE FUTURE OF CONVERSATIONAL SYSTEMS	9

Contact Centers: Introduction to Contact centers – Impact &Terminologies, Case studies & Trends, How does a Virtual Agent/Assistant fit in here? Overview on Conversational Analytics: Conversation Analytics: The need of It, Introduction to Conversational Metrics. Future – Where are we headed? Summary. Robots and Sensory Applications overview .XR Technologies in Conversational Systems, XR-Commerce, What to expect next? – Future technologies and market innovations overview.

	Total periods	45
LAB	**LIST OF EXPERIMENTS**	15

Develop the code for the following:

1. To identify morphological features of a word by analyzing it.

2. To generate word forms from root and suffix information.

3. To perform morphological analysis of a word by the use of Add-Delete table.

4. To do sentiment analysis for the given dataset and to classify sentences based on their categories.

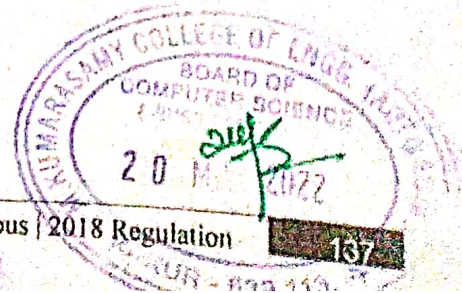5. To detect the entities from the dataset and tag them based on their categories.

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6.	To find Parts – Of - Speech tags of words in a sentence.
7.	To detect the entities from the dataset and tag them based on their categories.
8.	To build a chatbot for an application that proves its importance from a social perspective

Text Book (s)

| 1 | McTear, Michael. "Conversational AI: dialogue systems, conversational agents, and chatbots." Synthesis Lectures on Human Language Technologies 13, no. 3 (2020): 1-251. |
| 2 | Hands-On Chatbots and Conversational UI Development: Build chatbots and voice user interfaces with Chatfuel, Dialogflow, Microsoft Bot Framework, Twilio, and Alexa Skills Paperback – 1 January 2017 by Srini Janarthanam |

Reference (s)

1	Pearl, Cathy. Designing voice user interfaces: Principles of conversational experiences. "O'Reilly Media, Inc.", 2016.
2	https://www.tcs.com/content/dam/tcs/pdf/discover-tcs/research- book/ Conversational% 20Systems% 20in% 20Enterprises% 20dps.pdf
3	https://www.morganclaypoolpublishers.com/catalog_Orig/samples/9781636390321_sample.pdf
4	https://www.mdpi.com/2073-8994/13/7/1187/pdf

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Regulation 2018			Semester V		Total Hours			60
Category	Course Code		Course Name		Hours / Week			
					L	T	P	C
Elective	18CBE002J		CLOUD MICROSERVICE AND APPLICATION		3	0	2	4

Prerequisite Course(s)

Operating Systems, Object Oriented Programming -

Course Objective (s):

The purpose of learning this course is to:

1	Make the students to understand the fundamentals of developing application on Cloud, specifically public clouds such as AWS, AZURE and Google.
2	To help students to design applications for Cloud.
3	Enable students to develop applications using various cloud services.
4	Understand students to deploy applications on Cloud by using cloud native services.
5	Develops students to implement fundamentals tools and applications.

Course Outcome (s) (COs):

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

CO 1	Understand the fundamentals of cloud service applications.
CO 2	Know about the different public cloud applications
CO 3	Design and develop the application for providing cloud services
CO 4	Deploy the cloud micro services using native cloud tools
CO 5	Evaluate and Implement python and Develop stools and applications

CO-PO Mapping

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

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

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UNIT I	CLOUD FUNDAMENTALS	9

Cloud Service Components, Cloud service/Deployment Models. Cloud Components Guiding Principle with respect utilization / Security/ Pricing and the applications of Cloud. Public Cloud Platforms overview and their usage.

UNIT II	APPLICATION ARCHITECTURE	9

Application architectures-Monolithic & Distributed ,Micro service fundamental and design approach, Cloud Native applications, 12 Factors App, Application integration Process / APIFICATION Process , API Fundamental.

UNIT III	MICRO SERVICE	9

Micro service / API management, Spring boot Fundamental and design of micro service, API Tools, Developer Portal. Applications of Micro service and APIFICATION.

UNIT IV	DEVELOPMENT FUNDAMENTALS	9

Tools and Applications Containerization Process and application.

UNIT V	PYTHON	9

Introduction - Programming Concepts - Beyond the Basics - Use cases .Cloud Application development/Deployment/ Execution steps, Cloud Security and Monitoring Tools.

	Total Periods	45
LAB	LIST OF EXPERIMENTS	15

Students can select the project work/ thesis in any one of the Cloud application development / deployment use cases.

Text Book (s)

1	Hwang, Kai, Jack-Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan kaufmann, 2013.
2	Reese, George. Cloud application architectures: building applications and infrastructure in the cloud. "O'Reilly Media, Inc.", 2009.

Reference (s)

1	Raj Kumar Buyya ,Christian Vecchio la , S. ThamaraiSelvi," MasteringinCloud",MHI,2013
2	John W. Ritting house and James F. Ran some, "Cloud Computing :Implementation, Management, and Security", CRC Press, 2010
3	Barrie So sin sky ,"Cloud Computing Bible",Wiley,2011
4	Michael Huttermann, "DevOps for Developers", Apress, 2012.

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Regulation 2018			Semester V	Total Hours			60
Category	Course Code		Course Name	Hours / Week			
				L	T	P	C
Elective	18CBE003J		MACHINE LEARNING	3	0	2	4

Prerequisite Course(s)

Nil

Course Objective (s):

The purpose of learning this course is to:

1.	Understand the fundamental concepts of Machine Learning
2	Help students to understand the concepts and algorithms of Classification
3	Make students to understand the theoretical and practical aspects of Probabilistic Graphical Models
4	Empathize with the concepts of regression analysis
5	Appreciate the concepts Clustering.

Course Outcome (s) (COs):

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

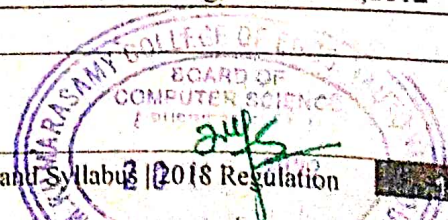| CO 1	Understand the different types of Supervised and Unsupervised Learning.
CO 2	Analyze the different types of classification algorithms for real time applications.
CO 3	Analyze Probabilistic Discriminative and Generative algorithms for an application and Compare the results.
CO 4	Identify regression analysis techniques for Supervised Learning.
CO 5	Implement typical Clustering algorithms for different types of applications

CO-PO Mapping

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

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

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UNIT I	INTRODUCTION AND CLASSIFICATION	9

Introduction to Machine Learning (ML); Relationship between ML and human learning; Aick survey of major models of how machines learn ;Example applications of ML classification : Supervised Learning; problem of classification ;Feature engineering ;Training and testing classifier models Cross – validation ; Model evaluation (precision, recall, F1- measure, accuracy, area under curve) ; Statistical decision theory including discriminant functions and decision surfaces;

UNIT II	CLASSIFICATION ALGORITHM	9

Naive Bayes classification; Bayesian networks; Decision Tree and Random Forests; k- Nearest neighbor classification ; Support Vector Machines ; Artificial neural networks including back propagation ; Applications of classifications ; Ensembles of classifiers including bagging and boosting.

UNIT III	PROBABLITISTIC GRAPHICAL MODELS	9

Hidden Markov Models (HMM) with forward-backward and Viterbi algorithms; Sequence classification using HMM Conditional random fields; Applications of sequence classification such as part-of-speech tagging.

UNIT IV	REGRESSION	9

Regression :Multi-variable regression ; Model evaluation ; Least squares regression ; Regularization ; LASSO : Applications of regression . Association rule mining algorithms Including apriori .Expectation-Maximization(EM) algorithm forum supervised learning

UNIT V	CLUSTERING	9

Clustering :average linkage ;Ward's algorithm; Minimum spanning tree clustering; K nearest Neighbors clustering: BIRCH;CURE; DBSCAN .Anomaly and outlier detection methods.

	Total Periods	45

LAB	LIST OF EXPERIMENTS	15
1.	Introduction to WEKA and R	
2.	Classification of some public domain.datasets in UCI ML repository	
3.	Implement Decision Tree learning & Logistic Regression.	
4.	Implement association rule mining using apriori	
5.	Implement Expectation Maximization (EM) algorithm	
6.	Implement K-means Clustering to Find Natural Patterns in Data.	
7.	Implement Hierarchical clustering	
8.	Implement anomaly detection using one class SVM.	

Text Book(s)

1	E.Alpaydin, Introduction toMachineLearning,3/e,Prentice-Hall,2014.
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (First Edition),2019

Reference (s)

1	C.Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
2	R. O. Duda, P.E. Hart, D.G. Stork, Pattern Classification, 2/e, Wiley, 2001.
3	A.Rostamizadeh, A.Talwalkar, M.Moliri, Foundations of Machine Learning, MIT Press,2012
4	A.Webb, Statistical Pattern Recognition,3/e,Wiley,2011.

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Regulation 2018			Semester VI		Total Hours			60
Category	Course Code		Course Name		Hours / Week			C
					L	T	P	
Elective	18CBE004J		ROBOTICS AND EMBEDDED SYSTEM		3	0	2	4

Prerequisite course

Nil

Course Objective (s):

The purpose of learning this course is to:

1	Acquire knowledge about modern day robotics and their industrial applications.
2	Learn about the technologies essential for Cognitive Robotics.
3	Understand computer vision and their applications in Robotics.
4	Get an insight about AI, Data Science and Cloud Computing in the context.
5	Understand the Robotic Operating system and to apply the programming languages in building the applications related to Robotics.

Course Outcome (s) (COs):

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

CO 1	Learn about Robotics and its evolution in the industry along with the required technologies for Cognitive Robotics.
CO 2	Know about computer vision and the application of vision system in Robotics
CO 3	Understand modern day robotics and their industrial applications.
CO 4	Apply the concept of AI, Data Science and Cloud-Computing in the context of Cognitive Robotics.
CO 5	Analyze the suitable Operating system and programming languages that are applicable in the context of Robotics

CO-PO Mapping

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

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

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UNIT 1	INTRODUCTION	9

Introduction to Modern Day Robotics and their industrial applications: Introduction to the industrial revolution, advancements in technologies, evolution of Robotics and advancements in Robotics, Types of Robots.

UNIT 2	TECHNOLOGIES	9

Technologies essential for Cognitive Robotics; Computer systems and Technologies relevant to modern day robotics. Introduction to computer vision and application of Vision Systems in Robotics: Concepts of computer vision and the how vision systems are becoming essential part of Robotics. Examples of applications of vision systems.

UNIT 3	ARTIFICIAL INTELLIGENCE AND DATA SCIENCE PLATFORM	9

AI in the context of Cognitive Robotics and Role of AI in Robotics: Artificial Intelligence making the Robots behaves like human beings. Applications of AI in Robotics. Data Science and Big Data in the context of Cognitive Robotics: Role of Data Science and Big Data in maximizing the availability of Robots in application; Leveraging Data Science in predicting the potential failure of the Robots.

UNIT 4	CLOUD COMPUTING AND OPERATING SYSTEM PLATFORM	9

Concepts of Cloud computing, cloud platforms and it applications in Robotics: Introduction to Cloud computing and commercially available cloud platforms; How the concept of cloud computing is making the need for complex and extremely high computing requirements in robotic systems. Basics of Robotic operating System: Concepts of Robotic Operating Systems and how it is enabling standardization and communication between different robotic systems and IT systems.

UNIT 5	PYTHON AND R PROGRAMMING IN ROBOTICS	9

Introduction to Python and R Programming in the context of Robotics: Basics of Python and R Programming and the application of Python and R Programming in Robotics.

	Total periods	45
LAB	LIST OF EXPERIMENTS	15

1. Program a Robot in a Code Free Environment with Machine Logic DIY projects.
2. Sloth Arduino DIY DOF Humanoid Robot Learning Kit with Programming.
3. DIY Raspberry Pi robot: Making of remote control/autonomous wandering 4W.D robot.

Text Book (s)

1	Embedded Systems and Robotics with Open Source Tools by Nilanjan Dey, Amartya Mukherjee, 2016
2	Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems, 2008

Reference (s)

1	Ashitava Ghosal, Robotics: Fundamental Concepts and Analysis, Oxford University press, 2013
2	Nilanjan Dey, Amartya Mukherjee, Embedded Systems and Robotics with Open Source Tools
3	Mordechai Ben-Ari, Francesco Mondada, Elements of Robotics, Springer open, 2018
4	Thomas Braunl, Embedded Robotics-Mobile Robot Design and Applications with Embedded Systems, Third Edition, Springer, 2008.

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Regulation 2018			Semester VI		Total Hours			60
Category	Course Code		Course Name		Hours / Week			C
					L	T	P	
Elective	18CBE005J		FULL STACK WEB DEVELOPMENT		3	0	2	4

Prerequisite course

Nil

Course Objective (s):

The purpose of learning this course is to:

1	Enable students to develop modern web application by leveraging latest technologies.
2	Build strong foundation in students making them job ready as per industry requirements.
3	Enable them to learn new technologies by applying foundation paradigms
4	Build strong expertise to develop end to end application - web frontend and backend development
5	Perform database manipulation using MySQL and authenticate data.

Course Outcome (s) (COs):

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

CO 1	Construct a basic website using HTML and Cascading Style Sheets.
CO 2	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
CO 3	Create simple web pages in PHP and to represent data in XML format.
CO 4	Design and implement server side programs using PHP.
CO 5	Perform database manipulation using MySQL and authenticate data.

CO-PO Mapping

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

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

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UNIT 1	INTRODUCTION	9

Concept of website, its need and purpose, Types of websites: Static and dynamic website, Introduction to HTML, XML, JSON, Web Browsers, –Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Tiered Architecture: Client Server Model, Three Tier Model, Service Oriented Architectures, REST services.

UNIT 2	HYPERTEXT MARKUP LANGUAGE (HTML)	9

Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms.

UNIT 3	CASCADING STYLE SHEETS (CSS)	9

Basics of Cascading Style sheets, Advantages of CSS, External Style sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images.

UNIT 4	JAVA SCRIPT	9

Features of Java Script, extension of JavaScript, Syntax of Java Script: data types, operators, variables, tag, Document Object Model (DOM) with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while, do while, break and continue.

UNIT 5	FRONT END FRAMEWORK AND BACK END TECHNOLOGIES	9

Front End Framework: Introduction to jQuery - Syntax, Selectors, Events, Traversing, AJAX ; Introduction to Bootstrap – Basics, Grids, Themes ; Angular JS –·Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, Validation. Back End Technologies: Introduction to RESTful services, Resources, Messages (Request, Response), Addressing, Methods – (GET, POST, PUT, DELETE).

	Total Periods	45

LAB	LIST OF EXPERIMENTS	15

Students can be given a single web application development exercise covering all the units. This exercise can be also done in group of 2-3 students. Student can define the suitable web application example to implement as per their choice. It should cover followings:

- Application should cover Create, Read, Update, Delete scenarios of data.
- Frontendtobedevelopedcoveringallthetechnologies(HTML5,CSS3,jQuery,AngularJS)
- Back end connectivity to be established through RESTful services and must have database connectivity.

Student can choose any backend technologies and database for developing REST services required for the application development. RESTful services should be developed using technologies already familiar. E.g. Java OR C# OR Python etc.

Text Book (s) -

1	Deitel P. J., Deitel H. M. and Deitel A., "Internet and World Wide Web: How to Program", Fifth Edition, Pearson Prentice Hall, 2012.
2	Jon Duckett, "HTML & CSS: Design and Build Websites", First Edition, John Wiley & Sons, 2011.
3	Naramore E., Gerner J., Scouarnec Y.L., et al., "Beginning PHP5, Apache, MySQL Web Development: Programmer to Programmer", John Wiley & Sons Inc., 2005.

Reference (s)

1	Sebesta R. W.," Programming the World Wide Web", Eight Edition, Pearson, 2014.
2	Pressman R. and Lowe D.," Web Engineering: a practitioner's approach", First Edition, Mc Graw Hill, 2008.
3	Kappel G., et al.," Web Engineering: The Discipline of systematic Development of Web Applications", First Edition, John Wiley & Sons, 2006.
4	Ullman L." PHP for the Web: Visual Quick Start Guide", Fifth Edition, Peach pit Press, 2016.

Regulation 2018			Semester VI			Total Hours		60
Category	Course Code		Course Name			Hours / Week		
					L	T	P	C
Elective	18CBE006J		DATA MINING AND ANALYTICS		3	0	2	4

Prerequisite course

Nil

Course Objective (s):

The purpose of learning this course is to:

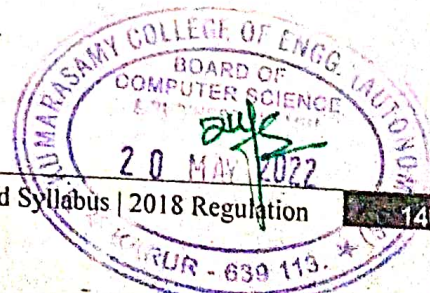| 1	Familiarize the fundamental concepts of data mining and data representation.
2	Learn the data pre-processing task and attribute oriented analysis.
3	Understand the association rules, classification and prediction algorithms.
4	Apply the linear and non-linear models of data analysis.
5	Acquire knowledge about the time series analysis and aspects of prescriptive analysis.

Course Outcome (s) (COs):

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

CO 1	Understand the basic concepts and techniques of Data Mining and representation.
CO 2	Perform pre-processing task for the Dataset.
CO 3	Apply association rules and predictive methods for data mining.
CO 4	Develop data models using linear and non-linear regression techniques.
CO 5	Perform time series analysis and prescriptive analysis.

CO-PO Mapping

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

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UNIT 1	INTRODUCTION TO DATA MINING	9
	Introduction to Data Mining: What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications.	
UNIT 2	DATA PREPROCESSING	9
	Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies. Data mining knowledge representation: Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques. Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures.	
UNIT 3	ASSOCIATION AND CLASSIFICATION ALGORITHMS	9
	Association rules: Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis. Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules. Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models.	
UNIT 4	REGRESSION ANALYSIS	9
	Descriptive Analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis. Forecasting models: Heuristic methods, predictive modeling and pattern discovery, Logistic Regression: Logit transform, ML estimation. Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regressions, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models. Generalized Linear model: link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma. Non Linear Regression (NLS): Linearization transforms, their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semi-parametric regression models, additive regression models. Introduction to nonparametric regression methods.	
UNIT 5	TIME SERIES ANALYSIS	9
	Time Series Analysis: Auto-Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing. Linear time series models: Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARMA models such as Yule- Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models. Prescriptive Analytics: Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.	
	Total periods	45
LAB	LIST OF EXPERIMENTS	15
1.	Installing Weka and exploring a dataset.	
2.	Loading a dataset and visualizing the Data	
3.	Preprocessing a dataset from a real domain(Medical/Retail/Banking)	
4.	Building a classifier- Run Decision Tree, Naïve Bayesian Classifier, NN classifier and SVM	

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5.	Mining Association Rules- Run Apriori Algorithm.
6.	Building a statistical model using a sample dataset – preprocessing, hypothesis building, model fitting, model validation and interpretation of results.
7.	Implementation of linear regression technique for statistical model building.
8.	Implementation of Non-linear regression technique for statistical model building.

Text Book (s)

1	Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.
2	LiorRokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010
3	Box, G.E.P and Jenkins G.M. Time Series Analysis, Forecasting and Control, Holden-Day,1970

Reference (s)

1	Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition. Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).
2	Hosmer, D. W. and Lemeshow, S., "Applied Logistic Regression", Third Edition, Wiley, 2003.
3	Daniel T.Larose, "Data Mining Methods and Models", Wiley-Inter Science, 2006.
4	Jason Brownlee "Machine Learning Mastery with Weka",2020.
5	http://garfield.library.upenn.edu/classics1989/A1989AV48500001.pdf