CURRICULUM AND SYLLABUS
REGULATION 2018
Programme: B.Tech. – Artificial Intelligence and Data Science

Vision of the Department:

To reach excellent standards of quality-education by using latest tools and to be the centre of excellence by promoting knowledge centric education, innovation and state-of-art research in the field of Artificial Intelligence and Data Science.

Mission of the Department:

M1: To impart quality and value based education and contribute towards the innovation of computing, expert system, Data Science to raise satisfaction level of all stakeholders.

M2: To educate the future Computing engineers with strong fundamentals by continuously improving the teaching learning methodologies using contemporary aids.

M3: Enabling students to get expertise in critical skills with Artificial Intelligence domain and facilitate socially responsive research and innovation.

M4: To encourage professional development of students that will inculcate ethical values and leadership skills while working with the community to address societal issues.

Programme Educational Objectives (PEOs):

PEO1: To apply mathematical, scientific and engineering concepts essential for a data architect/data scientist to address the various challenges using emerging AI technologies.

PEO2: To impart knowledge to create, analyze, design, implementation and test a novel solutions required for broader social context.

PEO3: To hone personality skills, leadership qualities, social commitment, social responsibilities, possess professional and ethical attitude through life-long learning and multidisciplinary approach.

Mapping of Programme Educational Objectives with Mission of the Department:

PEOs / Department Mission Statements	M1	M2	M3	M4
PEO1	3	2	3	3
PEO2	3	3	3	1
PEO3	3	3	3	3

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 understand, design and develop essential proficiency in the areas related to data science & AI and to identify, use appropriate analytical, statistical and computational principles for designing novel intelligent solutions to meet society needs.

PSO2: Ability to implement Artificial Intelligence and data science techniques such as research establishment career advancement & entrepreneurship and to practice social responsibilities, ethical and human values for the growth of 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	3	2	2	2	3	2	3	3	1	2	3	1	3	1
PEO2	2	2	3	2	3	3	3	2	2	3	2	3	3	2
PEO3	3	3	2	3	3	2	3	3	3	2	3	3	2	3

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

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Programme Articulation

Semester	Course Code	Course Name	POs											PSOs	
			PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
I	18LEH101J	Technical English	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓
I	18MAB101T	Calculus and Linear Algebra	✓	✓	✓	✓	✓				✓			✓	✓	
I	18CYB101J	Chemistry	✓	✓	✓	✓	✓								✓	✓
I	18EES101J (R)	Basic Electrical and Electronics Engineering	✓	✓	✓	✓	✓				✓	✓		✓	✓	✓
I	18CSS101J (R)	Programming for Problem Solving	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓
I	18MBH102L	General Aptitude	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
I	18LEM101T	Constitution of India							✓	✓	✓	✓	✓	✓		✓
II	18LEH102J	Professional English	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
II	18MAB102T	Advanced Calculus and Complex Analysis	✓	✓	✓	✓	✓				✓			✓	✓	
II	18PYB101J	Physics	✓	✓	✓	✓	✓						✓		✓	✓
II	18MES102J	Basic Civil and Mechanical Engineering	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓
II	18MES101J	Engineering Graphics	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓
II	18AIC101J	Python Programming	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
II	18MBH101L	Professional Skills and Practices						✓	✓	✓	✓	✓	✓	✓	✓	✓
II	18LEM102T	Value Education	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓
II	18GN M101L / 18GNM102L	Physical & Mental Health using Yoga / NSS						✓						✓		✓
III	18MAB207T	Probability and Statistics	✓	✓	✓	✓	✓							✓	✓	
III	18ECS204T	Digital Logic Design	✓	✓	✓	✓	✓		✓		✓		✓	✓	✓	✓
III	18AIC201J	Foundation of Artificial Intelligence & Data Science[&]	✓	✓	✓	✓	✓						✓	✓	✓	✓
III	18AIC202T	Computer Organization and Architecture	✓	✓	✓	✓	✓						✓	✓	✓	
III	18AIC203J	Data Structures and Algorithms	✓	✓	✓	✓	✓						✓	✓	✓	✓
III	18AIC204J	Object Oriented Programming with Java[&]	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
III	18AIP201L	Minor Project – I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
III	18MBM201L	Competencies in Social Skills	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓
III / IV	18CYM201T	Environmental Science	✓	✓	✓	✓		✓	✓							✓

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Semester	Course Code	Course Name	POs												PSOs	
			PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
IV	18MAB206T	Discrete Mathematics	✓	✓	✓	✓	✓						✓	✓	✓	✓
IV	18AIC205L	Design Thinking - Practitioner Course[&]	✓	✓	✓	✓									✓	
IV	18AIC206T	Software Engineering	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
IV	18AIC207J	Operating Systems and Virtualization	✓	✓	✓	✓	✓						✓	✓	✓	✓
IV	18AIC208J	Database Management Systems	✓	✓	✓	✓	✓						✓	✓	✓	✓
IV	18AIC209T	Design And Analysis of Algorithms	✓	✓	✓	✓	✓						✓	✓	✓	✓
IV	18AIP202L	Minor Project – II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IV	18MBM202L	Critical and Creative Thinking Skills	✓	✓	✓	✓	✓					✓	✓	✓		✓
III / IV	18LEM103T	Indian Tradition and Heritage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
V	18AIC301J	Machine Learning and AI Services	✓	✓	✓	✓	✓	✓						✓	✓	✓
V	18AIC302J	Data Analytics and Business Intelligence	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
V	18AIC303J	Computer Networks	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓
V	18AIC304T	Embedded Systems with AI	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓
V	18AIP301L	Minor Project – III	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
V	18MBM301L	Analytical and Logical Thinking Skills	✓								✓	✓				
V	18LEM301T	Indian Art Forms						✓	✓	✓	✓	✓		✓		
VI	18AIC305J	Deep Learning Models[&]	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
VI	18AIC306J	Analytics in Cloud Computing	✓	✓	✓	✓	✓						✓	✓	✓	✓
VI	18AIC307T	Cryptography and Network Security	✓	✓	✓	✓	✓			✓			✓	✓	✓	✓
VI	18AIP302L	Minor Project – IV(AI&DS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VI	18MBM302L	Employability Skills and Practices	✓								✓	✓				
VI	18LEM302T	SelfDevelopment and Entrepreneurship	✓	✓				✓	✓	✓	✓	✓	✓	✓		
VI	18AIE001T	R Programming for Machine Learning	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
VI	18AIE002T	AI Techniques in Data Mining	✓	✓	✓	✓	✓	✓						✓	✓	✓
VI	18AIE003T	Agile Methodologies	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓

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Semester	Course Code	Course Name	POs											PSOs	
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
VI	18AIE004T	GPU Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
VI	18AIE005T	Theory of Computation	✓	✓	✓	✓	✓								✓	✓
VI	18AIE006T	Computer Vision	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
VI	18AIE007T	IOT and its Applications	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓
VI	18AIE008T	Web Development	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
VI	18AIE009T	Statistical Analysis using R	✓	✓	✓	✓	✓							✓	✓	✓
VI	18AIE010T	Web & Social Media Mining	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓
VI	18AIE011T	Clean Coding and DevOps	✓	✓	✓	✓	✓								✓	
VI	18AIE012T	AI for Game Programming	✓	✓	✓	✓	✓						✓		✓	✓
VI	18AIE013T	Natural Language Processing	✓	✓	✓	✓	✓							✓	✓	✓
VI	18AIE014T	Augmented Reality	✓	✓	✓	✓	✓						✓	✓	✓	✓
VI	18AIE015T	Autonomous Systems and Drones	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
VI	18AIE016T	XML and Web Services	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓

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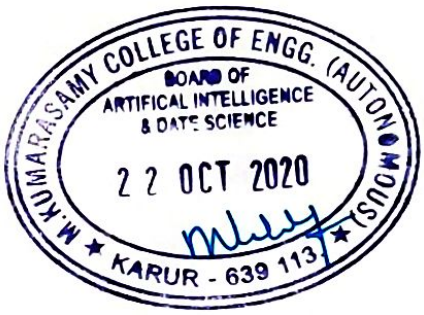
Structure of Curriculum

S.No.	Category	Credits
1	Humanities and Social Sciences including Management courses (H)	10
2	Basic Science courses (B)	26
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.(S)	17
4	Professional core courses (C)	64
5	Professional Elective courses relevant to chosen specialization/branch (E)	21
6	Open Electives –Electives from other technical and /or emerging subjects (O)	9
7	Project work, Minor project, seminar and internship in industry or elsewhere (P)	14
8	Mandatory Courses (M) [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	04
	Total Credits	**165**



1. Humanities and Social Sciences including Management courses (H)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18LEH101J	Technical English	2	0	2	3
2	18LEH102J	Professional English	2	0	2	3
3	18MBH101L	Professional Skills and Practices	0	0	2	1
4	18MBH102L	General Aptitude	0	0	2	1
6	18MBH301T	Management Principles for Engineers	2	0	0	2
					Total Credits	10

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2. Basic Science courses (B)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18CYB101J	Chemistry	3	1	2	5
2	18PYB101J	Physics	3	1	2	5
3	18MAB101T	Calculus and Linear Algebra	3	1	0	4
4	18MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4
5	18MAB207T	Probability and Statistics	3	1	0	4
6	18MAB206T	Discrete Mathematics	3	1	0	4
					Total Credits	26

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3. Engineering Science courses including workshop, drawing, basics of electrical/mechanical /computer etc (S)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18EES101J(R)	Basic Electrical and Electronics Engineering	3	0	2	4
2	18MES102J	Basic Civil and Mechanical Engineering	3	0	2	4
3	18MES101J	Engineering Graphics	1	0	4	3
4	18CSS101J (R)	Programming for Problem Solving	2	0	2	3
5	18ECS204T	Digital Logic design	3	0	0	3
					Total Credits	17

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4. Professional core courses (C)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18AIC101J	**Python Programming**[&]	2	0	2	3
2	18AIC201J	**Foundation of Artificial Intelligence & Data Science**[&]	2	0	2	3
3	18AIC202T	Computer Organization and Architecture	3	0	0	3
4	18AIC203J	Data Structures and Algorithms	3	0	2	4
5	18AIC204J	Object Oriented Programming with Java	3	0	2	4
6	18AIC205L	**Design Thinking - Practitioner Course**[&]	0	0	4	2
7	18AIC206J	Software Engineering	2	0	2	3
8	18AIC207J	Operating Systems and Virtualization	3	0	2	4
9	18AIC208J	Database Management Systems	3	0	2	4
10	18AIC209T	Design and Analysis of Algorithms	3	0	0	3
11	18AIC301J	**Machine Learning and AI Services**[&]	2	0	2	3
12	18AIC302J	**Data Analytics and Business Intelligence**[&]	2	0	2	3
13	18AIC303J	Natural Language Processing	3	0	0	3
14	18AIC304J	Embedded Systems with AI & IOT Applications	3	0	2	4
15	18AIC305T	Computational Biology for Engineers	3	0	0	3
16	18AIC306J	**Deep Learning Models**[&]	2	0	2	3
17	18AIC307J	Distributed and Cloud Databases	3	0	2	4
18	18AIC401J	Knowledge Engineering and Expert Systems	3	0	0	3
19	18AIC402J	**Predictive Modelling and Analytics**[&]	2	0	2	3
20	18AIC403J	**AI analyst - Practitioner Course**[&]	0	0	4	2
					Total Credits	64

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[&] **- Industry Supported Courses (IBM)**

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5. Professional Elective courses relevant to chosen specialization/branch (E)

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1		Professional Elective – 1 (AI/DS)	3	0	0	3
2		Professional Elective – 2 (CSE)	3	0	0	3
3		Professional Elective – 3 (AI/DS)	3	0	0	3
4		Professional Elective – 4 (CSE)	3	0	0	3
5		Professional Elective – 5 (AI/DS)	3	0	0	3
6		Professional Elective – 6 (CSE)	3	0	0	3
7		Professional Elective – 7 (AI/DS)	3	0	0	3
					Total Credits	21

S.No	Course Code	Course Name	Hours / Week			C
			L	T	P	
Professional Elective – 1(AI/DS)						
1	18AIE001T	R Programming for Machine Learning	3	0	0	3
2	18AIE002T	AI techniques in Data Mining	3	0	0	3
3	18AIE003T	Agile Methodologies	3	0	0	3
4	18AIE004T	GPU Programming	3	0	0	3
Professional Elective – 2(CSE)						
5	18AIE005T	Theory of computation	3	0	0	3
6	18AIE006T	Computer Vision	3	0	0	3
7	18AIE007T	IOT and its Applications	3	0	0	3
8	18AIE008T	Web Development	3	0	0	3
Professional Elective – 3(AI/DS)						
9	18AIE009T	Statistical Analysis Using R	3	0	0	3
10	18AIE010T	Web & Social Media Mining	3	0	0	3
11	18AIE011T	Clean Coding and DevOps	3	0	0	3
12	18AIE012T	AI for Game Programming	3	0	0	3
Professional Elective – 4(CSE)						
13	18AIE013T	Natural Language Processing	3	0	0	3
14	18AIE014T	Augmented Reality	3	0	0	3
15	18AIE015T	Autonomous Systems and Drones	3	0	0	3
16	18AIE016T	XML and Web Services	3	0	0	3

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Professional Elective – 5(AI/DS)						
17	18AIE017T	Human Computer Interaction	3	0	0	3
18	18AIE018T	Virtual Reality	3	0	0	3
19	18AIE019T	Pattern Recognition	3	0	0	3
20	18AIE020T	Soft Computing and Swarm Intelligence Techniques	3	0	0	3
Professional Elective – 6(CSE)						
21	18AIE021T	Mobile Application Development	3	0	0	3
22	18AIE022T	Distributed System	3	0	0	3
23	18AIE023T	Software Project Management	3	0	0	3
24	18AIE024T	Block Chain Technology	3	0	0	3
Professional Elective – 7(AI/DS)						
25	18AIE025T	Augmented Reality	3	0	0	3
26	18AIE026T	Optimization Methodologies for AI Problem	3	0	0	3
27	18AIE027T	Information Retrieval	3	0	0	3
28	18AIE028T	Web Mining And Semantic Web	3	0	0	3

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6. Open subjects –Electives from other technical and /or emerging subjects (O) (Any 3 Courses)

Artificial Intelligence and Data Science

S.No.	Course Code	Course Name	Hours / Week			C
			L	T	P	
1	18AIO001T	Artificial Intelligence and Machine Learning	3	0	0	3
2	18AIO002T	Deep Learning	3	0	0	3
3	18AIO003T	Data Analytics	3	0	0	3
4	18AIO004T	Predictive Modelling	3	0	0	3
5	18AIO005T	Business Intelligence	3	0	0	3
					Total Credits	9[$]

[$] For Artificial Intelligence and Data Science only 3 Open Electives

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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	18AIP201L	Minor Project – I	0	0	2	1
2	18AIP202L	Minor Project – II	0	0	2	1
3	18AIP301L	Minor Project – III (AI & DS using Python)	0	0	2	1
4	18AIP302L	Minor Project – IV (AI/DS)	0	0	2	1
5	18AIP303N	MOOC / Industrial Training – 1	0	0	0	1
6	18AIP304N	MOOC / Industrial Training – 2	0	0	0	1
7	18AIP401L	Project work / Semester Internship (AI/DS Applications)	0	0	16	8
					Total Credits	14

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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	18GNM102L	NCC / NSS / NSO	0	0	2	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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9. One-Credit Courses (OC)

S.No.	Course Code	Course Name	Credits
1	18AIOC001L	Machine Learning for Engineers	1
2	18AIOC002 L	Keras (For Deep Learning)	1
3	18AIOC003 L	AI for Decision Making	1
4	18AIOC004 L	JavaScript	1
5	18AIOC005 L	Angular JS	1
6	18AIOC006 L	Raspberry PI	1
7	18AIOC007 L	Ethical Hacking Essentials (EHE)	1
8	18AIOC008 L	Foundations of Robotics and Automation	1

10. Value Added Courses (VAC)

S.No.	Course Name	Hours
1	Android Studio Essential	30
2	Interview Perspective on Programming Languages	30
3	Blog Writing	30
4	Automation Testing Using QTP	30
5	Tensor Flow	30
6	IOT Use Cases	30
7	Cloud Infrastructure and Services (AWS /Google /Oracle/ Hadoop Cloud Foundations)	30
8	Blockchain Essentials	30
Note: Not limited to the above Courses		

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B.Tech. – Artificial Intelligence and Data Science

Semester I							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	H	18LEH101J	Technical English	2	0	2	3
2	B	18MAB101T	Calculus and Linear Algebra	3	1	0	4
3	B	18CYB101J	Chemistry	3	1	2	5
4	S	18EES101J(R)	Basic Electrical and Electronics Engineering	3	0	2	4
5	S	18CSS101J (R)	Programming for Problem Solving	2	0	2	3
6	H	18MBH102L	General Aptitude	0	0	2	1
Mandatory Courses							
7	M	18LEM101T	Constitution of India	1	0	0	Nil
8	M	18GNM102L / 18GNM101L	NSS / Physical & Mental Health using Yoga	0	0	2	Nil
						Total Credits	20

Semester II							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	H	18LEH102J	Professional English	2	0	2	3
2	B	18MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4
3	B	18PYB101J	Physics	3	1	2	5
4	S	18MES102J	Basic Civil and Mechanical Engineering	3	0	2	4
5	S	18MES101J	Engineering Graphics	1	0	4	3
6	C	18AIC101J	**Python Programming**[&]	2	0	2	3
7	H	18MBH101L	Professional Skills and Practices	0	0	2	1
Mandatory Courses							
8	M	18LEM102T	Value Education	1	0	0	Nil
9	M	18GNM101L / 18GNM102L	Physical & Mental Health using Yoga / NSS	0	0	2	Nil
						Total Credits	23

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Semester III							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	B	18MAB207T	Probability and Statistics	3	1	0	4
2	S	18ECS204T	Digital Logic Design	3	0	0	3
3	C	18AIC201J	**Foundation of Artificial Intelligence & Data Science&**	2	0	2	3
4	C	18AIC202T	Computer Organization and Architecture	3	0	0	3
5	C	18AIC203J	Data Structures and Algorithms	3	0	2	4
6	C	18AIC204J	Object Oriented Programming with Java	3	0	2	4
7	P	18AIP201L	Minor Project – I	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			C
				L	T	P	
1	B	18MAB206T	Discrete Mathematics	3	1	0	4
2	C	18AIC205L	**Design Thinking - Practitioner Course&**	0	0	4	2
3	C	18AIC206T	Software Engineering	3	0	0	3
4	C	18AIC207J	Operating Systems and Virtualization	3	0	2	4
5	C	18AIC208J	Database Management Systems	3	0	2	4
6	C	18AIC209T	Design and Analysis of Algorithms	3	0	0	3
7	P	18AIP202L	Minor Project – II	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	**22**

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Semester V							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	C	18AIC301J	**Machine Learning and AI Services&**	2	0	2	3
2	C	18AIC302J	**Data Analytics and Business Intelligence&**	2	0	2	3
3	C	18AIC303J	Computer Networks	3	0	2	4
4	C	18AIC304T	Embedded Systems with AI	3	0	0	3
5	E	18AICXXX	Professional Elective – 1(AI/DS)	3	0	0	3
6	E	18AICXXX	Professional Elective – 2(CSE)	3	0	0	3
7	P	18AIP301L	Minor Project – III (AI & DS using Python)	0	0	2	1
8	P	18AIP303N	MOOC / Industrial Training – 1	0	0	0	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	**22**

Semester VI							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	C	18AIC305J	**Deep Learning Models&**	2	0	2	3
2	C	18AIC306J	Analytics in Cloud Computing	3	0	2	4
3	C	18AIC307T	Cryptography and Network Security	3	0	0	3
4	E	18AICXXX	Professional Elective – 3(AI/DS)	3	0	0	3
5	E	18AICXXX	Professional Elective – 4(CSE)	3	0	0	3
6	O	18AICXXX	Open Elective – 1	3	0	0	3
7	P	18AIP302L	Minor Project – IV(AI&DS)	0	0	2	1
8	P	18AIP304N	MOOC / Industrial Training – 2	0	0	0	1
Mandatory Courses							
9	M	18MBM302L	Employability Skills and Practices	0	0	2	1
10	M	18LEM302T / 18LEM301T	Self Development and Entrepreneurship / Indian Art Forms	1	0	0	Nil
						Total Credits	**22**

Semester VII							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	C	18MBH301T	Computational Biology for Engineers	2	0	0	2
2	C	18AIC401J	Cyber Security	2	0	2	3
3	C	18AIC402J	**Predictive Modelling and Analytics&**	2	0	2	3
4	E	18AICXXX	Professional Elective – 5(AI/DS)	3	0	0	3
5	E	18AICXXX	Professional Elective – 6(CSE)	3	0	0	3
6	O	18AICXXX	Open Elective – 2	3	0	0	3
7	O	18AICXXX	Open Elective – 3	3	0	0	3
						Total Credits	**20**

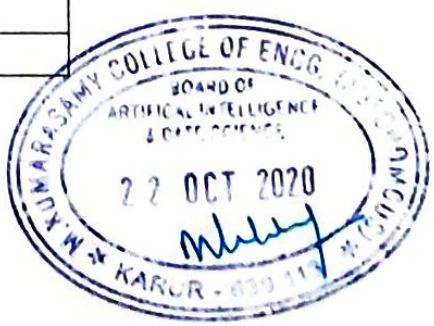
Semester VIII							
S.No	Category	Course Code	Course Name	Hours / Week			C
				L	T	P	
1	C	18AIC403J	**AI analyst - Practitioner Course&**	0	0	4	2
2	E	18AICXXX	Professional Elective – 7(AI/DS)	3	0	0	3
3	P	18AIP401L	Project work / Semester Internship (AI/DS Applications)	0	0	16	8
						Total Credits	**13**

L-Lecture T-Tutorial P-Practical

& - Industry Supported Courses (IBM)

Total Credit

Semester	Credits
1	20
2	23
3	23
4	22
5	22
6	22
7	20
8	13
Total	**165**



Regulation 2018		Semester I	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
H	18LEH101J	TECHNICAL ENGLISH (Common to all UG programmes except CSBS)	2	0	2	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Analyze the importance of communication in personal, professional contexts. Identify proper English pronunciation
CLR-2	Strengthen vocabulary and grammar. Enhance listening and writing comprehension. Review films and documentaries
CLR-3	Writing brief paragraphs using appropriate techniques. Enhance their English fluency in speaking
CLR-4	Write effective essays, stories. Experience workplace communication aspects
CLR-5	Research on a topic and write a comprehensible academic project reports. Make effective presentations

Course Outcome (s) (COs):

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

CO1	Identify types, modes, channels and barriers of communication. distinguish different speech sounds, pronounce correctly
CO2	Identify, rectify the errors in the use of grammar and vocabulary. Improve listening and writing skills
CO3	Develop a topic idea into a cohesive paragraph with examples. Improve the fluency of speaking skills
CO4	Develop ideas into logical and coherent essays. Understand better the workplace culture
CO5	Identify the steps involved in writing an academic project report. List and practice skills need for making a presentation

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO2	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO3	1	3	1	3	3	2	1	3	3	3	-	3	-	-	-
CO4	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO5	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO (Avg)	1	3	1	3	3	2.8	1	3	3	3	-	3	-	-	-

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

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UNIT I	COMMUNICATION	6

Definition, Process of communication - (Filling in-Class Worksheets) - Verbal and Non-Verbal Communication(Individual and Group Activities - Role play)-Other Types of Communication: General-Technical-Formal, Informal- External, Internal (Write upon a selected type of communication)- Listening, Speaking, Reading, Writing(Group activity (Newspaper) – Discussion and Feedback)- Communication and Language Barriers(Individual Activity- Sharing of Personal Experiences)-Body language(Mime).

UNIT II	VOCABULARY AND GRAMMAR	7

Words with Foreign Roots, Word Formation – Inflectional, Derivational Prefixes, Suffixes(Quiz - Identifying the Borrowed roots and Their Meanings-Worksheet Exercise)-Synonyms and Antonyms and Standard Abbreviations(Context Based Activity / Learner Compiling Standard Abbreviations from Core Subject)-Homonyms and Homophones(Fun Activities – Worksheets- Cross Words)-Articles, Tenses(Exercise through Worksheets- Individual Activity -Peer Correction- Open Discussion)- Noun-Pronoun Agreement and Subject-Verb Agreement(Identifying and Learning through Error Analysis – Worksheets)-Misplaced Modifiers - Prepositions- Prepositional verbs and Phrasal verbs(Learn through Practice – Placing Same Modifier in Different Places in a Sentence)-Prepositions- Prepositional Verbs and Phrasal Verbs(Filling in-Class Worksheets)

UNIT III	DISCOURSE TECHNIQUES	7

Sentence Structure, Phrases and Clauses(Exercise: Worksheet, Identifying Phrases, Clauses, Compound, Complex Sentences)-Developing Ideas into Paragraphs –Cohesion Markers(Identify Topic sentence in a Paragraph; Writing a Paragraph Based on a Topic)- -Inputs on Writing Precisely, Redundancies, Wordiness-Repetition-Clichés(Error Analysis and Editing)-Defining, Describing Technical Terms(Writing Definitions-Product and Process Description)-Inputs on Classifying/Categorising and Sequencing Ideas with Relevant Diagrams(Writing a Passage on the Given hints, Tree Diagram, Classification Table and Flow Chart)-Importance of Punctuation – Miscommunication –(Fun Activities - Worksheets for Appropriate Punctuation – Written)- Errors in Punctuation(Fun Activities - Worksheets for Appropriate Punctuation – Written)

UNIT IV	WORKPLACE COMMUNICATION	6

Reading Comprehension, Guidelines questions (Referential, Critical,Interpretative)(Practice Excercise) - Précis-writing Guidelines(Practice Excercise) - Summarising(Group Activity (Oral/Written) on the Given Passages)-Essay Writing Guidelines: Introduction, Elaboration and Conclusion with Examples(Individual Activity (Written) on the Given Topic)-Organisational Report Writing - Progress Report- Guidelines(Writing a Progress Report)-Interview Skills(Mock Interview).

UNIT V	PROJECT WRITING	5

Topics for Project Writing(Discussion)- Collection of Data – Avoiding Plagiarism-Authenticity and Credibility of Data(Collection of Data for Verification)- Guidelines for Writing: Outline- Objectives-Background- Methodology-Discussion-Documentation(Drafting an Outline & Preparing References)-Discussion Using Sample Project(Writing the First Draft on the Selected Topic)-Checklist for Project Format (PPT)(Self-Verification and Submission of Final Draft).

LIST OF EXPERIMENTS	14

1. Often Mispronounced sounds (Audio Visual Material - Listening to minimal pairs and reproducing)
2. Barriers of communication- Language barriers – videos (Identifying the Language Barriers of communication –Written)
3. Short Biographical Account on Famous Personalities –Video(Oral Paraphrasing of the Content Shown)
4. Listening to Long Conversations, Daily Life (Identify Various Communication Contexts – Answering Questions – Collocation)
5. Introduction to Englishes -British and American –Videos (Discussion on Difference between British and American Words)
6. Speaking - Practice Activity – Brain Storming – Mind Mapping (Just a Minute)

	7. Describing a Scene or Event –Videos (String Narration – Describing an Event or a Scene) 8. Technical Communication – Interpreting Data (Group Activity - Interpretation of Data - Oral Presentation) 9. Sample Case Studies for Work Ethics – Videos (Debate on the Videos Shown) 10. Learning Interview Techniques through Models (Mock Interview) 11. Guidelines for Preparing a PPT; Presentation Techniques (Preparing PPT on the Topic of Learners' Choice) 12. Formal Presentation
Text Book (s)	
1	Abirami K ,Technical English , R.K.Publishers, Coimbatore.
Reference (s)	
1	Swan, Michael. Practical English Usage. OUP, 1995
2	Kumar Sanjay and PushpaLata. Communication Skills. OUP, 2011
3	CIEFL, Hyderabad. Exercises in Spoken English. Parts I-III. OUP
4	Anbazhagan K, Cauveri B, Devika M.P., English for Engineers. Cengage, 2016
5	www.mmm.english.com
6	www.onlinewriting.com/purdue
7	www.ieee.org/index.html

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Regulation 2018		Semester I	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
B	18MAB101T	CALCULUS AND LINEAR ALGEBRA (Common to all UG Programmes except CSBS)	3	1	0	4

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Apply the Matrices in problems of Science and Engineering
2	Utilize Taylor series, Maxima minima and Jacobian in solving real- time application problems
3	Utilize the concepts of radius of curvature, evolute, envelope in problems of Science and Engineering
4	Apply the concept of Differential Equations in problems of Science and Engineering
5	Apply the Sequences and Series in all problems involving Science and Engineering
6	Utilize appropriate mathematical techniques for the different solutions required in Science and Engineering applications

Course Outcome (s) (Cos):

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

CO1	Apply Matrices, Eigenvalues and Eigen Vectors and Reduction of Quadratics form in Science and Engineering problem solving
CO2	Apply Maxima and Minima, Jacobian, and Taylor series to solve problems in Science and Engineering
CO3	Identify Radius, Centre, envelope and Circle of curvature and apply them in the problem solving
CO4	Solve the different types of Differential Equations in Science and Engineering applications
CO5	Apply convergence and divergence of series using different tests and apply sequences and Series in the problem solving

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	3	-	-	3	-	-	-
CO2	3	-	-	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	3	-	-	-	-	3	-	-	3	-	-	-
CO4	-	3	-	-	-	-	-	-	3	-	-	3	-	-	-
CO5	-	3	-	-	-	-	-	-	3	-		3	-	-	-
CO (Avg)	3	3	3	3	3	-	-	-	3	-	-	3	-	-	-

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

UNIT I	EIGEN VALUE PROBLEMS	9 + 3

Characteristic equation- Cayley-Hamilton theorem (excluding proof)- Eigen values and Eigen vectors of a real matrix – Properties- Orthogonal transformation of a symmetric matrix to diagonal form-Quadratic form-Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II	FUNCTIONS OF SEVERAL VARIABLES	9 + 3

Partial derivatives-Euler's theorem for homogenous functions-Total derivatives-Differentiation of implicit functions-Jacobians-Taylor's expansion-Maxima and Minima Method of Lagrangian multiplicrs.

UNIT III	APPLICATIONS OF DIFFERENTIAL CALCULUS	9 + 3

Curvature and Radius of curvature – Circle of curvature and Centre of curvature-Envelope- Evolute as Envelope of Normals.

UNIT IV	DIFFERENTIAL EQUATIONS OF SECOND ORDER	9 + 3

Second order linear differential equations with constant coefficients- Particular Integrals for x^n, e^{ax}, cosax/sinax, e^{ax}cosbx/e^{ax}sinbx - Method of variation of parameters-Cauchy and Legendre's linear equation-Simultaneous first order linear equations with constant coefficients.

UNIT V	SEQUENCES AND SERIES	9 + 3

Sequences: Definition and examples-Series : Types and Convergence - Series of positive terms-Test of convergence: Comparison test, D'Alembert's ratio test, Integral test, Rabee's Root test and Log test-Alternating series-Leibnitz's test-Series of positive and negative terms(Alternating series)-Absolute and Conditional convergence.

Text Book (s)

1	B. H. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
2	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

Reference (s)

1	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008
2	N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008
3	G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson,Reprint, 2002
4	Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010

Regulation 2018		Semester I /Semester II	Total Hours			90
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
B	18CYB101J	CHEMISTRY (Common for all UG Programmes except CSBS)	3	1	2	5

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

- Apply the basic principles of chemistry at both atomic and molecular levels in understanding the concepts related to the engineering field.
- Integrate the chemical principles in their projects undertaken in their respective fields
- Enhance the quality of a materials used in the product from the technological aspects for societal applications

Course Outcome (s) (Cos):

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

CO1	Identify the suitable polymeric materials fabrication processes in various application
CO2	Apply the basic principle of inorganic chemistry at the atomic and molecular levels
CO3	Apply the various thermodynamic and kinetics concepts to real system
CO4	Assemble a battery through the understanding of electrochemical principles
CO5	Catagorize the Engineering materials for their applications

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO (Avg)	3.00	3.00	-	-	-	-	-	-	-	-	-	-	-	-	-

2: Moderate (Medium) 3: Substantial (High)

UNIT I	ENGINEERING ORGANIC MATERIALS	9+3

Polymer – Introduction- Classification(Based on Molecular Weight, Structure and Usage) - Types of Polymerization (Addition, Condensation and Copolymerisation) -Crystallinity, Melting Point and Glass Transition temperature-Mechanism of Polymerization(Free Radical Addition Polymerization) -Elastomer-Structure and Curing (Vulcanization)- Fabrication and Molding of Polymers (Injection Molding and Blow Molding)- Engineering Plastics – PE, PVC, PMMA, Phenol Formaldehyde Resin , Urea Formaldehyde Resin (Preparation, Properties and Uses)- Industrial Applications of Polymers.

UNIT II	COORDINATION AND ORGANOMETALLIC COMPOUNDS	9+3

Co-Ordination compounds – Introduction- Nomenclature- Types of Ligands (Mono, Di and Polydendate Ligands)-Isomerism (Structural and Stereo Isomerism) – Theories of Bonding (Werner and Sidgwick Pouvell Theory (EAN Rule)) – Applications – EDTA Titration – Organometallic Compounds - Synthesis (Organo Zinc, Organo Lithium and Organo Magnesium) – Applications (18 Electron Rule, Zicgler Natta Catalyst and Hydroformylation)

UNIT III	THERMODYNAMICS AND KINETICS	9+3

Introduction- First and Second Law of Thermodynamics – Gibbs –Helmholtz Equation – Clausius Clapeyron Equation – Maxwell Relations – Vant Hoff Isotherm and Isochore (Problems also)- Kinetics- Introduction-Types of Reactions (Opposing, Consecutive and Parallel Reactions) - Chain Reactions (HBr and HCl formation)- Applications of Kinetics and Thermodynamics.

UNIT IV	ENGINEERING ELECTROCHEMISTRY	9+3

Introduction- Conductors and its types - Cells (Electrolytic and Electrochemical cells) – Standard electrode potential- Nernst equation of an electrode- Types of electrodes (SHE and Calomel electrode)- Batteries – Types (Primary, Secondary, Flow and Reserve battery)- Examples (Lead acid battery, Ni-Cd battery, Lithium battery, Lithium sulphur battery and Hydrogen- Oxygen fuel cells)- Graphene.

UNIT V	INDUSTRIAL APPLICATIONS OF CHEMISTRY	9+3

Cement (Types, manufacture and properties) – Paints (constitutions and functions)- Lubricants- types-mechanism – properties-Abrasives – types –Diamond, Corundum, Emery, Garnet, Quartz, Silicon carbide, Carborundum-Boron Carbide, Alundum (preparation, properties and uses) –Applications – Basics of Biosensor and Biochips.

LIST OF EXPERIMENTS	30

1. Determination of total , permanent and temporary hardness of water sample (EDTA method)
2. Determination of alkalinity in water sample - Indicator method
3. Determination of chloride content of water sample by Argentometric method (Mohr's method)
4. Determination of dissolved oxygen content of water sample by winkler's method

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5. Conductometric titration of strong acid with strong base 6. Conductometric titration of mixture of acids 7. Determination of strength and amount of Hydrochloric acid- pH metry 8. Estimation of strength and amount of ferrous ion by potentiometric method 9. Determination of molecular weight of a polymer by viscometry method 10. Estimation of ferrous ion by colorimetry. 11. Cement analysis

Text books / Reference books:	
1	B.L.Tembe, Kamaluddin and M.S.Krishnan , "Engineering Chemistry"
2	S.S. Dara "A Text book of Engineering Chemistry" S.Chand & Co.Ltd, New Delhi (2009).
3	P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., NewDelhi (2012).
4	Shashi Chawla, Engineering Chemistry: Dhanpat Rai &Co., 3rd Edition, 2015
5	www.nptel.ac.in

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Regulation 2018		Semester I	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
S	18EES101J(R)	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	2	4

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Gain knowledge about the D.C and A.C circuits.
2	Impart the fundamentals of electrical machines.
3	Study the fundamentals of semiconductor devices
4	Study the working concepts of measuring instruments.
5	Know about digital logic concepts and operational amplifier.

Course Outcome (s) (COs):

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

CO1	Apply the concepts of ohm's law and Kirchhoff's law in DC and AC circuits
CO2	Explain the basic concepts of DC motor, DC generator, Transformer and Induction motor.
CO3	Summarize the nature of semiconductor devices.
CO4	Interpret the concept of measuring devices like PMMC, MI, energy meter and wattmeter.
CO5	Infer the concept of electronics devices and conversion techniques

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	1	-	-	-	1	1	-	1	3	1
CO2	3	-	1	1	1	-	-	-	1	1	-	1	3	1
CO3	3	-	1	1	1	-	-	-	1	1	-	1	3	1
CO4	3	-	1	1	1	-	-	-	1	1	-	1	3	1
CO5	3	-	1	1	1	-	-	-	1	1	-	1	3	1
CO (Avg)	3	0.4	1	1	1	-	-	-	1	1	-	1	3	1

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

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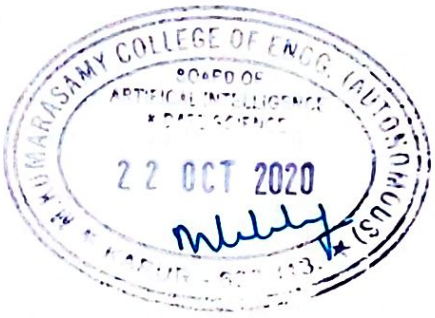
UNIT I	ELECTRICAL CIRCUITS	9
Electrical quantities: Resistors, Inductors, Capacitors - Ohm's Law - Kirchoff's Laws -Series and Parallel circuits - Analysis of DC circuits: Mesh & Nodal analysis, Thevenin's Theorem, Norton's Theorem & Maximum Power Transfer Theorem, Star delta Transformation, RL & RC Transient Analysis. Introduction to AC Circuits: Waveforms and RMS Value – Power and Power factor- Introduction to three phase systems – Types of connections, Relationship between line and phase values		
UNIT II	**ELECTRICAL MACHINES**	**9**
Faraday's laws- Construction, Principle of Operation, Basic Equations of DC Generators, DC Motors – Two Point & Three Point Starter – Construction, Working and EMF Equation of Single Phase Transformer – Construction and Working of AC Generator – Three Phase Induction Motor: Construction and Working of Squirrel Cage and Slip Ring Induction Motor – Single Phase Induction Motor (Split Phase, Capacitor Start Induction Motor)		
UNIT III	**ELECTRONIC DEVICES**	**9**
Intrinsic and Extrinsic Semiconductors – PN junction diode , Zener diode and its Characteristics – Operation of Half Wave, Full Wave and Bridge Type Rectifiers – Bipolar Junction Transistor: Configurations and Characteristics of CB, CE, CC – Construction and Operation of JFET, MOSFET..		
UNIT IV	**MEASUREMENTS**	**9**
Basic Principles and Classification of Instruments – Construction and Working of PMMC, MI Instruments (Attraction & Repulsion type) – Principle of Operation of Dynamometer Type Wattmeter, Induction Type Energy Meter – Instrument transformer – CRO – Megger		
UNIT V	**DIGITAL & INTEGRATED DEVICES**	**9**
Number Systems – Boolean Theorems– Logic Gates – Half Adder and Full Adder Circuit – Flip-Flops: RS, JK,T and D – A/D Converter (Successive Approximation Type) – D/A Converter (Binary Weighted Type) – Op-Amp : Functional Block and Types (Inverting , Non-Inverting & Differential Amplifier)		
LIST OF EXPERIMENTS		**15**

1. Verification of Ohm's & Kirchoff's Laws
2. Types of Wiring (Fluorescent Lamp & Staircase)
3. Verification of Thevenin's Theorem
4. Verification of Norton's Theorem
5. Characteristics of PN Junction Diode
6. Characteristics of Common Base Configuration.
7. Characteristics of Common Emitter Configuration.
8. Measurement of Ripple Factor : Half Wave & Full Wave Rectifier.
9. Study of AC and DC Machines
10. Verification of Logic Gates
11. Study of PMMC and MI Meters

Text Book (s)	
1	R. Muthusubramanian, S. Salivahanan,"Basic Electrical and Electronics Engineering," Tata McGraw-Hill, 2012
2	Sawhney, A.K., "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai and Co, 2011.
Reference (s)	
1	Dash.S.S, Subramani.C, Vijayakumar.K, "Basic Electrical Engineering", Vijay Nicole, 1st Edition, 2013.
2	Jegatheesan.R, "Analysis of Electric Circuits", Tata McGraw-Hill, 2014.
3	Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI Learning Private Ltd, 2nd Edition, 2010.



Regulation 2018		Semester I	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
S	18CSS101J (R)	PROGRAMMING FOR PROBLEM SOLVING	2	0	2	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

CO1	Learn programming using a structured programming language.
CO2	Provide exposure on C programming.
CO3	Introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

Course Outcome (s) (COs):

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

CO1	Apply the problem solving techniques for solving numeric and string problems
CO2	Solve basic numeric problems using control statements in C
CO3	Develop the C program using the concepts of array and string.
CO4	Apply the concept of function prototypes and pointers.
CO5	Compare the performance of structures and union in memory management.

CO-PO Mapping

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

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

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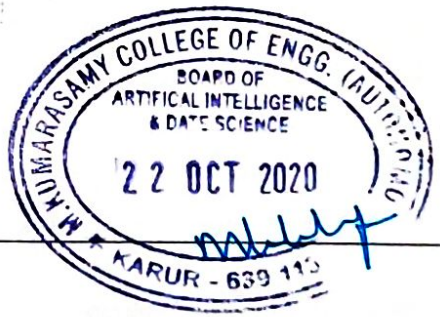
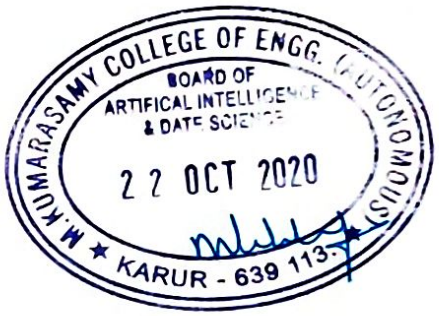
UNIT I	INTRODUCTION	6
Basic Organization of a Computer – Number System – Binary – Decimal – Conversion – Problems – Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.		
UNIT II	**C PROGRAMMING BASICS**	**6**
Structure of 'C' program – Tokens – Data Types – Operators – Input and Output operations – Decision Making and Branching – Looping Statement.		
UNIT III	**ARRAYS AND STRING**	**6**
Arrays: Declaration – Initialization – One dimensional and Two dimensional arrays – String: String Declaration and Initialization – String Function.		
UNIT IV	**STRUCTURES AND POINTERS**	**6**
Introduction to Structures-Needs for Structure Data type – Structure: Definition, Declaration – Structure vs Union. Pointers – Definition – Initialization – Pointer and arrays – Null Pointer – Pointer to Structure		
UNIT V	**FUNCTIONS**	**6**
Function – Definition of function – Declaration of function – Function Prototype – Pass by value – Pass by reference.		
LIST OF EXPERIMENTS		**15**

1. Programs on Operators
2. Programs on Control statements
3. Programs on one Dimensional Array
4. Programs on Two Dimensional Array
5. Programs on String Handling
6. Programs on Function using Call by Value
7. Programs on Function using Call by Reference
8. Programs on Pointers
9. Programs on Structure
10. Programs on Union



Text Book (s)	
1	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2	PradipDey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition,Oxford University Press, 2009
Reference (s)	
1	Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill,2006.
2	Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
3	Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, PearsonEducation, 2006.
4	Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.



Regulation 2018		Semester I/ Semester II	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
H	18MBH102L	GENERAL APTITUDE (Common to all UG programmes except CSBS)	0	0	2	1

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

CLR1	Recapitulate fundamental mathematical concepts and skills
CLR2	Hone critical thinking skills by analyzing the arguments with explicit and implicit premises
CLR3	Sharpen logical reasoning through skillful conceptualization
CLR4	Identify the relationships between words based on their function, usage and characteristics
CLR5	Nurture passion for enriching vocabulary
CLR6	Acquire the right knowledge, skill and aptitude to face any competitive examination.

Course Outcome (s) (COs):

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

CO1	Build a strong base in the fundamental mathematical concepts
CO2	Identify the approaches and strategies to solve problems with speed and accuracy
CO3	Gain appropriate skills to succeed in preliminary selection process for recruitment
CO4	Collectively solve problems in teams and groups
CO5	Build vocabulary through methodical approaches
CO6	Enhance lexical skills through systematic application of concepts and careful analysis of style, syntax, semantics and logic

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	-	3	2	-	-	-	3	3	1	3	-	-	-
CO2	-	3	-	3	2	-	-	-	3	3	-	3	-	-	-
CO3	-	3	-	3	2	-	-	-	3	3	1	3	-	-	-
CO4	1	3	-	3	2	-	-	-	3	3	-	3	-	-	-
CO5	-	3	-	3	2	-	-	-	3	3	1	3	-	-	-
CO6	-	3	-	3	2	-	-	-	3	3	-	3	-	-	-
CO (Avg)	1	3	-	3	2	-	-	-	3	3	1	3	-	-	-

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

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UNIT I		**6**
Types of numbers, Divisibility tests -Introduction to Significance of Verbal Aptitude in Competitive Examinations - LCM and GCD -Vocabulary enrichment techniques - Unit digit, Number of zeroes, Factorial notation - Vocabulary enrichment Techniques.		
UNIT II		**6**
Square root, Cube roots, Remainder - Identities - Contextual Vocabulary Exercise - Synonyms Fractions and Decimals, surds -Contextual Vocabulary Exercise -Antonyms		
UNIT III		**6**
Percentage Introduction - Sentence Completion Basic Level Exercises : Single Blank - Percentage Problems - Sentence Completion Basic Level Exercises : Double Blank - Profit and Loss - Cloze Test		
UNIT IV		**6**
Discount -Reading Comprehension – Introduction -Simple Interest - Reading Comprehension – Summary & Main Idea - Compound Interest, Installments - Reading Comprehension – Summary & Main Idea		
UNIT V		**6**
Logarithms Intro - Grammar Rules :A comprehensive Introduction - Logarithms Rules - Sentence Completion – Grammar - Linear Equations - Spotting Errors		
LIST OF EXPERIMENTS		**-**
Nil		

Text Book (s)

1	Nil

Reference (s)

1	Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Random House Reference, 2002
2	Merriam Webster's Vocabulary Builder, Merriam Webster Mass Market, 2010
3	Norman Lewis, How to Read Better and Faster, Goyal, 4th Edition
4	Franklin GRE Word List, 3861 GRE Words, Franklin Vocab System, 2014
5	Wiley's GMAT Reading Comprehension Grail, Wiley, 2016
6	Manhattan Prep GRE : Reading Comprehension and Essays, 5th Edition
7	Martin Hewings, Advanced Grammar in Use. Cambridge University Press, 2013
8	Nishit K. Sinha, The Pearson Guide to Quantitative Aptitude and Data Interpretation for the CAT
9	Dinesh Khattar-The Pearson Guide to QUANTITATIVE APTITUDE for competitive examinations

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Regulation 2018		Semester I	Total Hours			15
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18LEM101T	CONSTITUTION OF INDIA (Common to all UG programmes except CSBS)	1	0	0	-

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Utilize the citizen's rights
CLR-2	Utilize the basic citizen's fundamental rights of freedom of speech, expression, equality, religion and privacy
CLR-3	Identify the Indian constitutional framework with union parliament, government and their functions and citizen's rights
CLR-4	Utilize the States functionality and provisions for the betterment of the individual and society
CLR-5	Identify the emergency provisions, the functions of election and public service commissions, identify the tax system

Course Outcome (s) (COs):

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

CO1	Identify the basic provisions in the Indian constitution
CO2	List the fundamental rights, rights to equality, freedom, religion, culture, education and the right against exploitation
CO3	Identify the fundamental duties of the Union of India, President, Vice-President, Union Ministers and Parliament functions
CO4	Identify the power of states, its legislature, Governors role and the state judiciary
CO5	List the special provisions and functionality of election commission, public service commission, individual tax and GST

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	2	3	3	3	-	3	-	-	-
CO2	-	-	-	-	-	-	2	3	3	3	-	3	-	-	-
CO3	-	-	-	-	-	-	2	3	3	3	2	3	-	-	-
CO4	-	-	-	-	-	-	2	3	3	3	2	3	-	-	-
CO5	-	-	-	-	-	-	2	3	3	3	2	3	-	-	-
CO (Avg)	-	-	-	-	-	-	2	3	3	3	2	3	-	-	-

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

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UNIT I	INDIAN CONSTITUTION	3
Meaning of the Constitution law and Constitutionalism- Historical perspective of the Constitution of India- Salient features and characteristics of the Constitution of India Citizenship- Scheme of the fundamental rights- Scheme of the Fundamental Duties and its legal status		
UNIT II	**FUNDAMENTAL RIGHTS**	**3**
The Directive Principles of State Policy- Scheme of the Fundamental Right to Equality- Scheme of the Fundamental Right to certain Freedom under Article 19- Scope of the Right to Life and Personal Liberty under Article 21- Union Government, Union Legislature (Parliament)- Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive		
UNIT III	**POWERS AND FUNCTIONS OF CENTRAL GOVERNMENT**	**3**
President of India (with Powers and Functions)- Prime Minister of India (with Powers and Functions) - Union Judiciary (Supreme Court)- Jurisdiction of the Supreme Court - State Government, Legislature, Legislative Assembly, Legislative Council- Powers and Functions of the State Legislature, State Executive- Governor of the State (with Powers and Functions)		
UNIT IV	**POWERS AND FUNCTIONS OF STATE GOVERNMENT**	**3**
The Chief Minister of the State (with Powers and Functions)- State Judiciary (High Courts) Union Territory, Panchayat, Municipality- Scheduled and Tribal Areas- Co-operative Societies Consumer Rights - Consumer Protection Act		
UNIT V	**POWERS AND FUNCTIONS OF ELECTION AND SERVICE COMMISSION**	**3**
Local Self Government – Constitutional Scheme in India-Emergency Provisions : National, President Rule, Financial Emergency - Election Commission of India (with Powers and Functions) - The Union Public Service Commission (with Powers and Functions) - Amendment of the Constitutional Powers and Procedure -Income Tax, Goods and Services Tax		

Text Book (s)

	NIL

Reference (s)

1	DurgadasBasu, Introduction to the Constitution of India,Lexis- Nexis, 2015
2	Subash C Kashyap, Our Parliament, National Books Trust, 2011
3	Kaushal Kumar Agarwal, India's No 1 book on Tax : Simple Language Advanced Problems: Income Tax, Kindle, 2017
4	Vivek K R Agarwal, GST Guide for students: Making GST – Good and Simple Tax, Neelam Book House, 2017

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Regulation 2018		Semester II	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
H	18LEH102J	PROFESSIONAL ENGLISH (Common to all UG programmes except CSBS)	2	0	2	3

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Develop team spirit and stress management skill
CLR-2	Demonstrate the interpersonal skills of the learners
CLR-3	Make learners perform well in interviews
CLR-4	Enable them to listen well and express their ideas, opinions effectively in official contexts
CLR-5	Sharpen their reading comprehension skill
CLR-6	Strengthen their official written communication skill.

Course Outcome (s) (COs):

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

CO1	Work in a team under any situation.
CO2	Practice interpersonal relationships in workplace
CO3	Face interviews confidently and successfully
CO4	Participate and excel in role plays, presentations and formal conversations.
CO5	Read and infer the meanings of technical and aesthetic passages.
CO6	Draft official letters, reports, memos, emails, etc.,

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO2	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO3	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO4	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO5	1	3	1	3	3	3	1	3	3	3	-	3	-	-	-
CO6	1	1	3	3	3	3	1	3	3	3	-	3	-	-	-
CO (Avg)	1	2.66	1.33	3	3	3	1	3	3	3	-	3	-	-	-

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

UNIT I	SOFT SKILLS	7

Introduction to Soft Skills(MCQ on Soft Skills)- Leadership Skills(Handling a Team) - Optimism & Business Etiquettes(Presentations on How to Handle Situations Effectively)- Team Management (Motivational Videos on Positive Thinking)- Time Management(Discussion on Real Time Hardships) -StressManagement(Handling Criticism)- Organizational Communication - Channels of Communication(Case Study).

UNIT II	LISTENING	7

Listening Skills: Active Listening, Passive Listening(Classroom Listening Activities)-Methods for improving Listening Skills, Listening and its process – Barriers to Listening(Innovative Practices and Strategies for Better Listening) – Listening to Pre-Recorded video/audio (Listening to Famous Motivational Speeches)- Listening to Reading in the Class - for Vocabulary - for Complete Understanding – for Better Pronunciation(Read aloud a Story or an Article to Listen and Complete the Task) - Listening for General Content – Listening to fill up Information(Listening –fill in the Form Activity) – Intensive Listening for Specific Purpose-Listening to Monologues(Listening to Announcements) -Extensive Listening(Listening to Business News).

UNIT III	SPEAKING	5

Defining Presentation and its Purpose; Audience & Local; Organizing Contents; Preparing Outline(Mini presentation)- Audio-Visual Aids; Nuances of Delivery; Body Language;(PPT Presentation) - Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice(Voice Modulation Practice)-Interviews &Its Types- Role Play(Mock Interview) - Group Discussion-Oral Presentations -Formal Conversations(Group Discussion Practice) .

UNIT IV	READING	5

Reading & Its Types- Techniques for Good Comprehension, Reading Comprehension(Reading Comprehension Exercises) - Cloze Test ,Reading Newspaper- Editorials & Business Articles (Cloze Test Exercises)- Inferring Meaning- Improving Comprehension Skills(Reading for Meaning) - Skimming and Scanning– Structure of the Text – Structure of Paragraphs(Skimming and Scanning Exercises) - Interpreting Visual Communication(Graphs, Charts, Tables)(Interpreting the Graphical images).

UNIT V	WRITING	5

Writing Official Letters(Invitation Letter (Accepting & Declining),Quotation, Ordering, Complaining, Seeking Clarification)(Business Letter Writing Exercises), Writing Official Letters(Permission – In-Plant Training)- Writing CV (Job Application)(Job Application Letter Exercise)- Essay Writing- Email Writing - Writing Reports & Proposal(Writing a Business Report)- Writing Circulars, Memos, Agenda & Minutes(Exercises on Writing Circulars, Memos, Agenda & Minutes).

LIST OF EXPERIMENTS	16

1. Videos on Stress Management (Stress Management Activities)
2. Videos on Team Spirit (Team Activities)
3. Listening to TED Talks(Listening to Business Interviews)
4. Listening to Business Presentation (Listening to Business Interviews)
5. Telephonic Conversation (Organizing a Meeting)
6. Product Launch (Persuasive Speech)
7. Business Conversations
8. Business Role Play Activities
9. Reading for Pleasure(Intensive Reading)
10. Extensive Reading(Briefing Favourite Self Help Books)

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	11. Reading Newspaper articles(Reading Business Reports) 12. Reading Business Legends Success Formula(Read Between the Lines) 13. Writing an Advertisement (Writing Slogans for Products) 14. Error Correction Exercises (Formal Language expressions) 15. Business Vocabulary (Writing Official E-mails) 16. Writing Business Proposals (Writing Permission Letters)
Text Book (s)	
1	Abirami K, "Professional English", First Edition, R.K.Publishers, Coimbatore, 2019.
Reference (s)	
1	Lina Muhkopadhyay, et al., "English for Jobseekers" ,Cambridge University Press, New Delhi,2013
2	Brook Hart Guy , Business Benchmark Advanced Personal Study Book for BEC and BULATS, Cambridge
3	Mascull , Bill, Business Vocabulary in Use, Third Edition, Nov 2017
4	Emerson Paul, Business English Handbook ,Advanced, Macmillan
5	www.Business English Site.com
6	www.businessenglishpod.com

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Regulation 2018		Semester II	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
B	18MAB102T	ADVANCED CALCULUS AND COMPLEX ANALYSIS (Common to all UG Programmes except CSBS)	3	1	0	4

Prerequisite Course (s)

Calculus and Linear Algebra

Course Objective (s):

The purpose of learning this course is to:

1	Evaluate Double and triple Integral and apply them in problems in Engineering Industries
2	Evaluate Surface, Volume Integral and applications of Gauss theorem, Stoke's and Green's theorem in Engineering fields
3	Know the properties of Complex functions and apply them in all the Engineering fields
4	Evaluate improper integrals involving complex functions using Residue theorem and apply them in Engineering fields
5	Transform engineering problems into ODE, PDE and Integrals and solve them using Laplace / complex analytic methods
6	Identify how Engineering problems can be transformed in to simple mathematical constructs and solve the same

Course Outcome (s) (Cos):

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

CO1	Evaluate multiple integrals using change of variables
CO2	Apply techniques of vector calculus in problems involving Science and Engineering.
CO3	Apply complex analytic functions and its properties in solving problems
CO4	Evaluate improper integrals using Residue theorem involving problems in Science and Engineering
CO5	Apply techniques of Laplace Transforms and inverse transform for problems in Science and Engineering and Solving Ordinary Differential Equations

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	3	-	-	3	-	-	-
CO2	3	-	-	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	3	-	-	-	-	3	-	-	3	-	-	-
CO4	-	3	3	-	-	-	-	-	3	-	-	3	-	-	-
CO5	-	3	-	-	-	-	-	-	3	-	-	3	-	-	-
CO (Avg)	3	3	3	3	3	-	-	-	3	-	-	3	-	-	-

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

UNIT I	MULTIPLE INTEGRALS	9 + 3
Evaluation of double integration in cartesian and polar Coordinates - Evaluation of double integral by changing of order of integration - Area as a double integral (Cartesian and Polar) - Conversion from Cartesian to Polar in double integrals - Triple integration in Cartesian Coordinates - Volume as triple integral in Cartesian, Polar and Spherical Coordinates.		
UNIT II	**VECTOR CALCULUS**	**9 + 3**
Gradient,Divergence,Curl,Solenoidal,Irrotational fields - Directional derivative - Line integrals - Surface integrals - Volume Integrals - Green's theorem (excluding proof) :Applications in evaluating Line and Region - Gauss divergence theorem (excluding proof):Applications to cubes and parallelopipeds - Stoke's theorem (excluding proof):Applications to cubes and parallelopipeds.		
UNIT III	**ANALYTIC FUNCTION**	**9 + 3**
Definition of Analytic function – Cauchy Riemann equations- Properties of Analytic function - Determination of Analytic function using Milne's Thomson method-Conformal mapping (w=c+z, w=cz, w= $\frac{1}{z}$) - Bilinear transformation.		
UNIT IV	**COMPLEX INTEGRATION**	**9 + 3**
Cauchy's integral theorems (without proof) - Cauchy's integral formulae - Taylor's expansions with simple problems - Laurent's expansions with simple problems - Singularities - Poles and their types - Residues - Cauchy's residue theorem (without proof)- Contour integration: unit circle and semicircle.		
UNIT V	**LAPLACE TRANSFORMS**	**9 + 3**
Laplace Transforms of standard functions- Transforms properties- Transform of derivatives and integrals - Initial & Final value theorems (without proof) and Verification for some problems- Inverse laplace transforms using Partial fractions and Shifting theorem- Convolution theorem- Periodic functions- Solution of linear second order ODE equations with constant coefficients.		

Text Book (s)

1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008

Reference (s)

1	B. H. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
2	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008
3	Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
4	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002

Regulation 2018		SemesterI/Semester II	Total Hours			90
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
B	18PYB101J	**PHYSICS** (Common for all UG Programmes except CSBS)	3	1	2	5

Prerequisite Course (s)

NIL

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

CLR-1	Identify the applications of electric field on materials
CLR-2	Identify the applications of magnetic field on materials
CLR-3	Identify the significance of quantum theory
CLR-4	Create insights to the concepts of optical effects
CLR-5	Analyze the working principle of lasers and optical fibers

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

CO1	Identify the effect of charge dynamics
CO2	Analyze electromagnetic induction
CO3	Apply quantum mechanics to basic physical problems
CO4	Apply ray propagation and optical effects
CO5	Identify the applications of lasers and optical fiber

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO (Avg)	3.00	3.00	3.00	3.00	-	-	-	-	-	-	-	-	-	-	-

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

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UNIT I	ELECTROSTATICS AND DIELECTRIC MATERIALS	9+3

Del-divergence-curl and gradient operations in vector calculus-Gauss-divergence and Stoke's theorem-Electric field and electrostatic potential for a charge distribution-Gauss' law and its applications-Laplace's equations for electrostatic potential-Poisson's equations for electrostatic potential-Solving Problems-Concepts of electric current-Continuity equation-Laws of magnetism-Faraday's law-Ampere's law-Maxwell's equations-Solving Problems-Polarizations, permeability and dielectric constant -Polar and non-polar dielectrics -Types of polarization-Frequency and temperature dependence-Internal field in a field-Clausius-Mossotti equation-Solving Problems.

UNIT II	MAGNETIC AND SUPERCONDUCTING MATERIALS	9+3

Magnetization, permeability and susceptibility-Classification of magnetic materials-Ferromagnetism-Concepts of ferromagnetic domains –Hysteresis-Solving Problems -Properties and applications of ferromagnetic materials -Hard and soft magnetic materials -Ferrimagnetic materials - Magnetic bubbles – Ferrites- Solving Problems-Superconductivity -Properties of superconductivity -Type I & Type II superconductors-High Tc superconductors – SQUID – CRYOTRON-MAG LEV-Solving Problems.

UNIT III	QUANTUM PHYSICS	9+3

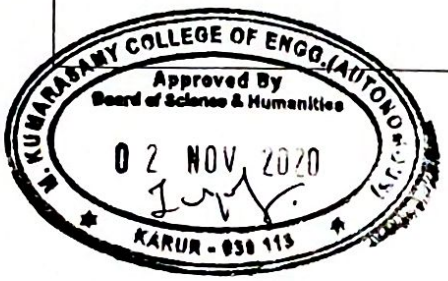
Introduction to Quantum mechanics-Explanation of wave nature of particles-Black body radiation-Compton effect-Solving Problems-Photoelectric effect-de Broglie hypothesis for matter waves - Physical Significance of wave function -Time independent Schrödinger's wave equation -Time dependent Schrödinger's wave equation -Solving Problems-Particle in a 1 D box -Normalization - Born interpretation of wave function -Properties of Matter waves-Verification of matter waves-G.P. Thomson Experiment-Solving Problems.

UNIT IV	WAVE OPTICS	9+3

Introduction to interference-Introduction to diffraction-Fresnel diffraction-Fraunhofer diffraction-Fraunhofer diffraction at single slit-Fraunhofer diffraction at double slit-Solving Problems-Fraunhofer diffraction at multiple slit-Diffraction grating-Characteristics of diffraction grating-Applications of diffraction grating-Polarization by reflection-Polarization by double refraction-Solving Problems -Scattering of light-Circular polarization-Elliptical polarization-Optical activity-Fresnel's relation -Brewster's angle--Solving Problems.

UNIT V	LASER AND FIBER OPTICS	9+3

Absorption and emission processes-two level-Einstein's theory of matter radiation A and B coefficients-Characteristics of laser beams-Amplification of light by population inversion-Threshold population inversion-Essential components of laser system and pumping mechanisms-Solving Problems-Nd: YAG laser-Semiconductor laser-CO_2laser Vibrational modes- CO_2 laser-energy level-Optical fiber-physical structure-Total internal reflection-Solving Problems-Numerical aperture - Acceptance angle-Losses associated with optical fibers-Classification of optical fibers-Optical fiber communications system-Optical sensors-Solving Problems.



LIST OF EXPERIMENTS	30

1. Basics of experimentation
2. Determine dielectric constant of the sample
3. Calibrate Ammeter using Potentiometer
4. Calibrate voltmeter using Potentiometer
5. Determine the energy loss of magnetic materials using B-H curve experiment
6. Determine Planck's Constant
7. Study of I-V characteristics of a light dependent resistor (LDR)
8. Determine wavelength of monochromatic light by Newton's ring
9. Determine particle size using laser
10. Determine wavelength of using diffraction grating
11. Determine wavelength for a given laser source
12. Study of numerical aperture and acceptance angle of optical fiber
13. Mini project

Text books/ References:

1	David Jeffery Griffiths, Introduction to Electrodynamics, Revised edition, Pearson, 2013
2	Ajay Ghatak, Optics, Tata McGraw Hill Education, 5th edition, 2012
3	David Halliday, Fundamentals of Physics, 7th edition, John Wiley & Sons Australia, Ltd, 2004
4	Berg and Resnick, Quantum Physics: Of Atoms, Molecules, Solids, Nuclei and Particles, 2nd Edition, 1985

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Regulation 2018		Semester II	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
S	18MES102J	BASIC CIVIL AND MECHANICAL ENGINEERING	3	0	2	4

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Select building materials and identify the components of a building
2	Identify the various transportation systems, bridges, dams and water supply system
3	Apply the concept of Harnessing energy from various energy sources
4	Know the working of IC engines and identify the sub system requirements
5	Apply manufacturing processes; casting, forming. List machining operations; lathe, drilling. Identify process of welding

Course Outcome (s) (COs):

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

CO1	Identify the building materials and its applications
CO2	Identify different transportation system, water supply system and its applications
CO3	List the basic components and analyze the working of major power plants
CO4	Identify the working of IC engines and understand the need of various auxiliary systems
CO5	Identify manufacturing processes; casting, forming. List machining operations; lathe, drilling. Identify process of welding

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	3	3	-	-	-	-	3	1	-
CO2	3	3	3	2	2	3	3	-	-	-	-	3	1	-
CO3	3	3	3	2	2	-	3	-	-	-	-	1	1	-
CO4	3	3	3	2	2	-	3	-	-	-	-	1	3	1
CO5	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO (Avg)	3	3	3	2	2	1.2	2.4	-	-	-	-	1.8	1.8	0.6

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

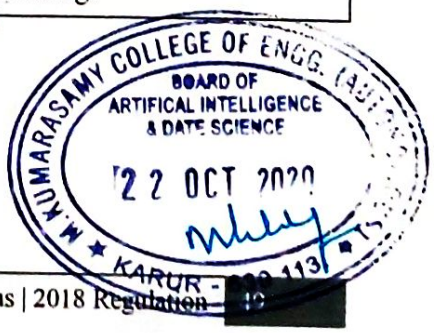
UNIT I	BUILDING MATERIALS	9
Introduction to Civil Engineering, Building Materials, History, Disciplines in Civil Engineering, Early constructions and development over time, Ancient Monuments: Peruvudaiyar or Brihadeeswarar Temple, Kallanai dam Grand Anicut, Taj Mahal, Golconda fort, Angkor Wat, Pyramids of Giza, Colosseum Development of various materials, Methods of Construction, Building Materials - Stone – Classification of Rocks, Quarrying, Dressing, Properties and Uses of Stone Mortar, Plain and Reinforced Cement, Concrete Grade and properties and uses, Necessity of Special Concrete, Self Compacting Concrete, Construction Chemicals (Plasticizers), Recycling: construction, demolition wastes, Buildings, Classification of Buildings, Selection of site for a building, Components of Buildings, Soil, General types of soil, Bearing Capacity, Factors affecting bearing capacity, Foundations: Functions, General types of, foundation, Shallow foundations		
UNIT II	**RANSPORTATION AND WATER SYSTEM**	**9**
Cement concrete flooring, Marble flooring, Granite flooring, Ceramic tile flooring, Roofs: Types of roofs, Madras terrace roof, Reinforced concrete roofs, Trussed roof, Roof Coverings: Types, Weathering course: Types, Mode of Transportation - Highways - Classification of Roads, Cross section details of flexible pavements, Railways – Zone and Headquarters, Permanent way and its requirement, Components of Permanent way, Bridges: Components of Bridge, Types, Dams: Purpose, Classification, Gravity dams - Advantages and Disadvantages, Elements of protected Water Supply system, Objective, Quantity of water, Design period, Per-capita demand, Factor affecting per capita demand, Sources of Water Supply, Standards of Drinking water, Drinking Water Treatment: Objectives, Treatment plant process, Sewage: Method of collection, Sewage treatment and disposal		
UNIT III	**POWER PLANTS**	**9**
Coal based thermal Power Plant: layout, components description, working, advantages, disadvantages, Hydro Electric power plant: layout, components description, working, advantages and disadvantages, Nuclear power plant: Nuclear fission and fusion reactions, Nuclear reactor, components description, Layout, working, merits and demerits of boiling water reactor , Layout, working, merits and demerits of pressurized water reactor, Gas turbine power plants: components description, working and types gas turbines, methods to improve performance, Layout and working of open cycle plant with intercooling, reheating, regeneration, Solar Thermal power plant: layout of Flat plate collector based plant, central receiver type plant, advantages, disadvantages, Wind energy conversion system – wind turbine types, Working, advantages and disadvantages		
UNIT IV	**INTERNAL COMBUSTION ENGINES**	**9**
Engine: Classification, operations of 2 stroke & 4 stroke, Comparison of SI & CI engines, Fuel supply system and Battery ignition system, Magneto ignition system of SI engine, Working of a simple carburetor, GDI, MPFI, CRDI, Lubrication system of an engine, Functions and Working of mist and forced feed lubrication system, Cooling system of an engine – Working of air cooled (fins), Water cooled engines (forced circulation), Alternate fuels for IC Engines. Liquid fuels: methanol, ethanol, vegetable oil, Biodiesel, Gaseous fuel: Hydrogen, CNG, LPG, properties, advantages, disadvantages, Emissions from engine – Emission standards – Euro, BS, Emission control measures – Catalytic converter, Exhaust gas recirculation, Introduction to electric vehicles, Hybrid and autonomous vehicles		

UNIT V	CASTING AND FORMING PROCESS	9

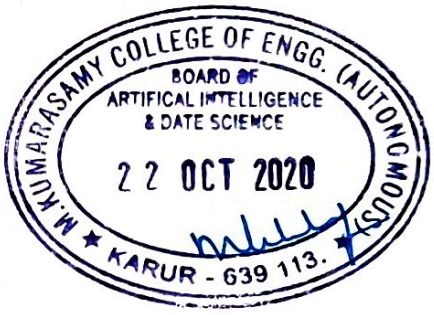
Casting introduction and history, Expandable mold casting process , Production steps in a typical sand-casting process, terms including patterns and core, Other expendable mold casting: shell molding, vacuum molding, expanded polystyrene process, Investment casting, Permanent mold casting: hot chamber and cold chamber die casting & Permanent moldcasting: Semi centrifugal and centrifuge casting, Metal forming introduction and its classification, metals and alloys, Bulk deformation: hot, cold forging processes, hot rolling processes, cold rolling processes, Rolling mill classification, hot and cold extrusion processes, wire and bar drawing processes, Sheet metal working, applications. Cutting operations: shearing, blanking, punching, cutoff, parting, slotting, perforating, notching, trimming, shaving, fine blanking, Bending operations: V-bending, edge bending, flanging, hemming, seaming, curling, spring back effect, Drawing operations, its defects, coining, embossing, ironing, lancing, twisting

LIST OF EXPERIMENTS	30

1. Study about Brick, Stone & Cement: Types, Uses, Structural steel, Timber properties and uses
2. Study about Water Supply, Distribution System, Water Treatment Plant, Sewerage System
3. Study about basics of Casting, processes, Equipment"s, To make the mould using stepped flange
4. Basics of Metal Arc welding operations, Equipment"s, Tools, Butt joint of two metal plates using arc welding process
5. Welding-Lap joint of two metal plates overlapping on one another using arc welding process.
6. Basics of fitting practice, tools and method of producing models, Tools, Step fitting of two metal plates using fitting tools
7. Half Round, Vee fitting of two metal plates using fitting tools
8. Basics of Carpentry operations, Equipment"s, Tools, Cross halving joint of two wooden pieces at perpendicular direction
9. To make duster from wooden piece using carpentry tools.
10. Basics of Sheet metal operations, Equipment"s, Tools and demonstration of producing models, To make geometrical shape like frustum
11. Sheet metal operations - To make geometrical shape like square tray, rectangulat tray
12. Sheet metal operations - To make geometrical shape like Cone , Funnel
13. Study the basics of moulding and processes, Equipment"s, To make plastic models using injection moulding of simple part
14. Basics of Plumbing practices for G.I and P.V.C., Tools and demonstration of producing models
15. Plumbing of bathroom/ kitchen fittings using G.I. fittings, P.V.C. fittings



Text Book (s)	
1	Dr.V. Rameshbabu,"Basic of Civil and Mechanical Engineering", VRB Publishers pvt ltd, 2017
Reference (s)	
1	SeropeKalpakjian, Steven Schmid," Manufacturing Processes for Engineering Materials", Pearson, 2016
2	Drbal, Larry F. Boston, Patricia G. Westra, Kayla L. Black, Veatch, "Power Plant Engineering", Kluwer Academic Pub., 1995
3	Andy Walker, "Solar Energy", John Wiley & Sons, 2013
4	John B. Heywood, "Internal Combustion Engine Fundamentals", Tata McGraw Hill Education, 2017
5	Kumar. T, LeenusJesu Martin and Murali. G, "Basic Mechanical Engineering", Suma Publications Chennai, 2007.



Regulation 2018		Semester II	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
S	18MES101J	ENGINEERING GRAPHICS	1	0	4	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Construct ellipse, Parabola, hyperbola, cycloid and involutes.
2	Sketch the projection of points, straight lines and plane surfaces.
3	Sketch the Projection of simple solids like prisms, pyramids, cylinder and cone
4	Sketch the sectional solids and developing the lateral surfaces of simple solids
5	Understand the three dimensional drawing of simple solid by isometric projection and perspective projection, and convert isometric projection to orthographic projection.

Course Outcome (s) (COs):

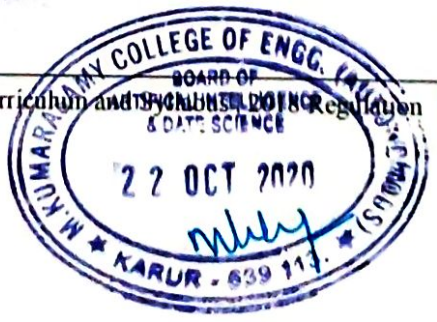
At the end of this course, learners will be able to:

CO1	Apply engineering graphic fundamentals to draw/evaluate engineering curves.
CO2	Draw the graphics of engineering parts with point, line and plane projections
CO3	Draw projection of solid objects like prisms, cylinders, pyramids and cones used in engineering objects
CO4	Develop the lateral surfaces of the sectional solids.
CO5	Create 3D part models using isometric and perspective projection.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	2	3	2	2	-	3	2	2
CO2	3	2	3	2	2	-	1	2	3	2	-	3	3	1
CO3	3	2	3	2	3	-	1	2	3	2	-	2	2	1
CO4	3	2	3	2	3	-	1	2	3	2	-	2	2	1
CO5	3	2	2	2	2	-	1	2	2	2	-	3	3	1
CO (Avg)	3	2	2.6	2	2.4	-	2.2	2.2	2.6	2	-	2.6	2.4	2.2

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



UNIT I	PLANE CURVES	9
Principles of Engineering Graphics - Lettering - dimensioning - Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes – Drawing of tangents and normal to the above curves.		
UNIT II	**PROJECTION OF POINTS, LINES AND PLANE SURFACES**	**9**
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations. Projection of polygonal surface and circular lamina inclined to both reference planes.		
UNIT III	**PROJECTION OF SOLIDS**	**9**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of POsition method.		
UNIT IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**	**9**
Sectioning of above solids in simple vertical POsition by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.		
UNIT V	**ISOMETRIC PERSPECTIVE AND ORTHOGRAPHICS PROJECTIONS**	**9**
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method. Isometric to orthographic multi-view.		
LIST OF EXPERIMENTS		**15**
1. Spiral and involutes using bspline or cubic spline 2. Plan of residential building 3. Simple steel truss 4. Isometric projection of simple objects 5. Creation of 3D model 6. Orthographic projection of given 3D object 7. Projection of planes with inclination to reference plane 8. Solids with inclination to one reference plane 9. Section view of simple solids 10. Development of solids		

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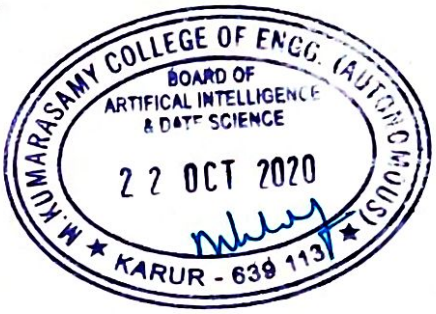
22 OCT 2020

Text Book (s)	
1	K. V. Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2010).
2	K. Venugopal& V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 15th edition (2018).
Reference (s)	
1	K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications, 2010.
2	R. L Jhala "Engineering Graphics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2015.
3	DhananjayA.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2008.
4	Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
5	M.S. Kumar, "Engineering Graphics", D.D. Publications, 2009.



Regulation 2018		Semester II	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC101J	PYTHON PROGRAMMING	2	0	2	3

Prerequisite Course (s)

Nil

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

1	Understand the fundamentals of Python programming
2	Handle list, tuples, sets and Dictionaries data types
3	Learn function prototypes and string functions
4	Use files and modules for data processing
5	Understand packages in Python and data visualization

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

CO1	Develop basic Python programs using conditional and control statements
CO2	Perform operations on list, tuples, sets and Dictionaries
CO3	Implement function prototypes and string functions
CO4	Apply files and modules and perform operations on CSV files
CO5	Perform data visualization and apply Python packages

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	-	-	-	-	3	3	3	2
CO2	3	3	3	3	3	1	-	-	-	-	3	3	3	2
CO3	3	3	3	3	3	1	-	-	-	-	3	3	3	2
CO4	3	3	3	3	3	1	-	-	-	-	3	3	3	2
CO5	3	3	3	3	3	1	-	-	-	-	3	3	3	2
CO (Avg)	3.00	3.00	3.00	3.00	3.00	1.00	-	-	-	-	3.00	3.00	3.00	2.00

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

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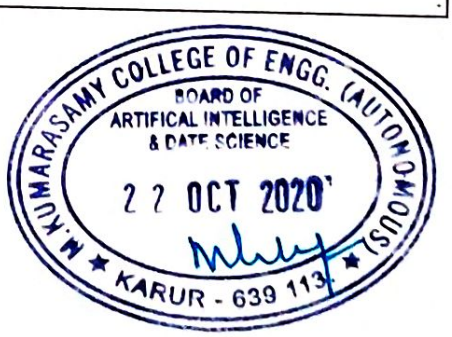
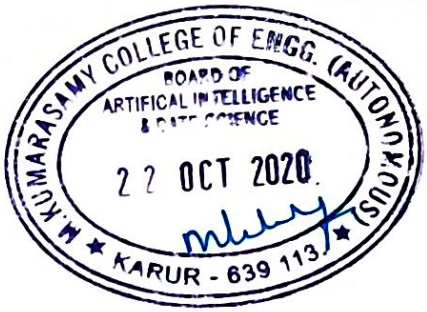
UNIT I	INTRODUCTION TO PYTHON	6
Introduction to Python, features, installing Python, writing and executing Python program — native data types, comments, constants, variables, operators, expression, conditional statements, control statements, continue, pass, break.		
UNIT II	**LISTS, TUPLES, SETS AND DICTIONARIES**	**6**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Sets: methods and operators, Dictionaries: operations and methods.		
UNIT III	**FUNCTIONS AND STRINGS**	**6**
Functions definition, declaration, arguments, parameters – formal and local, parameter passing methods - function prototypes, recursion; Strings: string slices, immutability, string functions and methods, string module, regular expressions.		
UNIT IV	**FILES AND MODULES**	**6**
Files and exception: Text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, accessing CSV file.		
UNIT V	**PACKAGES AND DATA VISUALIZATION**	**6**
Text processing, Numerical processing: numpy package – mean, medium and mode, pandas package – vector, dataframe, data visualization: matplotlib, Time operations.		
LIST OF EXPERIMENTS		**15**

1. Finding factorial of n
2. Generating Fibonacci series
3. Exchange the values of two variables
4. Calculating student grade
5. Sum and average of n elements, linear search, printing a pattern.
6. Find minimum in a list, list operations, create and insert elements in a Dictionary, operations on sets and tuples
7. Counting the vowels and consonants in a given string, exchanging of two values using recursion
8. File operations: accessing a CSV file and generate reports
9. Display a data frame from a dictionary input using Pandas
10. Create a 3x3 matrix with values from 2 to 10 using numpy



Text Book (s)	
1	Anurag Gupta,G.P BISWAS ," Python Programming – Problem solving, packages and Libraries, Edition 1, Tata McGraw Hill, 2018
2	E Balagurusamy, "Problem Solving and Python Programming", Edition1 , TataMcGraw Hill, 2018
3	Reema Thareja, "Python Programming using Problem Solving Approach", OXFORD University Press, 2017.
Reference (s)	
1	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist,,,,, 2nd edition, Updated for Python 3, Shroff/O,,Reilly Publishers, 2016.
2	John V Guttag, —Introduction to Computation and Programming Using Python,,,,, Revised and expanded Edition, MIT Press , 2013
3	John V. Guttag,, Introduction to Computation and Programming using Pythonl, Prentice Hall of India, 2014.



Regulation 2018		Semester I/Semester II	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
H	18MBH101L	PROFESSIONAL SKILLS AND PRACTICES (Common to all UG programmes except CSBS)	0	0	2	1

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Equip students with different aspects of Presentation
CLR-2	Train students to use appropriate language for publics peaking.
CLR-3	Help students better understand basic leadership qualities and personality traits
CLR-4	Train the students to face interview confidently.
CLR-5	Make students understand how setting goals in life is important.

Course Outcome (s) (COs):

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

CO1	Make presentation in a formal way.
CO2	Speak with clarity and confidence, thereby enhancing their employability skills.
CO3	Enable students to understand different aspects of leadership and evaluate in their own strengths.
CO4	Clear the job interview successfully.
CO5	Realize that selecting goal is a fundamental component to long- term success of an individual.

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	2	3	3	3	2	3	-	-	-
CO2	-	-	-	-	-	3	2	3	3	3	2	3	-	-	-
CO3	-	-	-	-	-	3	2	3	3	3	2	3	-	-	-
CO4	-	-	-	-	-	3	2	3	3	3	2	3	-	-	-
CO5	-	-	-	-	-	3	2	3	3	3	2	3	-	-	-
CO(Avg)	-	-	-	-	-	3	2	3	3	3	2	3	-	-	-

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

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UNIT I	PRESENTATIONS	5
Tips and Techniques for an Effective Presentation - Effective presentation structure - Types of Presentation - Verbal aspect of a presentation - Non-verbal aspect of a presentation – body language - Stress management during a presentation		
UNIT II	**PUBLIC SPEAKING**	**5**
Importance of Public Speech - Dealing with fear and Anxiety - Tips and Techniques for Public Speaking - Informative Speech - Delivering a Persuasive Speech - Dealing with audience questions		
UNIT III	**LEADERSHIP SKILLS**	**5**
Communication – Motivation – Delegating – Creativity – Responsibility - Commitment		
UNIT IV	**INTERVIEW SKILLS**	**5**
Preparing for a Job Interview - The Interview Process - Telephone Interviews - Interview Techniques - Mock Interview - Mock Interview		
UNIT V	**GOAL SETTING**	**5**
Types of goals - Reasons for goal setting - Goal Setting Process - S.M.A.R.T. goals - Tips and Techniques for Goal Setting - Trouble in Setting Goals		
LIST OF EXPERIMENTS		**5**
1. Make a presentation on a general topic 2. Give a persuasive speech 3. Exhibit your leadership qualities 4. Mock interview 5. Share your realistic short term and long term goals and the ways to attain them.		

Text Book (s)	
	NIL
Reference(s)	
1	Aruna Koneru, Professional Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi
2	Professional Skills and Practice, Oxford University Press
3	https://www.skillsyouneed.com
4	https://www.Business English Site.com

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Regulation 2018		Semester II	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18LEM102T	VALUE EDUCATION (Common to all UG programmes except CSBS)	1	0	0	-

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Connect the learners to their potential, identify their potential to create a new positive world
CLR-2	Analyze the merits and demerits of different educational systems. Identify the different systems of education
CLR-3	Draw attention towards the weaknesses they are susceptible to and inspire them through positive models
CLR-4	Instill a sense of professional ethics which help them develop a safe comfortable and prosperous society
CLR-5	Cultivate a spirit of willing accommodation in an increasingly diverse world

Course Outcome (s) (COs):

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

CO1	Equipped with an awareness of their positive energy and power
CO2	Identify the meaning of 'education'; have a clearer and better understanding in taking education to the masses
CO3	Assess their weaknesses; understand risks involved and rectify them through learning from positive and negative instances
CO4	Realize their professional responsibilities
CO5	Acquire the required values in an expanding pluralistic world not be swept off their feet due to the rapid changes

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	3	-	3	3	3	-	3	-	-	-
CO2	2	3	2	-	3	3	2	2	3	3	-	3	-	-	-
CO3	2	-	-	-	2	3	2	2	3	3	-	3	-	-	-
CO4	3	2	-	-	3	3	3	3	3	3	-	3	-	-	-
CO5	2	-	-	-	3	3	3	3	3	3	-	3	-	-	-
CO (Avg)	2	2.33	2	-	2.6	3	2.5	2.6	3	3	-	3	-	-	-

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

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UNIT I	**VISIONS FOR YOUTH**	**6**
Introduction (Quiz) - Two speeches by great personalities (Oral presentations) - Quotes, proverbs relating to the power and potential of youth, Excerpts: Wings of Fire (Collecting proverbs highlighting the potential of youth) - Two news articles highlighting the initiatives for social causes by youth (Role play in a similar context) - One song exhibiting the positive energy of youth (Discussion on the song)		
UNIT II	**YOUTH AND EDUCATION**	**6**
Meaning and the significance of education (Brainstorming) - Overview of different (traditional, modern) educational systems (Debate) - Role of youth in education, Urban and Rural set up, dissemination (Student presentations) - Designing and framing educational curriculum and materials (Students' Presentation based on write ups) -The pressing challenges in current educational system (Collage Design)		
UNIT III	**YOUTH AND SOCIETY**	**6**
Need for social values in the present context (Poem – "Where the mind is without fear" , Write up on various instances from real life) - Individual and group behaviour, respect for others (Case study on recent happenings) - Civic sense, bullying-substance abuse, uses of expletives (Case study on recent happenings) - Hero worship, gender insensitivity moral policing (Case study on recent happenings) - Positive contribution by youth in promoting social welfare (Short videos followed by discussions)		
UNIT IV	**YOUTH AS PROFESSIONALS**	**6**
Introduction to professional values (Brainstorming through visual cues) - Engineering societies in India (Quiz) - Challenges to be addressed by Engineers in India (Case Study) - Challenges in different sectors: agriculture (Case Study) - Challenges in different sectors: urban development, environment (Group activity (oral and written)) - Challenges in different sectors: sustainable development, cyber security (Case Study – from Newspapers)		
UNIT V	**YOUTH IN PLURALISTIC SOCIETY**	**6**
Introduction to pluralistic society, forces of globalization (Group Discussion) - Science and technology intercultural proximity (Narration of stories from various religions to illustrate the oneness of humanity) - Positive, Negative impact: religion, politics, gender, economic status, aesthetics (Discussion on "To Kill a Mocking Bird") - Values required to live in a global society (Poster presentation on festivals of various religions) - Learning the etiquettes of various societies (Poster presentation on festivals of various religions) - Success of pluralistic society, enliven the society, religious harmony through literary (Writing the aspects of pluralistic society based on the text).		

Text Book (s)

	Nil

Reference (s)

1	Kalam, APJ Abdul. Wings of Fire: AN Autobiography of APJ Abdul Kalam. Ed. Sangam Books Ltd., 1999
2	"Banaras Hindu University Speech" and "To Students". The Voice of Truth. General Editor Shriman Narayan. Navajivan Publishing House. pp. 3-13 and pp 425-30. www.mkgandhi.org
3	Piroda, Sam. "Challenges in Science and Technology". www.nfdindia.org/loc19-01
4	Thomas A Address to VTU Students by Narayana Murthy. https://www.karnataka.com/personalities/narayana-murthy/vtu-address-2006/
5	World Economic forum. "India's top 7 challenges from skills to water scarcity"

Regulation 2018		Semester I / II	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18GNM101L	PHYSICAL & MENTAL HEALTH USING YOGA	0	0	2	Nil

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Provide Deeper insight into the curriculum of Yogic Sciences along with practical applications of Yoga
CLR-2	Intend that students should get familiar with the Poses if Yogasanam.
CLR-3	Promote Positive health in the Student through Yoga and enabling and imparting skill in them to practice and apply Yogic
CLR-4	Practice for Health to general public and teach Yoga for Total personality development and spiritual evolution.

Course Outcome (s) (COs):

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

CO1	Increase the muscle strength
CO2	Improve respiration, energy and vitality.
CO3	Maintain a balanced metabolism and weight reduction.
CO4	Maintain cardio and circulatory health.
CO5	Improve athletic performance and protection from injury.

CO-PO Mapping

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

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

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	Introduction	**6**
▪ Human Body – Meaning and its Importance in Yoga ▪ Definition of Anatomy and Physiology ▪ Cell: Structure & Function		
	General Information, Different parts, Structure, Function and Effect of Yogic Practices.	**24**
▪ Tissues: Types, Structure & Function ▪ Musculo-Skeletal System ▪ Digestive System ▪ Excretory System ▪ Respiratory System ▪ Circulatory System ▪ Nervous System ▪ Endocrinal System		

Text/ Reference (s) Books

1	Shirley Telles – A Glimpse of the Human Body The structure and Functions, Swami Vivekananda Yoga Prakashana, Bangalore.
2	Makar and Madhukar Gore – Anatomy and Physiology of Yogic Practices, motilal Banarsidass, New Delhi, 2007.
3	Anne Waugh, Allison Grant – 1ross and Wilson Anatomy and Physiology in Health & Illness, Churchill Livingstone; 2010.

M.KUMARASAMY COLLEGE OF ENGG. (AUTONOMOUS) BOARD OF ARTIFICAL INTELLIGENCE & DATA SCIENCE 22 OCT 2020 KARUR - 639 113

Regulation 2018		Semester III	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
B	18MAB207T	PROBABILITY AND STATISTICS	3	1	0	4

Prerequisite Course (s)

Advanced Calculus and Complex Analysis

Course Objective (s):

The purpose of learning this course is to:

1	Have a well – founded knowledge of standard distributions which can describe real life phenomena.
2	Acquire skills in handling situations involving more than one random variable and functions of random variables.
3	Understand and characterize phenomena which evolve with respect to time in a probabilistic manner.
4	Gain the knowledge on test of hypothesis and how they relate to engineering applications.
5	Classify the experimental design.

Course Outcome (s) (COs):

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

CO1	Apply basic probability techniques and models to analyze the performance of computer systems.
CO2	Illustrate and apply the concept of pairs of random variables from the knowledge of distributions.
CO3	Apply the concept of random processes in engineering disciplines.
CO4	Identify the right test statistic to test the hypothesis formulated from the given data.
CO5	Apply the basic concepts of classifications of design of experiments in the real life phenomena.

CO-PO Mapping

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

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

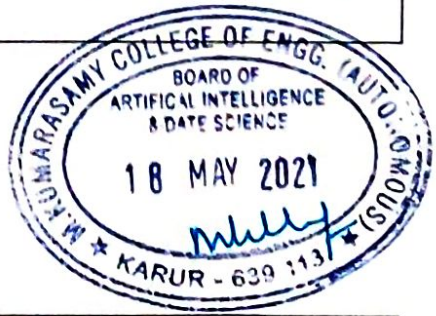
UNIT I	RANDOM VARIABLE AND STANDARD DISTRIBUTIONS	9 + 3
Random variable - Probability mass function - Probability density functions- Properties - Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties .		
UNIT II	**TWO DIMENSIONAL RANDOM VARIABLES**	**9 + 3**
Joint distributions - Marginal and conditional distributions – Covariance – Correlation and regression - Transformation of random variables - Central limit theorem.		
UNIT III	**MARKOV PROCESSES AND MARKOV CHAINS**	**9 + 3**
Classification-First order, Second order, strictly stationary order, wide-sense stationary - Markov process - Markov chains – Transition probabilities - Poisson process.		
UNIT IV	**TESTING OF HYPOTHESIS**	**9 + 3**
Sampling distributions - Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.		
UNIT V	**DESIGN OF EXPERIMENTS**	**9 + 3**
Completely randomized design – Randomized block design – Latin square design - 2^2 – factorial design.		

Text Book (s)

1	Oliver Ibe, "Fundamentals of Applied Probability and Random Processes" 2nd Edition, Elsevier, 2014.
2	Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers", Third Edition, John Wiley & Sons, 2003.

Reference (s)

1	R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.
2	M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum"s Outlines Probability and Statistics", Tata McGraw Hill edition, 2004.
3	I.R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers", 9th Edition, Pearson, 2017.
4	Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
5	Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.



Regulation 2018		Semester III	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
S	18ECS204T	DIGITAL LOGIC DESIGN	3	0	0	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Introduce the concept of digital systems, binary systems and switching functions.
2	Enable the students to understand and optimize the logic expressions.
3	Enable the students to design and analyse combinational logic circuits.
4	Enable the students to understand the principles of flip flops in designing registers and counters.
5	Design, implement and analyse the synchronous and asynchronous sequential circuits.

Course Outcome (s) (COs):

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

CO1	Demonstrate and perform arithmetic operations in any number system.
CO2	Explain the Boolean expression using K-Map and Tabulation techniques.
CO3	Design a combinational hardware circuit using boolean expression.
CO4	Design and Analysis the given sequential circuit.
CO5	Construct and test synchronous and asynchronous Sequential circuits.

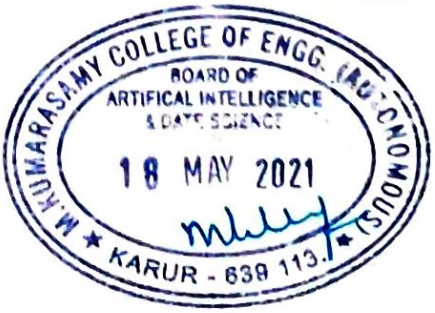
CO-PO Mapping

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

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

UNIT I	BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS	9
The nature of logic- Boolean Algebra and switching functions- Number Systems- binary, hexadecimal and other systems. Representation and properties of switching functions and their logic realizations using GATES and Switches.		
UNIT II	**OPTIMAL DESIGN**	**9**
Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) - Implicants and prime implicants Minimization using K-map – Quine - McCluskey algorithm for finding prime implicants.		
UNIT III	**COMBINATIONAL CIRCUITS**	**9**
Combinational circuits – Analysis and design procedures - Circuits for arithmetic operations - Code conversion –-Decoders and encoders - Multiplexers and demultiplexers - Implementation of combinational logic circuits using ROM, PLA, PAL- Introduction to Hardware Description Language (HDL) -HDL for combinational circuits		
UNIT IV	**SEQUENTIAL CIRCUITS**	**9**
Sequential logic elements -Flip-Flops, Registers, Shift Registers and Counters- Examples of applications. State reduction and state assignment - HDL for Sequential Circuits		
UNIT V	**SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS**	**9**
Synchronous Sequential Circuits: General Model – Classification – Design – Analysis of Synchronous Sequential Circuits. Asynchronous Sequential Circuits: Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race free state assignment – Hazards - Design of Hazard Free Switching circuits -ASM Chart.		

Text Book (s)	
1	M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
Reference (s)	
1	John F.Wakerly, "Digital Design", 4th Edition, Pearson/PHI, 2008
2	John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3	Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4	Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011



Regulation 2018		Semester III	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC201J	FOUNDATION OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE	2	0	2	3

Prerequisite Course (s)

Python Programming

Course Objective (s):

The purpose of learning this course is to:

1	Understand the scientific method for science projects, and the data science team key roles.
2	Acquire technical expertise using popular open-source data science frameworks including jupyter notebook.
3	Data Engineering and data modelling practices using machine learning concepts.
4	Explore data science industry case studies.
5	Engage in role-playing challenge-based scenarios to propose real-world solutions.

Course Outcome (s) (COs):

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

CO1	Understand the evolution and relevance of Data science in the world today.
CO2	Explore end-to-end data science industry use cases using the data analytics lifecycle.
CO3	Data modelling practices using machine learning.
CO4	Gain a competitive edge using popular low-code-cloud-based platform for data science – IBM Watson studio.
CO5	Build Machine Learning Models.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	2	1	3	2
CO2	3	3	3	2	2	-	-	-	-	-	2	1	3	2
CO3	2	3	3	2	2	-	-	-	-	-	2	1	3	2
CO4	2	3	3	2	2	-	-	-	-	-	2	1	3	2
CO5	3	3	3	2	2	-	-	-	-	-	2	1	3	2
CO (Avg)	2.6	3	3	2	2	-	-	-	-	-	2	1	3	2

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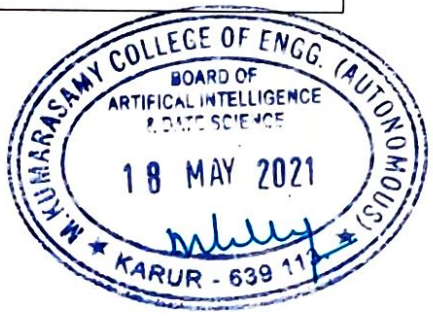
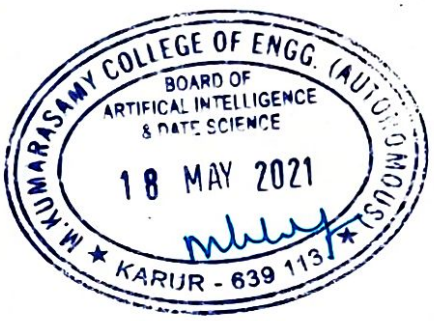
UNIT I	OVER VIEW OF DATASCIENCE AND AI	5
Data science Introduction and overview-Data science domains-data science roles-Data science methodology-data analytics lifecycle-Business Analytics-Business Understanding-Data Science Methodology– History and evolution of AI – AI impact in the world today – AI technologies –AI Industry impact		
UNIT II	**EXPLORE AND PREPARE DATA**	**8**
Business understanding – Explore data – Accessing data from various source –Data Science using python, Over view of python - Web Scraping – Tidy data – Handling Missing data -Data Analysis-Data Visualization		
UNIT III	**REPRESENT AND TRANSFORM DATA**	**8**
Statististical and representation techniques —Descriptive and inferential statistics – Data Transformation Techniques – Tokenization, Bucketization, Feature Standardization – Data Normalization – Represent and transform unstructured data - Data Transformation tools		
UNIT IV	**DATA SCIENCE ON THE CLOUD**	**8**
Introduction to IBM cloud – Integrated Environment for data science Projects-Cloud based data science Lifecycle-Introduction to IBM Watson studio – Integrated visual recognition – Data analytics and Visualization Using Watson-Introduction to natural language processing, Natural language processing concepts and components, Natural language processing evaluation metrics, Natural language processing and IBM Watson.		
UNIT V	**DATA MODELING AND MACHINE LEARNING ALGORITHMS**	**8**
Overview of modelling techniques – Machine learning techniques – Accuracy, precision and recall – Model Deployment – About machine learning algorithms – From regression to Neural Nets – Decision Tree classifier – Machine Learning framework – Deep Learning methodologies		
LIST OF EXPERIMENTS		**8**
1. Accessing IBM cloud 2. Exploring and preparing auto data 3. Validating automotive data 4. Data Refinery visualization 5. Visualizing automotive data 6. Predict heart failure 7. Apply models to attrition 8. Chatbot using Watson Studio		



Text Book (s)	
1	IBM Course ware
Reference (s)	
1	Data Science for Beginners – by Leonard Deep
2	Python Data Science Handbook - Jake VanderPlas
3	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow-AurelienGeron
4	Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" ,Oreilly, 2011
5	Andreas C. Muller, Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreilly, 2016



Regulation 2018		Semester III	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC202T	COMPUTER ORGANIZATION AND ARCHITECTURE	3	0	0	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Recognize the basic structure of a digital computer and representation of non-numeric data.
2	Learn different arithmetic operations and organization of control unit.
3	Study memory organization, different ways of communication with I/O devices and parallel processors.
4	Understand the concept of pipelining and its impact in processor design.
5	Learn the hierarchical memory system.

Course Outcome (s) (COs):

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

CO1	Discuss the functionalities of various blocks of a digital computer and express the data representation.
CO2	Illustrate the logic design of Arithmetic and control Unit.
CO3	Infer the concepts of memory system, concurrence access in parallel processors and classify the approaches for I/O communication.
CO4	Distinguish hazards in pipelining and outline its impact in the performance of the processors.
CO5	Determine the performance of different types of memory.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	1	1	2	-
CO2	3	3	3	3	3	-	-	-	-	-	1	1	3	-
CO3	3	3	3	3	3	-	-	-	-	-	1	1	2	-
CO4	3	3	3	3	3	-	-	-	-	-	1	1	2	-
CO5	3	3	3	3	3	-	-	-	-	-	1	1	2	-
CO (Avg)	3	3	3	3	3	-	-	-	-	-	1	1	2.2	-

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

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UNIT I	INTRODUCTION TO COMPUTER ARCHITECTURE	9
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs. Data representation: Signed number representation, fixed and floating-point representations, character representation.		
UNIT II	**COMPUTER ARITHMETIC**	**9**
Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and- add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.		
UNIT III	**CONTROL UNIT AND PIPELINING**	**9**
Introduction to x86 architecture. CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU. Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.		
UNIT IV	**PERIPHERAL DEVICES AND THEIR CHARACTERISTICS**	**9**
Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB.		
UNIT V	**MEMORY ORGANIZATION AND SYSTEM DESIGN**	**9**
Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies. Memory system design: Semiconductor memory technologies, memory organization.		

Text Book (s)

1	Morris Mano, "Computer System Architecture" 3rd Edition, Prentice Hall of India, New Delhi, 2014.

Reference (s)

1	David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier, 5th Edition 2013.
2	Carl Hamacher, Zvonko Vranesic, SafwatZaky, Naraig Manjikian, "Computer Organization and Embedded Systems" McGraw-Hill, 6th Edition 2014.
3	John P. Hayes, Computer Architecture and Organization, McGraw-Hill ,3rd Edition,2013.
4	William Stallings, "Computer Organization and Architecture – Designing for Performance", 10th Edition, Pearson Education, 2015.
5	Vincent P. Heuring and Harry F. Jordan," Computer System Design and Architecture", Prentice Hall, 2 nd Edition, 2004.

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Regulation 2018		Semester III	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC203J	DATA STRUCTURES AND ALGORITHMS	3	0	2	4

Prerequisite Course (s)

Programming for Problem Solving

Course Objective (s):

The purpose of learning this course is to:

1	Implement abstract data types for linear data structures.
2	Apply the different linear and non-linear data structures to problem solutions.
3	Solve problems using data structures binary trees, heaps, binary search trees and writing programs for these solutions.
4	Understand the Tree ADT and types of balancing the tree.
5	Critically analyze the various sorting algorithms.

Course Outcome (s) (COs):

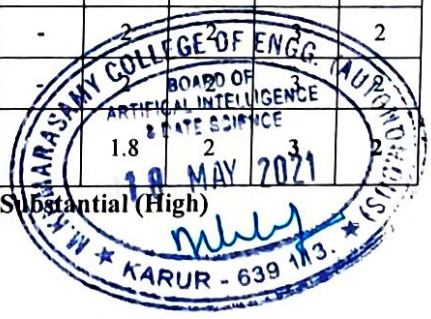
At the end of this course, learners will be able to:

CO1	Identify the basic concept of data structure and identify the need for list data structures and its operations.
CO2	Exemplify the concept of stacks and queues with suitable applications.
CO3	Classify the types of tree data structures and explain its functionalities.
CO4	Outline the concept of graph data structures with examples.
CO5	Design the algorithms for searching and sorting techniques.

CO-PO Mapping

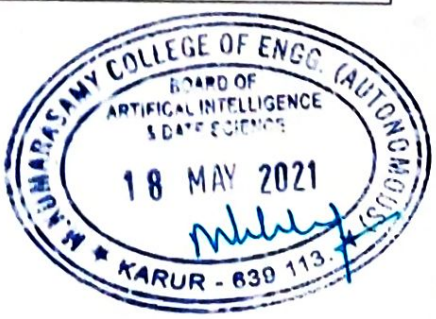
Cos	Pos												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO2	3	2	3	3	3	-	-	-	-	-	1	2	3	2
CO3	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO5	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO (Avg)	3	2.8	3	3	3	-	-	-	-	-	1.8	2	3	2

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

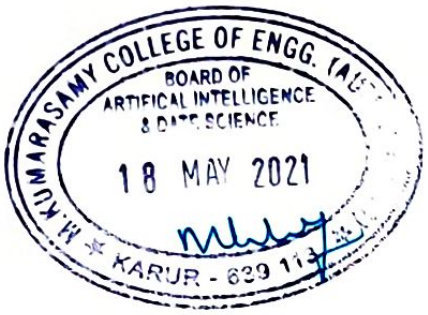


UNIT I	LINEAR DATA STRUCTURES – LIST	9
Pseudo code-Algorithm efficiency -Designing recursive algorithms - Recursive examples. -Abstract Data Types (ADTs) - List ADT - array-based implementation - linked list implementation -singly linked lists - circularly linked lists- doubly-linked lists -applications of lists -Polynomial Manipulation -All operations (Insertion, Deletion, Merge, Traversal).		
UNIT II	**LINEAR DATA STRUCTURES - STACKS, QUEUES**	**9**
Stack ADT - Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT - Operations - Circular Queue - Priority Queue- deQueue - applications of queues.		
UNIT III	**NON-LINEAR DATA STRUCTURES – TREES**	**9**
Tree ADT - tree traversals - Binary Tree ADT - expression trees - applications of trees - binary search tree ADT - AVL Trees – B-Tree - Heap - Applications of heap.		
UNIT IV	**SEARCHING, SORTING AND HASHING TECHNIQUES**	**9**
Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort – Shell sort - Radix sort. Hashing- Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.		
UNIT V	**NON-LINEAR DATA STRUCTURES – GRAPHS**	**9**
Definition - Representation of Graph - Types of graph - Breadth-first traversal - Depth-first traversal - Topological Sort - Shortest Path Algorithms: Unweighted Shortest Paths - Dijkstra's Algorithm. Minimum Spanning Tree: Prim's Algorithm Kruskal's Algorithm.		
LIST OF EXPERIMENTS		**15**

1. Array Implementation of List ADT.
2. Array Implementation of Stack and Queue ADTs.
3. Linked list Implementation of Stack, Queue and List ADTs.
4. Implementation of Binary Search Tree.
5. Implementation of AVL Tree.
6. Implementation of Heaps.
7. Graph representation and Traversal algorithms.
8. Applications of graphs.
9. Implementation of Searching and sorting algorithms.
10. Hashing – any two collision techniques.



Text Book (s)	
1	Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition, Pearson Education, 2014.
Reference (s)	
1	Richard F. Gilberg, and Behrouz A. Forouzan, Data Structures - A Pseudocode Approach with C, Thomson 2011.
2	Aho, J.E.Hopcroft and J.D.Ullman, Data Structures and Algorithms, Pearson education, Asia, 2010.



Regulation 2018		Semester III	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC204J	OBJECT ORIENTED PROGRAMMING WITH JAVA	3	0	2	4

Prerequisite Course (s)

Programming for Problem Solving

Course Objective (s):

The purpose of learning this course is to:

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

Course Outcome (s) (COs):

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

CO1	Develop Java programs using OOP principles.
CO2	Develop Java programs with the concepts inheritance and interfaces.
CO3	Build Java applications using exceptions and I/O streams.
CO4	Develop Java applications with threads and generics classes.
CO5	Develop interactive Java programs using swings.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	-	-	-	-	3	2	3	3
CO2	3	3	3	3	3	1	-	-	-	-	3	2	3	3
CO3	3	3	3	3	3	2	-	-	-	-	3	2	2	3
CO4	3	3	3	3	3	1	-	-	-	-	3	2	2	3
CO5	3	3	3	3	3	2	-	-	-	-	3	2	3	3
CO (Avg)	3	3	3	3	3	1.4	-	-	-	-	3	2	2.6	

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

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UNIT I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	9
Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.		
UNIT II	**INHERITANCE AND INTERFACES**	**9**
Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists – Strings		
UNIT III	**EXCEPTION HANDLING AND I/O**	**9**
Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files		
UNIT IV	**MULTITHREADING AND GENERIC PROGRAMMING**	**9**
Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.		
UNIT V	**EVENT DRIVEN PROGRAMMING**	**9**
Applet Basics - Applet Architecture - Applet Display Methods - Event Handling Mechanisms - Event Classes - Event Listener – AWT : Working with Windows, Graphics, Colours and Fonts - AWT Controls – Database Connectivity and JDBC Concepts		
	LIST OF EXPERIMENTS	**15**

1. Implementing Object Oriented Concepts.
2. Implementing Control Statements
3. Implementation of Interface and Package program.
4. Implement the concept of Exception Handling using predefined exception
5. Implement the concept of Exception Handling by creating user defined exceptions
6. Implement Multithreading concepts.
7. Implementation of Collection interfaces
8. Implement conversion of InputStream into Byte Array
9. Implement a simple calculator. Use a grid Layout to arrange buttons for the digits and for the +, -, *, / operations. Add a text field to display the results.
10. Implement Mouse events and Keyboard event.

Text Book (s)	
1	Herbert Schildt, —Java The complete reference, 8th Edition, McGraw Hill Education, 2011
2	Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentals, 9th Edition, Prentice Hall, 2013.
Reference (s)	
1	Paul Deitel, Harvey Deitel, —Java SE 8 for programmersl, 3rd Edition, Pearson, 2015.
2	Steven Holzner, —Java 2 Black bookl, Dreamtech press, 2011.
3	Timothy Budd, —Understanding Object-oriented programming with Javal, Updated Edition, Pearson Education, 2000.

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Regulation 2018		Semester III	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
P	18AIP201L	MINOR PROJECT - I	0	0	2	1

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report.

Course Outcome (s) (COs):

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

CO1	Identify the requirement and develop the concepts or models through standard procedures and preparation of report.

CO-PO Mapping

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

Strategy(s)

- The Student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department.

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Regulation 2018		Semester III	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18MBM201L	COMPETENCIES IN SOCIAL SKILLS	0	0	2	1

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	To sharpen problem solving skill and to improve thinking capability of the students.
2	To hone soft skill and analytical ability of students.
3	To engage learners in using language purposefully and cooperatively.
4	To expertise the writing and presentation skill to fulfill the corporate expectations.

Course Outcome (s) (COs):

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

CO1	Students should be able to solve both analytical and logical problems in an effective manner.
CO2	Students can design and deliver information in a proper manner.
CO3	Presentation skills of students will be improved individually as well as a team member.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	1	-	-	-	-	3	2	1	2	2	1
CO2	3	1	3	1	-	-	-	2	3	2	1	2	2	1
CO3	3	1	3	1	-	-	-	-	2	-	-	-	2	1
CO (Avg)	3	1	3	1	-	-	-	0.67	2.67	1.33	0.67	1.33	2	1

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

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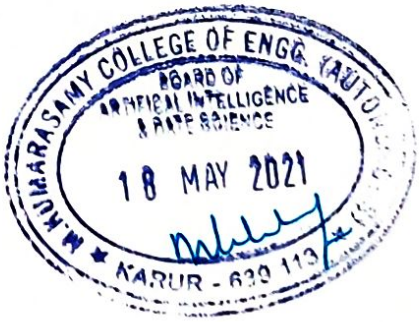
UNIT I	Module – 1	6
Aptitude: Coding & Decoding - Direction Sense Test. **Communication:** Self-Introduction and SWOT analysis - Letter writing - types.		
UNIT II	**Module – 2**	**6**
Aptitude: Venn Diagrams - Data Interpretation. **Communication:** Phrasal verbs - Voice of Valluvar.		
UNIT III	**Module – 3**	**6**
Aptitude: Averages. **Communication:** Idioms and Phrases - Skits.		
UNIT IV	**Module – 4**	**6**
Aptitude: Time and Distance - Problems on Trains. **Communication:** Prefix/Suffix - Root words - Adjectives - JAM (Extempore Speech).		
UNIT V	**Module – 5**	**6**
Aptitude: Clocks & Calendars. **Communication:** Homophones - Frame Tales.		
Text Book (s)		
1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015	
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015	



Regulation 2018		Semester III / IV	Total Hours			15
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18CYM201T	ENVIRONMENTAL SCIENCE	1	0	0	-

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	To demonstrate in-depth knowledge within environmental engineering and an awareness of social, economic, political, and environmental impacts of engineering practices.
2	To have competence for working with multi-disciplinary teams to arrive at solutions to environmental engineering problems.
3	To get solutions which will minimize the negative impact of human activities on the environment and to protect human health.

Course Outcome (s) (COs):

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

CO1	Improve fundamental knowledge of the inter-relationships between the built environment and natural systems.
CO2	Characterize and mitigate man-made hazards like nuclear hazards. Understand the principles involved in the generation of different forms of energy.
CO3	Improve the reliability, performance, disaster-management of natural calamities and solid waste and water supplies and treatment processes.
CO4	Understand the source, effects and control measure of various environmental pollution.
CO5	Apply information technology in the control of human population and women and child welfare.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	3	-	-	-	-	-	-	1
CO2	2	2	2	-	-	3	3	-	-	-	-	-	-	1
CO3	2	2	2	2	-	3	3	-	-	-	-	-	-	1
CO4	2	2	2	-	-	3	3	-	-	-	-	-	-	1
CO5	2	2	2	2	-	3	3	-	-	-	-	-	-	1
CO (Avg)	2.00	2.00	2.00	0.8	-	2.4	3.00	-	-	-	-	-	-	1

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

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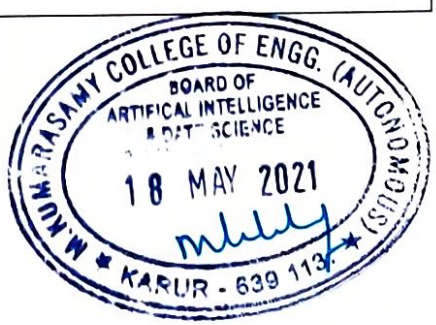
UNIT I	ENVIRONMENT& BIODIVERSITY	3
Definition-types of environment, components of environment, scope-importance of environmental studies- Bio diversity-definition-value of biodiversity-Threats to biodiversity - India a mega diversity nation-endangered and endemic species of India-conservation of biodiversity.		
UNIT II	**ENERGY SOURCES**	**3**
Energy resources- Growing energy needs- Renewable and Nonrenewable energy sources- Use of alternate energy sources - Nuclear Energy- Alternative energy fuels-power alcohol-Bio diesel (preparation, properties &uses)		
UNIT III	**SOCIAL ISSUES AND ENVIRONMENT**	**3**
Environment ethics – Climate change – Global warming – Acid rain – Ozone layer depletion – Nuclear accidents-holocaust. Solid waste management - Rain water Harvesting-watershed management		
UNIT IV	**ENVIRONMENTAL POLLUTION & ACTs**	**3**
Source, types, effects & control- Air pollution -Water pollution – Soil pollution – Marine pollution and Plastic Pollution -The Environment (Protection) Act - Air (Prevention and control of pollution) Act - Water (Prevention and control of pollution) Act- Role of individual in prevention of pollution.		
UNIT V	**HUMAN POPULATION AND ENVIRONMENT**	**3**
Sustainable development – Urban Population growth and distribution – Population explosion – Family Welfare Program –Women and child welfare- Role of information technology in environment and human health- case studies		

Text Book (s)

1	Dr.J.P.Sharma, "Environmental studies", Laxmi Publications(p) Ltd, New Delhi.
2	Miller "Environmental Science" 11th Edition, Cengage Learning India Private Limited, New Delhi, (2006).

Reference (s)

1	Master. G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt Ltd., (2004)
2	Dr.A.Ravikrishnan " Environmental Science and Engineering " Sri Krishna publications, Chennai(2015)
3	P.Anandan, R.Kumaravelan "Environmental Science and Engineering" Scitech Publication (India) Pvt. Ltd, Chennai, Reprint 2009.



Regulation 2018		Semester IV	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
B	18MAB206T	DISCRETE MATHEMATICS	3	1	0	4

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	Obtain general knowledge about the area of propositional calculus and apply in Science and Engineering
2	Obtain the basic knowledge in predicate calculus and apply in Decision making problems
3	Apply the basics of Set theory in real life problems
4	Model situations in a mathematical way using combinatorics and derive useful results
5	Gain well founded knowledge in the areas of Graph Theory and apply in the computing fields

Course Outcome (s) (COs):

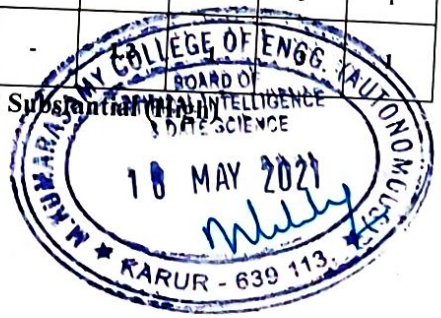
At the end of this course, learners will be able to:

CO1	Demonstrate their knowledge in propositional calculus
CO2	Demonstrate their knowledge in predicate calculus
CO3	Obtain the perception in the area of sets and the knowledge about functions.
CO4	Obtain perception in the area of combinatorics
CO5	Obtain perception in the area of graph theory

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	-	-	-	1	3	1
CO2	3	2	2	2	1	-	-	-	-	-	-	1	3	1
CO3	2	1	2	2	1	-	-	-	-	-	3	1	3	1
CO4	2	1	2	2	1	-	-	-	-	-	1	1	3	1
CO5	3	2	2	2	1	-	-	-	-	-	2	1	3	1
CO (Avg)	2.6	1.6	1.2	2	1	-	-	-	-	-				

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



UNIT I	PROPOSITIONAL CALCULUS	9 + 3
Propositions- Logical connectives-Compound propositions-Conditional and Biconditional propositions- Truth tables - Tautologies and Contradictions - Logical and equivalences and implications - DeMorgan's Laws-Normal forms-Principal conjunctive and disjunctive normal forms - Rules of inference-Arguments-Validity of arguments.		
UNIT II	**PREDICATE CALCULUS**	**9 + 3**
Predicates-Statement Function -Variables-free and bound variables- Quantifiers- Universe of discourse- Logical equivalences and implications for quantified statements- Theory of inference- The rules of universal specification and generalization-Validity of arguments.		
UNIT III	**SET THEORY AND FUNCTIONS**	**9 + 3**
Set Operations-properties-Power set-Relations-Graph and matrix of a relation- Partial Ordering-Equivalence relations-Partitions- Functions -Types of Functions- composition of relation and functions- inverse functions.		
UNIT IV	**COMBINATORICS**	**9 + 3**
Basics of Counting - Counting arguments- Pigeonhole Principle- Permutations and Combinations-Recursion and Recurrence relations-Generating Functions- Mathematical Induction- Inclusion – Exclusion		
UNIT V	**GRAPH THEORY**	**9 + 3**
Introduction to Graphs-Graph Operations- Graph and Matrices-Graph Isomorphism- Connected Graphs- Euler Graphs- Hamilton Paths and Circuits- Planar Graph-Graph Colouring-Trees- Shortest Path Problem-Directed and Undirected Graphs- Flows in Networks.		

Text Book (s)

1	Trembly J.P and Manohar R, —Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 2003.
2	Ralph. P. Grimaldi, —Discrete and Combinatorial Mathematics: An Applied Introductionl, Fourth Edition, Pearson Education Asia, Delhi, 2002.

Reference (s)

1	Kenneth H Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, Seventh Edition, McGraw Hill Education India Private Limited, New Delhi, 2013.
2	A.Doerr and K.Levasseur, Applied Discrete Structures, Galgotia Publication, New Delhi, 2004.
3	Gilbert Strang, "Introduction to Linear Algebra", 4th edition Wellesley- Cambridge Press, 2009.
4	Johnson baugh, Richard, "Discrete Mathematics", Sixth Edition, Maxwell, International Edition, 2006.

Regulation 2018		Semester IV	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC205L	DESIGN THINKING – PRACTITIONER COURSE	0	0	4	2

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

1	Understand what came before design thinking and how it built upon previous approaches.
2	See how design thinking is introduced in an organization and understand the transformation.
3	Get an overview of the whole approach to design thinking.
4	Learn 7 key habits of effective design thinking.
5	Explore the technology specializations.

Course Outcome (s) (COs):

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

CO1	Students develop a strong understanding of the Design Process and how it can be.
CO2	Students learn to build empathy for target audiences from different "cultures".
CO3	Students learn to research and understand the unique needs of a company around.
CO4	Students learn to develop and test innovative ideas through a rapid iteration cycle.
CO5	Understand the various domains in logistics.

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	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	3	-
CO3	2	2	1	3	-	-	-	-	-	-	-	-	3	-
CO4	3	2	1	2	-	-	-	-	-	-	-	-	3	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-	3	-
CO (Avg)	3	2	1.2	1.6	-	-	-	-	-	-	-	-	3	-

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

UNIT I	DESIGN THINKING HISTORY AND OVERVIEW	3
History of Design Thinking- Case study and Use cases- Importance of Design Thinking- benefits, Major Parts		
UNIT II	**KEY HABITS**	**3**
Introduction to Key Habits- Types - Avoid Common Anti-Patterns - Optimise for Success with These Habits - Introduction to Loop: Observe, Reflect, Make- Importance of Iteration-Drill down and do tomorrow		
UNIT III	**USER RESEARCH METHODS**	**3**
Importance of User Research - methods of User Research – Introduction to Make, Observe, Reflect Tools for Making		
UNIT IV	**USER FEEDBACK AND TEACHING**	**3**
User feedback - Different Types - Feedback Methods – Applications and its technologies		
UNIT V	**LOGISTICS AND APPLICATIONS**	**3**
Logistics: Room, Materials and Supplies and setting up the Room		
LIST OF EXPERIMENTS		**15**

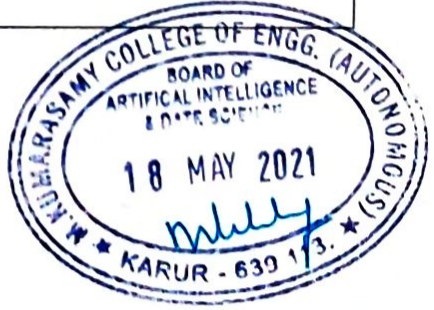
1. Listening
2. HMW (How Might We statements): User research Observe, Reflect and Ideation
3. Storyboarding
4. Crafting hills
5. Prototyping : Playbacks
6. User feedback:
7. Teaching

Text Book (s)

1	IBM Course ware

Reference (s)

1	Creative Confidence-Tom Kelley.,2013
2	Change by Design-Tim Brown.,2009
3	Design Thinking-Nigel Cross., Kindle Edition
4	The art of Innovation-Tom Kelly



Regulation 2018		Semester IV	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC206T	SOFTWARE ENGINEERING	3	0	0	3

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

1	Gain knowledge about the various phases in a software development life cycle.
2	Understand the basic of software requirements, project management and cost estimation.
3	Learn the metrics and models used to estimate the software quality and reliability.
4	Understand the various methodologies in software design using case tools.
5	Learn various testing strategies used to identify faults and failures in software development.

Course Outcome (s) (COs):

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

CO1	Explain the various phases in a software development life cycle.
CO2	Elucidate the software requirement specification and cost estimation for a project management.
CO3	Utilize the metrics and models for estimating the software quality and reliability.
CO4	Develop software using object oriented oase tools for a real time application.
CO5	Explain various testing techniques used in verification and validation of a software.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	1	-	3	-	3	1	3	1
CO2	3	3	2	2	2	1	1	-	3	-	3	2	3	2
CO3	3	3	3	2	2	1	1	-	3	-	3	2	3	2
CO4	3	3	3	2	2	1	1	-	3	-	3	2	3	2
CO5	3	3	2	2	2	1	1	-	3	-	3	2	3	2
CO (Avg)	3	2.8	2.2	2	2	0.8	1	-	3	-	3	1.8	3	1.8

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

UNIT I	INTRODUCTION	9
Programming in the Small vs. Programming in the Large; Software Project Failures and Importance of Software Quality and Timely Availability; Engineering Approach to Software Development; Role of Software Engineering Towards Successful Execution of Large Software Projects; Emergence of Software Engineering as a Discipline, Basic Concepts Of Life Cycle Models – Different Models And Milestones.		
UNIT II	**SOFTWARE PROJECT MANAGEMENT AND COST ESTIMATION**	**9**
Software Project Planning – Identification of Activities and Resources; Concepts of Feasibility Study; Techniques for Estimation of Schedule and Effort, Introduction to Software Requirements Specifications (SRS) and Requirement Elicitation Techniques; Techniques for Requirement Modelling – Decision Tables, Event Tables, State Transition Tables, Petri Nets, Requirements Documentation Through Use Cases. Software Cost Estimation Models and Concepts Of Software Engineering Economics; Techniques of Software Project Control and Reporting, Introduction to Measurement of Software Size; Introduction to the Concepts of Risk and its Mitigation; Configuration Management.		
Unit Iii	**SOFTWARE QUALITY AND RELIABILITY**	**9**
Internal and External Qualities; Process and Product Quality; Principles to Achieve Software Quality; Introduction to Different Software Quality Models Like McCall, Boehm Model. Introduction to Software Reliability, Reliability Models and Estimation, Introduction to Software Metrics and Metrics Based Control Methods, Measures of Code and Design Quality.		
UNIT IV	**OBJECT ORIENTED ANALYSIS, DESIGN AND CONSTRUCTION**	**9**
Introduction to UML, Concepts - Principles of Abstraction, Modularity, Specification, Encapsulation And Information Hiding; Concepts of Abstract Data Type; Class Responsibility Collaborator (CRC) Model; Quality of Design; Design Measurements; Concepts of Design Patterns; Refactoring; Object Oriented Construction Principles, Object Oriented Metrics.		
UNIT V	**SOFTWARE TESTING**	**9**
Introduction to Faults and Failures; Basic Testing Concepts; Concepts of Verificationand Validation; Black Box and White Box Tests; White Box Test Coverage – Code Coverage, Condition Coverage, Branch Coverage; Basic Concepts of Black-Box Tests – Equivalence Classes, Boundary Value Tests, Usage of State Tables; Testing Use Cases; Transaction Based Testing; Testing for Non-Functional Requirements – Volume, Performance and Efficiency; Concepts of Inspection.		

Text Book (s)	
1	Ian Sommerville, Software Engineering, Tenth Edition, Pearson Education, 2017
Reference (s)	
1	Ivar Jacobson, Object Oriented Software Engineering: A Use Case Driven Approach, First Edition, 2007.
2	Shari Lawrence Pfleeger and Joanne M. Atlee, Software Engineering: Theory and Practice, Fourth Edition, Pearson Education India, 2011.
3	Ivar Jacobson, Grady Booch, James Rumbaugh, The Unified Development Process, First Edition, Addison-Wesley, 2012.
4	Roger S. Pressman and Bruce Maxim, Software Engineering – A Practitioner's Approach, Ninth Edition, Mc Graw-Hill Education,.2019.

Regulation 2018		Semester IV	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC207J	OPERATING SYSTEMS AND VIRTUALIZATION	3	0	2	4

Prerequisite Course (s)

Data structures

Course Objective (s):

The purpose of learning this course is to:

1	To understand the basic concepts and functions of operating systems.
2	To understand Processes and Threads and Scheduling algorithms.
3	To understand the concept of Deadlocks.
4	To analyze various memory and storage management schemes.
5	To understand basic concepts of virtualization.

Course Outcome (s) (COs):

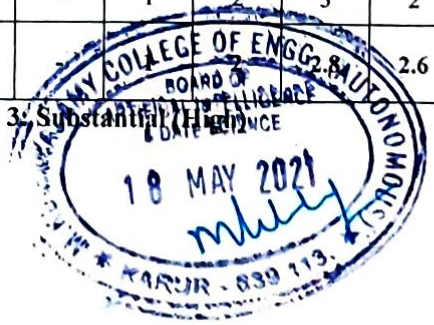
At the end of this course, learners will be able to:

CO1	Illustrate the operating system concepts and its functionalities.
CO2	Compare various CPU scheduling algorithms.
CO3	Explain the need for process synchronization.
CO4	Identify the issues in memory management.
CO5	Illustrate how to optimize the performance of virtualization.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2	-	-	-	-	-	1	1	2	3
CO2	3	2	3	2	3	-	-	-	-	-	1	2	3	3
CO3	3	2	2	3	3	-	-	-	-	-	1	2	3	3
CO4	3	2	2	2	3	-	-	-	-	-	1	3	3	2
CO5	3	2	2	3	2	-	-	-	-	-	1	2	3	2
CO (Avg)	3	2	2	3	3	-	-	--	-			2	2.8	2.6

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



UNIT I	INTRODUCTION	9
Introduction-History of Operating Systems-Operating System Structure – Operating System - Operations – Process Management – Memory Management – Storage Management – Protection and Security – Distributed Systems – Computing Environments – System Structures: Operating System Services – User Operating System Interface – System Calls – Types of System Calls – System Programs.		

UNIT II	PROCESS MANAGEMENT AND COORDINATION	9
Process Concept: Process Scheduling – Operations on Processes – Inter-process Communication. **Multithreaded Programming**: Overview – Multithreading Models – Threading Issues **CPU Scheduling**: Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Synchronization – The Critical-Section Problem – Peterson's Solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors.		

UNIT III	DEADLOCKS AND MEMORY MANAGEMENT	9
Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock **Memory Management Strategies**: Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Segmentation		

UNIT IV	VIRTUAL MEMORY AND STORAGE MANAGEMENT	9
Virtual Memory Management: Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing. **File System:** File Concept – Access Methods – Directory Structure – File Sharing – Protection - File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. **Secondary Storage Structure**: Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management. Devices – Device controllers- Device drivers.		

UNIT V	VIRTUALIZATION	9
Virtualization Concepts: Virtual machines - supporting multiple operating systems simultaneously on a single hardware platform - running one operating system on top of another - True or pure virtualization – Para virtualization – optimizing performance of virtualization system - hypervisor call interface		

LIST OF EXPERIMENTS	15
1. Study of LINUX - Basic Commands 2. Shell programming (Using looping, control constructs etc.,) 3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid 4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc). 5. Implementation of CPU scheduling algorithms: FCFS & SJF 6. Implementation of CPU scheduling algorithms: Round Robin & Priority Scheduling 7. Implement the Producer – Consumer problem using semaphores. 8. Implementation of Banker`s algorithm 9. Implement some memory management schemes (First fit, Best fit & Worst fit) 10. Implement some page replacement algorithms (FIFO & LRU)	

Text Book (s)	
1	Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts Essentials", John Wiley & Sons Inc., 2010.
Reference (s)	
1	Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
2	Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
3	D M Dhamdhere, " Operating Systems: A Concept-based Approach", Second Edition, Tata McGraw-Hill Education, 2007.
4	William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Prentice Hall, 2011.

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Regulation 2018		Semester IV	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC208J	DATABASE MANAGEMENT SYSTEMS	3	0	2	4

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	To infer the essentials of data models to intellectualize and illustrate a database system using ER diagram.
2	To conceptualize the relational database implementation using SQL with effective relational database design concepts.
3	To elaborate the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
4	To demonstrate Query evaluation and optimization techniques.
5	To signify the concepts of Database Security, Object Oriented, Data Warehousing and Data Mining.

Course Outcome (s) (COs):

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

CO1	Distinguish database systems from file systems and describe data models and DBMS architecture.
CO2	Identify the basic issues of transaction processing and concurrency control.
CO3	Demonstrate with understanding of SQL Programming language and normalization theory.
CO4	Practice the basic query evaluation techniques, query optimization and familiar with basic database storage structures and access techniques.
CO5	Analyze and derive an information model expressed in the form of an entity relation diagram and transform into a relational database schema.

CO-PO Mapping

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

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

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UNIT I	INTRODUCTION	9
Introduction to Database. Hierarchical, Network and Relational Models. Three-Schema Architecture and Data Independence– The Database System Environment– Data models: Entity-relationship model, network model, relational and object oriented data models, SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL.		
UNIT II	**RELATIONAL QUERY LANGUAGES AND DATABASE DESIGN**	**9**
Relational algebra, Relational Calculus, DDL and DML constructs. Relational Database Design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design.		
UNIT III	**TRANSACTION PROCESSING**	**9**
Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery		
UNIT IV	**PROCESSING & OPTIMIZATION**	**9**
Query Processing Overview – Algorithms for SELECT and JOIN operations - Evaluation of relational algebra expressions, Query equivalence, Query optimization algorithms.		
UNIT V	**DATABASE STORAGE STRATEGIES & SECURITY**	**9**
RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing Database Security: Authentication, Authorization and access control.		
Contents for Further Reading		
NoSQL: Overview and History of NoSQL Databases - Definition of the Four Types of NoSQL Database - Comparison of relational databases to new NoSQL stores -		
LIST OF EXPERIMENTS		**15**

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions.

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Text Book (s)	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 7th Edition, Tata McGraw Hill, March 2019.
2	R. Elmasri and S. Navathe ,"Fundamentals of Database Systems", Pearson 7th Edition,2017.
Reference (s)	
1	J. D. Ullman,"Principles of Database and Knowledge – Base Systems", Vol 1,Computer Science Press ,Inc. New York, 1998.
2	Gupta G K, "Database Management Systems", Tata McGraw Hill Education Private Limited, New Delhi, 2011
3	Serge Abiteboul, Richard Hull, VictorVianu ,"Foundations of Databases", Addison-Wesley Publishing Company, 1995.

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Regulation 2018		Semester IV	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC209T	DESIGN AND ANALYSIS OF ALGORITHMS	3	0	0	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	To know about different types of computing problem algorithms and learn how to analyze its efficiency.
2	To make the students understand how computing problems are solved using brute force and divide and conquer methods.
3	To know about problems solved using dynamic programming and greedy techniques
4	To make the students learn about iterative improvement method for problem solving
5	To make students understand the limitations of algorithms and learn about backtracking, branch and bound techniques.

Course Outcome (s) (COs):

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

CO1	Interpret the fundamental needs of algorithms in problem solving.
CO2	Classify the different algorithm design techniques for problem solving.
CO3	Develop algorithms for various computing problems.
CO4	Analyze the time and space complexity of various algorithms.
CO5	To identify the types of problem, formulate, analyze and compare the efficiency of algorithms.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	2	1	2	1
CO2	3	3	3	2	3	-	-	-	-	-	2	1	2	1
CO3	3	3	3	2	3	-	-	-	-	-	2	1	2	1
CO4	3	3	3	3	3	-	-	-	-	-	2	1	2	1
CO5	3	3	3	3	3	-	-	-	-	-	2	1	2	1
CO (Avg)	3	3	3	2.6	3	-	-	-	-	-	2	1	2	1

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

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UNIT I	INTRODUCTION	9
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis – Mathematical analysis for Recursive and Non-recursive algorithms – Visualization		
UNIT II	**BRUTE FORCE AND DIVIDE-AND-CONQUER**	**9**
Brute Force – Computing an– String Matching – Closest-Pair and Convex-Hull Problems - Exhaustive Search – Travelling Salesman Problem – Knapsack Problem – Assignment problem.Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex – Hull Problems.		
UNIT III	**DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**	**9**
Dynamic programming – Principle of optimality – Coin changing problem, Computing a Binomial Coefficient – Floyd's algorithm – Multi stage graph – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem – Prim's algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern – Huffman Trees.00		
UNIT IV	**ITERATIVE IMPROVEMENT**	**9**
The Simplex Method – The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.		
UNIT V	**COPING WITH THE LIMITATIONS OF ALGORITHM POWER**	**9**
Lower – Bound Arguments – P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem – Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search – Assignment problem – Knapsack Problem – Travelling Salesman Problem – Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.		

Text Book (s)

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

Reference (s)

1	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3	Donald E. Knuth, "The Art of Computer Programming", Volumes 1 & 3 , Pearson Education, 2009.
4	Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

Regulation 2018		Semester III	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
P	18AIP202L	MINOR PROJECT – II	0	0	2	1

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report.

Course Outcome (s) (COs):

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

CO1	Identify the requirement and develop the concepts or models through standard procedures and preparation of report.

CO-PO Mapping

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

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

Strategy(s)

- The Student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after comp0000leting the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department.

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Regulation 2018		Semester IV	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18MBM202L	CRITICAL AND CREATIVE THINKING SKILLS	0	0	2	1

Prerequisite Course (s)

NIL

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

1	To focus on listening, speaking, & writing skills through audio & video sessions.
2	To hone soft skill and analytical ability of students.
3	To overcome the fear in group communication and to provide the effective communication.
4	To expertise intelligible pronunciation, stress and intonation patterns.

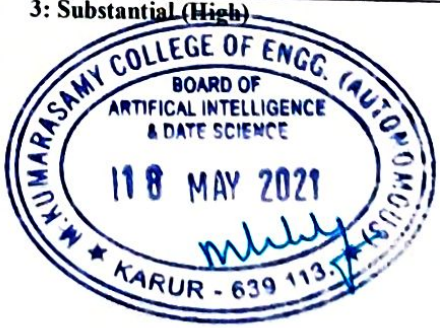
Course Outcome (s) (COs):
At the end of this course, learners will be able to:

CO1	Students can be able to solve both analytical and logical problems in an effective manner.
CO2	Students can demonstrate an ability to design and deliver messages.
CO3	The quality of student's communication with practical experience is improved.

CO-PO Mapping

Cos	Pos												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	1	-	-	-	-	2	1	1	-	1
CO2	3	1	2	1	2	-	-	-	-	2	1	1	-	1
CO3	3	1	1	1	1	-	-	-	-	2	1	1	-	1
CO (Avg)	3	1	1.67	1	1.33	-	-	-	-	2	1	1	-	1

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



UNIT I	**Module – 1**	**6**
Aptitude: Time and Work - Pipes and Cisterns. **Communication:** Sentence Pattern - Debate.		
UNIT II	**Module – 2**	**6**
Aptitude: Boats and Streams. **Communication:** Tenses and voices - Tech Talk.		
UNIT III	**Module – 3**	**6**
Aptitude: Problems on Ages - Probability **Communication:** Analogies - Biography.		
UNIT IV	**Module – 4**	**6**
Aptitude: Data sufficiency - Logical Puzzles. **Communication:** Punctuation - Connection.		
UNIT V	**Module – 5**	**6**
Aptitude: Mensuration. **Communication:** Preposition - News of the Week.		
Text Book (s)		
1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015	
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015	

Regulation 2018		Semester III / IV	Total Hours			15
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18LEM103T	INDIAN TRADITION AND HERITAGE	1	0	0	-

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

CLR-1:	Make students understand the role and impact of culture in human life.
CLR-2:	Draw attention towards languages and literatures of ancient period.
CLR-3:	Cultivate secularism in students.
CLR-4:	Equip students with the knowledge of Indian art and architectural evolution over years.
CLR-5:	Make students identify Indian culture in abroad.

Course Outcome (s) (Cos):

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

CO1	Understand the meaning of culture, trace the influence and significance of geographical features on Indian culture.
CO2	Develop an awareness of the variety of languages and literatures in India.
CO3	Recognise the characteristics of various religious movements in ancient India.
CO4	Identify the characteristics and various styles of Indian architecture and sculpture at different times.
CO5	Examine various modes through which Indian culture spread abroad.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	2	2	2	2	-	2	-	1
CO2	-	-	-	-	-	2	2	1	2	2	1	2	-	1
CO3	-	-	-	-	-	1	1	1	1	1	1	1	-	1
CO4	2	2	2	2	2	2	2	2	2	2	1	2	-	1
CO5	-	-	-	-	-	2	2	2	2	2	-	2	-	1
CO (Avg)	0.4	0.4	0.4	0.4	0.4	1.8	1.8	1.6	1.8	1.8	0.67	1.8	-	1

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

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UNIT I	HISTORY OF INDIAN CULTURE	2
Characteristics of Indian Culture - Significance of Geography on Indian Culture -Society in India through ages- Ancient Period - Varna and Jati, family and marriage in India - Position of women in ancient India- Contemporary period; Caste system and communalism.		
UNIT II	**LITERATURE AND EDUCATION**	**4**
Evolution of script and languages in India : Harappan Script and Brahmi Script, Short History of the Sanskrit Literature: The Vedas, The Brahmanas and Upanishads and Sutras, Epics: Ramayana and Mahabharata & Puranas - History of Buddhist and Jain Literature in Pali, Prakrit and Sanskrit, Sangam Literature and Odia Literature.		
UNIT III	**RELIGION AND PHILOSOPHY**	**4**
Religion and Philosophy in India: Ancient Period: Pre-Vedic and Vedic Religion, Buddhism and Jainisim, Indian Philosophy - Vedanta and Mimansa school of Philosophy.		
UNIT IV	**ART AND ARCHITECTURE**	**2**
Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Budhhist Architecture, Medieval Architecture and Colonial Architecture, Indian Painting Tradition, Performing Arts: Divisions of Indian classical music: Hindustani and Carnatic, Dances of India, Rise of modern theatre and Indian cinema.		
UNIT V	**SPREAD OF INDIAN CULTURE ABROAD**	**3**
Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies, Indian Culture in South East Asia, India, Central Asia and Western World through ages.		
Reference (s)		
1	Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): *The Trading World of the Indian Ocean, 1500-1800* (*History of Science, Philosophy and Culturein Indian Civilization,* ed. by D.P. Chattopadhyaya, vol. III, 7), Pearson, Delhi, 2012.	

M.KUMARASAMY COLLEGE OF ENGG. (AUTONOMOUS)
BOARD OF ARTIFICAL INTELLIGENCE & DATE SCIENCE
18 MAY 2021
KARUR - 639 113

Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC301J	MACHINE LEARNING AND AI SERVICES	2	0	2	3

Prerequisite Course (s)

Advance Python

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

1	To understand the basic theory underlying machine learning.
2	To be able to formulate machine learning problems corresponding to different applications
3	To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
4	To Understand the basic principles, techniques, and applications of Artificial Intelligence.
5	Investigate applications of AI techniques in expert systems, artificial neural networks and other machine learning models.

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

CO1	Understand a very broad collection of machine learning algorithms and problems
CO2	Apply structured thinking to unstructured problems
CO3	Develop an appreciation for what is involved in learning from data.
CO4	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO5	Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	1	-	-	-	-	-	2	3	1
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	1
CO3	3	3	3	2	2	-	-	-	-	-	-	-	3	1
CO4	3	2	2	1	1	2	-	-	-	-	-	1	3	1
CO5	3	2	3	2	2	1	-	-	-	-	-	1	3	1
CO (Avg)	3	2.6	2.2	1.6	1.6	0.8	-	-	-	-	-	1	3	1

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

UNIT I	INTRODUCTION TO MACHINE LEARNING	6
Machine learning Introduction - Types of Machine learning - Supervised, Unsupervised and reinforcement - Over fitting and Linear Regression – Classification - Parametric vs non Parametric models - Linear models		
UNIT II	**CLUSTERING AND REGRESSION MODELS**	**6**
Hierarchical clustering - K-Means clustering - Logistic Regression - Bayesian Classifier - Support Vector Machines - Model evaluation Methods - Maximum Likelihood estimation (least squares) - Measuring (dis)similarity - Evaluating the output of clustering method		
UNIT III	**TREE LEARNING**	**6**
Directed and Undirected trees - Decision tree representation-Basic decision tree learning algorithm - Issues in decision tree - Classification and regression trees(CART) - Random forest - Multivariate adaptive regression trees(MART)		
UNIT IV	**MACHINE LEARNING USING WATSON**	**6**
Introduction to Watson - Prebuilt Watson application - Watson API's - Watson Solutions – Watson Studio – Watson Studio Components - Watson knowledge studio and catalog - Watson Discovery Services - Watson Auto AI - Watson OpenScale		
UNIT V	**NATURAL LANGUAGE PROCESSING**	**6**
NLP Introduction - Natural language Understanding (NLU) - Conversational AI - Building blocks of chatbot - Watson Assistant - Speech to Text - Text to speech		
Case Study :		
LIST OF EXPERIMENTS		**15**
1. Group the similar data items using the ML algorithm. 2. Implement k-Nearest Neighbour algorithm to classify the iris data set. 3. Construct a Bayesian network considering student data. 4. Implement a K-Means Clustering 5. Create a chart bot for student help center college. 6. Create a model to Convert Audio note to Text by using Watson API. 7. Analyse the Airbnb(client review) Data using Watson Discovery		
Text Book (s)		
1	IBM Course ware	
Reference (s)		
1	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.	
2	Tom Mitchell, "Machine Learning", McGraw-Hill, 2013.	
3	AI as a Service ,Peter Elger, Eóin Shanaghy, Manning Publications, 2020.	

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Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC302J	DATA ANALYTICS AND BUSINESS INTELLIGENCE	2	0	2	3

Prerequisite Course (s)

Python and any reporting tool

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

1	Understand Data analytics in the real world.
2	Apply data Analysis concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively,
3	Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.
4	Identify, model and solve decision problems in different settings.
5	Create viable solutions to decision making problems

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

CO1	Describe the concepts and components of Data Analytics.
CO2	Develop the ability to build and assess data-based models.
CO3	Understand and use the technologies and tools that make up BI (e.g., Data warehousing, Data reporting and use of Online analytical processing (OLAP)).
CO4	Understand and design the technological architecture that underpins BI systems.
CO5	Plan the implementation of a BI system.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	1	-	-	-	-	-	1	3	2
CO2	3	2	2	2	2	-	-	-	-	-	-	1	3	2
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO4	3	2	2	1	1	1	-	-	-	-	2	1	3	2
CO5	3	2	3	2	2	1	-	-	-	-	-	1	3	2
CO (Avg)	3	2.4	2.2	1.6	1.6	0.6	-	-	-	-	0.4	1	3	2

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

UNIT I	OVERVIEW OF ANALYTICS AND DECISION SUPPORT	6
Introduction to Data Analytics-Ways to use Data Analytics-Process steps-Data Analytics Tools-Applications-Types of Analytics-Case study- Phases of the Decision, Making Process -Decision Support Systems: Capabilities, Classification, components.		
UNIT II	**DATA ANALYTICS USING PYTHON**	**6**
Python Libraries for Data Analytics -Numpy for N-Dimensional arrays-Pandas for Mathematical operation and manipulate data -Matplotlib for Plotting Data - Scipy for scientific computing-Scikit-Learn for build analytics model.		
UNIT III	**OVERVIEW OF IBM COGNOS BI**	**6**
Introduction to the reporting application-examine report studio and its interface- explore- format-group and sort list reports- options for aggregating data- report with repeated data		
UNIT IV	**FOCUS REPORTS USING FILTERS, CROSSTAB AND GRAPHS**	**6**
Filters to narrow the focus of reports-detail and summary filters- filters on aggregate data-format and sort crosstab reports- list to a crosstab-crosstabs using unrelated data items-complex crosstabs using drag and drop functionality-charts containing peer and nested items-present data using different chart type -add context - Create and reuse custom chart palettes.		
UNIT V	**CALCULATION AND CONDITIONAL FORMATTING**	**6**
Calculations based on data - add run-time information - expressions using functions- highlight exceptional data-show and hide data- conditionally render objects in reports-conditionally format one crosstab measure - multilingual reports-highlight exceptional data-conditionally rendered column-conditionally format one crosstab measure based on another		
LIST OF EXPERIMENTS		**15**

1. To Perform exploratory data analysis using Pandas and Matplotlib library functions to manipulate and visualize the data and find insights.
2. Explore IBM Cognos BI and Create List Reports.
3. Focus Reports using Filters .
4. Create Crosstab Reports .
5. Present Data Graphically.
6. Focus Reports using Prompts.
7. Extend Reports using Calculations.

Text Book (s)

1	IBM Course ware

Reference (s)

1	Foster Provost, Tom Fawcett-Data Science for Business-August 2013
2	Sangeeta Gautam - IBM Cognos Business Intelligence v10: The Complete Guide (IBM Press) 1st Edition (2012).
3	Dan Volitich and Gerard Ruppert - IBM Cognos Business Intelligence 10: The Official Guide (India) Private Ltd, 2012

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Regulation 2018		Semester V	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC303J	COMPUTER NETWORKS	3	0	2	4

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

1	To develop an understanding of computer networking basics.
2	To introduce the basic taxonomy and terminology of computer networking.
3	To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications
4	To build an understanding of the fundamental concepts of computer networking
5	To introduce advanced networking concepts.

Course Outcome (s) (Cos):

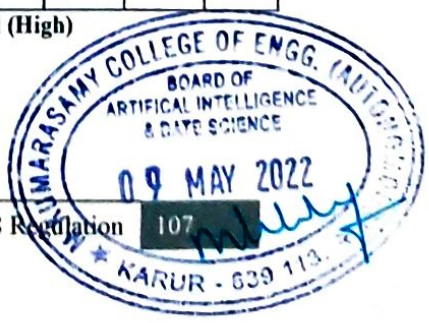
At the end of this course, learners will be able to:

CO1	Explain data communication system, components and the purpose of layered architecture.
CO2	Illustrate the functionality of each layer of OSI and TCP/IP reference model.
CO3	Explain the data link layer and network layer protocols.
CO4	Outline the functions of transport layer protocols.
CO5	Summarize application layer protocols.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	1	1	3	1
CO2	3	3	3	3	3	-	-	-	-	-	1	1	3	1
CO3	3	3	3	3	3	-	-	3	-	-	1	1	3	2
CO4	3	3	3	3	3	-	-	-	-	-	1	1	2	3
CO5	3	3	3	3	3	-	-	-	-	1	1	1	3	3
CO (Avg)	3	3	3	3	3	-	-	0.6	-	0.2	1	1	3	2

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



UNIT I	DATA COMMUNICATIONS	9
Data Communication- Networks-The OSI Model- Layers in the OSI Model – TCP/IP Protocol Suite – Addressing – Transmission Media.		
UNIT II	**DATA LINK LAYER**	**9**
Link and Medium Access protocols – Framing – Error Detection – Reliable Transmission – IEEE 802 Standards – Ethernet – Token Rings – Wireless LANs.		
UNIT III	**NETWORK LAYER**	**9**
Circuit Switching – Packet Switching – Switching and Forwarding – Bridges and LAN Switches – Cell Switching – Internetworking – Routing Techniques: Distance vector (RIP) – Link state (OSPF) – Subnetting – CIDR- BGP - IPv6.		
UNIT IV	**TRANSPORT LAYER**	**9**
UDP – TCP – Congestion Control and Resource Allocation –TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service- Integrated Services – Differentiated Services.		
UNIT V	**APPLICATION LAYER**	**9**
Domain Name System – Electronic Mail – File Transfer- WWW and HTTP-Network Management System – Simple Network Management Protocol.		
LIST OF EXPERIMENTS		**15**

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Write a code simulating PING and TRACEROUTE commands
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting
8. Applications using TCP Sockets like

a. Echo client and echo server

b. Chat

c. File Transfer

9. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.

a. Link State routing

b. Flooding

c. Distance vector

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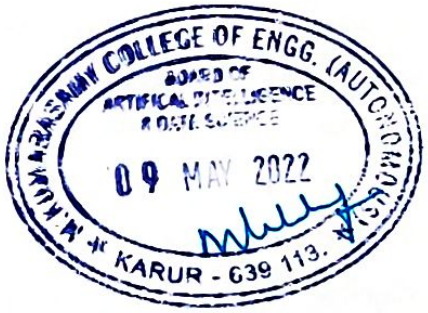
Text Books	
1	Larry Peterson, Bruce Davie, "Computer Networks: A Systems Approach", Elsevier, Online Edition, 2019.
2	William Stallings, Data and Computer Communications, Tenth Edition, Prentice Hall, 2014.
Reference (s)	
1	James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Pearson Education, Seventh Edition, 2017.
2	Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, Second Edition, 2015.
3	Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach ", McGraw Hill Publisher, 2011.
4	Behrouz A. Forouzan, Data Communication and Networking, Fifth Edition, McGraw Hill Education (India) Private Limited, 2013.
Web References	
1	http://nptel.ac.in/courses/106105081



Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC304T	EMBEDDED SYSTEMS WITH AI	3	0	0	3

Prerequisite Course (s)

- Basic concepts of Digital and Logical Circuits and AI

Course Objective (s):

The purpose of learning this course is to:

1	Understand how engineering processes can be applied in the real world.
2	Rely on AI powered computer vision for safely interacting with their environment.
3	Understanding Embedded AI Applications & Implementation over it
4	Detect vulnerabilities in programs is what makes advances in machine learning so special
5	Have a basic understanding of some of the more advanced topics of AI

Course Outcome (s) (COs):

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

CO1	Understand the concepts of embedded systems and its design processes
CO2	Aware about the embedded platforms, architectures and its functionalities
CO3	Apply and analyse the Embedded Programming Strategies & aspects
CO4	Identify and apply the strategies followed on embedded systems into the AI applications
CO5	Identify and apply various AI designing applications in real world applications

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	-	-	-	2	-	1	1	2	2
CO2	3	2	2	2	2	-	-	-	2	-	1	1	2	2
CO3	3	3	2	2	3	-	-	-	2	-	2	2	2	2
CO4	3	3	3	3	3	-	-	-	3	-	2	2	3	3
CO5	3	3	3	3	3	-	-	-	3	-	2	2	3	3
CO (Avg)	3	2.8	2.4	2.6	2.6	-	-	-	2.4	-	1.2	1.6	2.4	2.4

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

UNIT I	INTRODUCTION TO EMBEDDED SYSTEMS	9
Introduction – Overview - Design Process - Embedded System Architecture - Instruction Set Architecture - Basic Embedded Processor/Microcontroller Architecture - Memory System Architecture - I/0 Sub-system - Co-processors and Hardware Accelerators - Processor Performance Enhancement - CPU Power Consumption		
UNIT II	**DESIGNING EMBEDDED COMPUTING PLATFORM**	**9**
CPU Bus - Memory Devices and their Characteristics - I/O Devices - Component Interfacing - Designing with Processors – Implementation - Development Environment - Debugging Techniques - Manufacturing and Testing - Design Examples		
UNIT III	**PROGRAMMING EMBEDDED SYSTEMS**	**9**
Program Design - Programming Languages - Multi-tasking and Task Scheduling - Timing Specifications - Run-time Exception handling - Use of High-Level Languages - Programming and Run-time Environment - Basic Compilation Techniques - Analysis and Optimization of Execution Time, Energy and Power, Program Size - Program Validation and Testing		
UNIT IV	**EMBEDDED ARTIFICIAL INTELLIGENCE: SYSTEMS AND APPLICATIONS**	**9**
Artificial Intelligence, Machine Learning, Deep learning and Convolution Neural Network Processing of ML, DL, CNN and RNN in Embedded AI – Edge AI & Cloud AI - Embedded AI hardware and software development – Embedded AI Applications		
UNIT V	**DESIGNING OF AI APPLIANCES**	**9**
AI Robotics: Communicating between robots – Program modelling and programming in RTOS - Applications of Embedded systems in RFID and Finger Scan (Case Study) – Case study of Mobile phone software for Key inputs		

Text Book (s)

1	Raj Kamal "Embedded Systems - SoC, IoT, AI and Real-Time Systems", Tata McGraw Hill Education Private Limited, 4th Edition, 2020.
2	Lyla B Das, "Embedded Systems", Pearson Education, 1st Edition, 2012.

Reference (s)

1	Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley & Sons, 3rd Edition, 2006.
2	David E. Simon, "An Embedded Software Primer", Addison-Wesley, 1st Edition, 1999.
3	Wayne Wolf, "Computers as Components, Principles of Embedded Computing Systems Design", Elsevier, 2nd Edition, 2009.
4	Shibu K.V, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, 2nd Edition, 2009.

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Regulation 2018		Semester V	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
P	18AIP301L	MINOR PROJECT – III(AI and DS using Python)	0	0	2	1

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report.

Course Outcome (s) (COs):

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

CO1	Identify the requirement and develop the concepts or models through standard procedures and preparation of report.

CO-PO Mapping

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

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

Strategy(s)

- The Student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after comp0000leting the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department.

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BOARD OF ARTIFICAL INTELLIGENCE & DATE SCIENCE
09 MAY 2022
KARUR - 639 113.

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

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:

CO1	Solve both analytical and logical problems in a fruitful manner
CO2	Organize and convey the information in such an incomparable way
CO3	Improve their presentation skills

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	-	-	-	-	-	-	-	-	2	-	-	-			
CO3	-	-	-	-	-	-	-	-	-	2	-	-			
CO4	-	-	-	-	-	-	-	-	-	-	-	-			
CO5	-	-	-	-	-	-	-	-	-	-	-	-			
CO (Avg)	3.00	-	-	-	-	-	-	-	2.00	2.00	-	-			

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

UNIT I	Module - 1	6
Aptitude: Alligations or Mixtures - Blood Relations. **Communication:** How to set Goals - Interpersonal Relationships - JOHARI Window - Work & Business Etiquette		
UNIT II	**Module - 2**	**6**
Aptitude: Partnership - Statement and Assumptions. **Communication:** Transition to Corporate World - Career opportunities in Various Sectors and know your industry.		
UNIT III	**Module - 3**	**6**
Aptitude: Arithmetic and Geometric Progressions - Syllogisms. **Communication:** Time Management - Anger and Stress Management - Conflict Management.		
UNIT IV	**Module - 4**	**6**
Aptitude: Permutations and Combinations - Statements & Conclusions. **Communication:** Launch a Product - Telephonic Etiquette.		
UNIT V	**Module - 5**	**6**
Aptitude: Geometric Problems. **Communication:** Presentation Skills - Oral presentation and public speaking skills, Business presentations.		

Text Book (s)

1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015

Regulation 2018		Semester V/ VI	Total Hours			15
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18LEM301T	INDIAN ART FORMS (Common to all UG Programmes)	1	0	0	-

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

CLR-1	Introduce the learners to various art forms and whet their aesthetics sense.
CLR-2	Improve learners' knowledge on history of theatre and drama and draw connections between theatrical practices and social contexts in both modern and pre modern periods..
CLR-3	Enable the learners to identify and understanding various types of dance and music concepts
CLR-4	Make learners explore the diversity of Architecture, Sculpture, Painting and its intersection with community, culture and society.
CLR-5	Make students to get familiarized with the formal, historical, and theoretical aspects of literary arts.

Course Outcome (s) (COs):

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

CO1	Identify aesthetics traits found throughout Indian art.
CO2	Demonstrate understanding of the social and artistic movements that have shaped theatre and dance.
CO3	Recognize different concepts involved in music and dance.
CO4	Identify and appreciate the salient features and various styles of Indian Architecture, Sculpture and Painting at different times.
CO5	Demonstrate a broad understanding of Indian literary arts and appreciate the role that historical context plays in the creation and interpretation of literary works

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	1	1	2	2	2	-	2	-	-	-
CO2	-	-	-	-	-	1	1	2	2	1	-	2	-	-	-
CO3	-	-	-	-	-	1	1	2	2	1	-	2	-	-	-
CO4	-	-	-	-	-	1	1	2	2	2	-	2	-	-	-
CO5	-	-	-	-	-	1	1	2	2	2	-	2	-	-	-
CO (Avg)	-	-	-	-	-	1	1	2	2	1.6	-	2	-	-	-

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

UNIT I	**INDIAN ARTS**	**3**
Introduction to art (aesthetics, taste)- fine arts - applied arts –Terminology - Subject matter -Art as propaganda - Purposes/uses of art.		
UNIT II	**THEATRE & DRAMA**	**3**
History of Theatre and Drama- Traditional Theatre forms- Modern Theatre and its characteristics- Puppetry –different forms and elements of drama.		
UNIT III	**MUSIC AND DANCES**	**3**
Origin of Music and Dance- Classical music and Carnatic Music- Regional Music -Musical Instruments-Regional Classical Dances.		
UNIT IV	**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 V	**LITERARY ARTS**	**3**
Ancient Indian Literature- Early Dravidian Literature- Medieval Literature- Modern Indian Literature-Contemporary Literature.		

Text Book (s)

	NIL

Reference (s)

1	Dhar, Parul Pandya, ed., 2011, Indian Art History Changing Perspectives, New Delhi: D.K. Print world and National Museum Institute (Introduction).
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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Approved By
Board of Science & Humanities
0 NOV 2020
KARUR - 639

Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC305J	DEEP LEARNING MODELS	2	0	2	3

Prerequisite Course (s)

Advance Python and Basics of Machine Learning

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

1	To understand the Concepts of Advanced machine learning.
2	To understand the Various operations of Deep learning.
3	To apply the algorithms to implement Neural net models.
4	To understand the techniques of Decision theory.
5	Investigate applications of Multilayer perceptron, CNN and RNN

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

CO1	Understand collections of Advanced learning algorithms.
CO2	Identify the Deep learning Algorithm which is more appropriate for various types of learning tasks.
CO3	Understand Mathematics behind Learning Algorithms.
CO4	Apply basic principles of neural network to solve the problems in real time applications.
CO5	Demonstrate Deep learning Application in Tensor flow and keras.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	-	-	-	-	-	-	-	3	2
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	2
CO3	3	3	3	2	1	-	-	-	-	-	-	-	3	2
CO4	3	2	2	1	1	1	-	-	-	-	2	1	3	2
CO5	3	2	3	2	1	1	-	-	-	-	-	-	3	2
CO (Avg)	3	2.6	2.6	1.8	1	0.4	-	-	-	-	0.4	0.2	3	2

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

UNIT I	MACHINE LEARNING & DEEP LEARNING	9
Machine Learning - Deep Learning - Difference between Machine Learning and Deep Learning - Machine Learning process - preliminaries, testing Machine Learning algorithms, turning data into Probabilities, and Statistics for Machine Learning - Probability theory – Probability Distributions – Decision Theory.		
UNIT II	**NEURAL NETWORKS**	**9**
Biological motivation for Neural Network - Neural network Representation - Applications - Perceptron - Backpropagation(first Phase and Second Phase)		
UNIT III	**MULTILAYER PERCEPTRONS AND DEEP LEARNING**	**9**
Introduction to Deep Learning-Applications-Multilayer Perceptron-Convolutional neural network-Recurrent neural network-Hybrid Neural network.		
UNIT IV	**MODEL IMPLEMENTATION USING TENSORFLOW**	**9**
Tensorflow Introduction - Tensor Data Structure - Various Dimensions - Tensor handling and Manipulation - Tensor flow implementation of CNN and RNN - Tensor flow - Word Embedding		
UNIT V	**IMAGE RECOGNITION**	**9**
Image Classification - Tensor flow features - import tensor or other libraries - Pickle - Sklearn - Explore Dataset - Load data using Keras Utility - Visualize the data.		
LIST OF EXPERIMENTS		**15**

1. Decision tree Classification using Scikit Learn.
2. Theano for computing a Logistic function.
3. Calculate Data Loss using Tensor.
4. Classify Handwritten digits using MNIST dataset .
5. Image Manipulation using Scipy.
6. Predict the color red or white using keras.
7. Classify objects using Tensor flow.

Text Book (s)

1	IBM Course ware

Reference (s)

1	Deep Learning From Scratch: Building with Python from First Principles by Seth Weidman, Shroff/O'Reilley Publishers,September 2019
2	Deep learning in Python/ PyTorch by Manning Publications,July 2020
3	Deep Learning by Andrew W. Trask published by Manning Publications,January 2019

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Regulation 2018		Semester VI	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC306J	ANALYTICS IN CLOUD COMPUTING	3	0	2	4

Prerequisite Course (s)

Computer Networks

Course Objective (s):

The purpose of learning this course is to:

1	Understand the protocols and mechanisms necessary to support cloud computing.
2	Understand the architecture and features of different cloud models.
3	Analyze the basic concepts of virtualization technology to derive the best practice model for deploying cloud-based applications.

Course Outcome (s) (Cos):

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

CO1	Understand the different types of cloud models and services for building an efficient cloud computing environment.
CO2	Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud.
CO3	Analyze the key concepts of cloud storage for load balancing in cloud architecture.
CO4	Understand the concept web services in cloud applications
CO5	Explore the cloud security concerns and examine the risks involved in cloud security.

CO-PO Mapping

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

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

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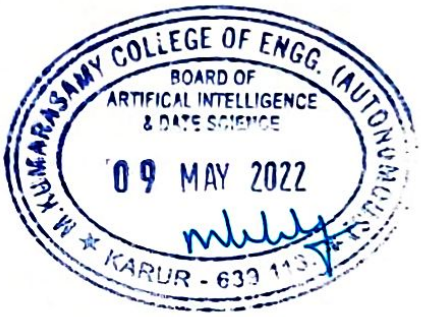
UNIT I	INTRODUCTION TO CLOUD COMPUTING	9
Introduction to Cloud Computing - The NIST Cloud Reference Model- Architectural Design Challenges- Deployment Models-Service Models-Essential Characteristics - Benefits - Measuring Cloud Computing Costs.		
UNIT II	**CLOUD ENABLING TECHNOLOGIES**	**9**
Service Oriented Architecture - REST and Systems of Systems - Web Services - Publish Subscribe Model – Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU - Memory - Network- I/O Devices- Application - Virtualization Support - Disaster Recovery		
UNIT III	**ANALYTICS IN CLOUD**	**9**
Introduction to Cloud Analytics - Working with Models - Benefits – Challenges - Analytics as a service. Analytical Tools in Cloud: Google Web Services (BigQuery, DataPrep, Data Proc) - Amazon web services(Athena, Cloud Search, Kinesis) - Microsoft Azure services(Synapse, Databricks).		
UNIT IV	**VISUALIZATION IN CLOUD**	**9**
Data Visualization- Types- Methods- Benefits-Challenges – Introduction to Google Charts, Tableau, Whatagraph, Sisense, Wrapper, Infogram, Chartblocks.		
UNIT V	**TOOLS IN CLOUD FOR REAL TIME SIMULATIONS**	**9**
Introduction to Cloud Simulator - CloudSim Architecture (User code, CloudSim, GridSim, SimJava) - Understanding Working platform for CloudSim - Introduction to GreenCloud - Cloud APIs		
FOR FURTHER READING		
Cloud evolution- Data center requirements- VMware virtualization- Google Infrastructure- Google Cloud Security, Case study on Amazon, Google and IBM cloud services		

List of Experiments

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8. Install a C compiler in the virtual machine and execute a sample program.
2. Install Bare Metal Hypervisor and create different VMs loaded with different flavours of OS on top of Baremetal Hyperviosr.
3. Configure internetworking Components.
4. Setting up Google Cloud & Big Query Environment and Create a project on Google Cloud Platform's one of the Analytics services named as Big Query.
5. Install and configure MySQL Server/MariaDB in the virtual machine and Access/Connect the database through SQLYOG.
6. Install Google App Engine. Create hello world app and other simple web applications using python/java
7. Show the virtual machine migration from one node to the other.
8. Write a program to use the API of Hadoop to interact with it.
9. Install and configure two different visualization tools in cloud and Visualize using different data sets.
10. Study and Install Cloud Sim. create different nodes and VMs. Perform VM Migration between the hosts.

Text Books	
1	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009., CRC Press, 2017
2	Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
References	
3	Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2014.
4	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
5	Ronald L.Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2013.
Web References	
1	https://www.edureka.co/blog/hadoop-tutorial/
2	https://www.simplilearn.com/tutorials/hadoop-tutorial
3	https://www.pragimtech.com/blog/cloud/cloud-tutorial-for-beginners/



Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIC307T	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3

Prerequisite Course (s)

Computer Networks

Course Objective (s):

The purpose of learning this course is to:

1	To understand the difference between stream ciphers & block ciphers, explain the encryption and decryption, present an overview of DES,. Triple DES, Blowfish, IDEA
2	Presents the basic principles of public key cryptography, distinct uses of public key cryptosystems.
3	Know the overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature
4	To learn an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches,
5	Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques

Course Outcome (s) (Cos):

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

CO1	Explain various classical encryption techniques.
CO2	Understand block ciphers and write Symmetric key cryptographic algorithms.
CO3	Apply Cryptographic Hash Functions & and verify messages using well known signature generation and verification algorithms.
CO4	Discuss User Authentication, Transport Layer Security & Email Security
CO5	Describe IP Security & Intrusion Detection Systems

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	2	-	-	1	2	3	2
CO2	3	3	3	3	3	-	-	2	-	-	1	2	3	2
CO3	3	3	3	3	3	-	-	1	-	-	1	2	3	2
CO4	2	3	3	3	3	-	-	3	-	-	1	2	3	2
CO5	2	3	3	3	3	-	-	2	-	-	1	2	3	2
CO (Avg)	2.6	3	3	3	3	-	-	2	-	-	1	2	3	2

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

UNIT I	Classical Encryption Techniques	9
Introduction: Security attacks, services & mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Cyber threats and their defense(Phishing Defensive measures, web based attacks, SQL injection & Defense techniques), Buffer overflow & format string vulnerabilities, TCP session hijacking(ARP attacks, route table modification) UDP hijacking (man-in-the-middle attacks).		
UNIT II	**Block Ciphers & Symmetric Key Cryptography**	**9**
Traditional Block Cipher Structure, DES, Block Cipher Design Principles, AES-Structure, Transformation functions, Key Expansion, Blowfish, CAST-128, IDEA, Block Cipher Modes of Operations		
UNIT III	**Number Theory & Asymmetric Key Cryptography**	**9**
Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms. Public Key Cryptography: Principles, public key cryptography algorithms, RSA Algorithms, Diffie Hellman Key Exchange, Elgamal encryption & decryption, Elliptic Curve Cryptography.		
UNIT IV	**Cryptographic Hash Functions & Digital Signatures**	**9**
Application of Cryptographic hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures, NIST Digital Signature Algorithm. Key management & distribution.		
UNIT V	**IP Security & Intrusion Detection Systems**	**9**
IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management. Intrusion detection: Overview, Approaches for IDS/IPS, Signature based IDS, Host based IDS/IPS.		

Text Books	
1	Cryptography & Network Security: Principles and Practice, William Stallings, Pearson, Seventh edition, 2017.
2	Introduction to Computer Networks & Cyber Security, Chwan Hwa Wu, J.David Irwin, CRC press, 2016
3	Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech, Second Edition, 2002.
Reference (s)	
1	Everyday Cryptography, Fundamental Principles & Applications, Keith Martin, Oxford Publication, 2017
2	Network Security & Cryptography, Bernard Menezes, Cengage, 2010
Web References	
1	https://www.geeksforgeeks.org/cryptography-and-its-types/
2	https://nptel.ac.in/courses/106105031

Regulation 2018		Semester VI	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
P	18AIP302L	MINOR PROJECT – IV	0	0	2	1

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report.

Course Outcome (s) (COs):

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

CO1	Identify the requirement and develop the concepts or models through standard procedures and preparation of report.

CO-PO Mapping

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

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

Strategy(s)

- The Student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after comp0000leting the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department.

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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

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:

CO1	Solve both analytical and logical problems in a productive manner
CO2	Launch their ability of comprising and delivering the information
CO3	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.

Text Book (s)

1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015.

Regulation 2018		Semester V/VI	Total Hours			15
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18LEM302T	SELF DEVELOPMENT AND ENTREPRENEURSHIP	1	0	0	Nil

Prerequisite Course (s)

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:

CO1	Identify entrepreneurial quality.
CO2	Know the entrepreneurial support agencies.
CO3	Prepare project setup planning and project report
CO4	Select appropriate agencies for technical and financial support.
CO5	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	-	-
CO2	-	1	-	-	-	2	1	1	1	2	2	1	-	-
CO3	1	3	-	-	-	-	2	1	1	1	2	1	-	-
CO4	-	1	-	-	-	1	2	1	1	1	2	1	-	-
CO5	2	1	-	-	-	-	1	-	1	1	1	1		
CO (Avg)	1.50	1.50	-	-	-	1.33	1.50	1.00	1.00	1.20	1.60	1.00		

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

UNIT I	**INTRODUCTION TO SELF-EMPLOYMENT AND ENTREPRENEURSHIP DEVELOPMENT**	6
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 II	**ENTREPRENEURIAL SUPPORT AGENCIES**	6
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 III	**PROJECT SET UP PLANNING**	6
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 IV	**PROJECT PROPOSAL PLANNING**	6
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 V	**ENTERPRISE AND RISK MANAGEMENT**	6
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.		

Reference (s)

1	Entrepreneurship & Venture Management, Clifford and Bombak, JosephR.Momanso.
2	Small Industries management – Karmakar.M.B.
3	Creativity –Pradeep Khandwala
4	Entrepreneurship development and Management, R.K.Singal, S.K.Kataria Sons.

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PROFESSIONAL ELECTIVES

Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE001T	R PROGRAMMING FOR MACHINE LEARNING	3	0	0	3

Prerequisite Course (s)

Basic concepts of programming language

Course Objective (s):

The purpose of learning this course is to:

1	Learn to run/execute the code without any compiler
2	Perform calculations with the applications of R vectors
3	Perform import and export operations of web library files
4	Develop web apps which would be more beneficial for data visualization
5	Enhance the learning through industrial standards and research

Course Outcome (s) (COs):

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

CO1	Understand about the importance of R Programming
CO2	Enforce the various data types into R applications
CO3	Import and manipulate the data using web files
CO4	Study about the use of conditional statements & functions and applying concepts
CO5	Visualize and model the data using statistical analysis

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	2	1	-	-	-	-	1	1	2	1
CO2	2	2	2	2	2	1	-	-	-	-	1	1	2	1
CO3	3	3	3	3	3	1	-	-	-	-	1	1	3	2
CO4	3	3	3	3	3	1	-	-	-	-	1	1	3	2
CO5	3	3	3	3	3	1	-	-	-	-	1	1	3	2
CO (Avg)	2.6	2.6	2.6	2.4	2.6	1	-	-	-	-	1	1	2.6	2.6

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

UNIT I	**INTRODUCTION**	**9**
Data Analysis, Data Analytics and Data Science - Business Decisions - Case study of Walmart - Various analytics tools – Descriptive – Predictive - Web Analytics - Google Analytics - R and features - Evolution of R - Big data Hadoop and R		
UNIT II	**DATA TYPES**	**9**
R & R Studio Installation – Scalar – Vectors – Matrix – List - Data frames – Factors - Handling data in R - Conversion of data types - Operators in R		
UNIT III	**IMPORTING & MANIPULATING DATA**	**9**
CSV files - Database data (Oracle) - XML files - JSON files - Reading & Writing PDF files - Reading & Writing JPEG files - Saving Data in R – Cbind – Rbind – Sorting – Aggregating - dplyr		
UNIT IV	**CONDITIONAL STATEMENTS AND FUNCTIONS, STATISTICAL CONCEPTS**	**9**
If …else - For loop - While loop - Repeat loop - Apply() - sApply() - rApply() – tApply Descriptive Statistics - Inferential Statistics - Central Tendency (Mean,Mode,Median) - Hypothesis Testing – Probability – tTest – zTest - Chi Square test – Correlation – Covariance - Anova		
UNIT V	**PREDICTIVE MODELLING & DATA VISUALISATION IN R USING GGPLOT**	**9**
Linear Regression - Normal distribution – Density - Box Plot – Histograms - Scatter Plotter - Line chart - Bar Chart - Heat maps - Text Mining - Exploratory Data Analysis - Machine Learning with R		

Text Book (s)

1. Reema Thareja, "Data Science and Machine Learning with R", Tata McGraw Hill, 1st Edition, 2021

Reference (s)

1. Richard cotton, "Learning R", O'Reilly Media, Inc, 3rd Edition, 2017
2. Robin Evans, "R Programming", Michaelmas, 2014.
3. Michael J. Crawley, "The R Book", John Wiley & Sons, Ltd, 1st Edition, 2013

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Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE002T	AI TECHNIQUES IN DATA MINING	3	0	0	3

Prerequisite Course (s)

- Database Management Systems
- Knowledge of probability and statistics

Course Objective (s):

The purpose of learning this course is to:

1	Understand the methods for mining frequent patterns, associations, and correlations.
2	Describes methods for data classification and prediction, and data–clustering approaches.
3	It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Course Outcome (s) (COs):

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

CO1	Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
CO2	Extract interesting patterns from large amounts of data.
CO3	Discover the role played by data mining in various fields.
CO4	Choose and employ suitable data mining algorithms to build analytical applications
CO5	Evaluate the accuracy of supervised and unsupervised models and algorithms.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	2	1	-	-	-	-	-	2	2	1
CO2	3	3	2	2	2	1	-	-	-	-	-	2	2	2
CO3	3	3	2	2	2	1	-	-	-	-	-	3	3	3
CO4	2	3	3	2	2	1	-	-	-	-	-	3	3	3
CO5	1	2	2	2	2	1	-	-	-	-	-	2	3	3
CO (Avg)	2	2.6	2	2	2	1	-	-	-	-	-	2.4	2.6	2.7

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

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UNIT I	INTRODUCTION	9
Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining – Data Pre-processing : Dimensionality reduction, Missing values, Normalization & standardization, Noise and outlier detection		
UNIT II	**ASSOCIATION RULE MINING**	**9**
Associations and correlations – Frequent item set mining, Apriori and its optimizations, FPgrowth , Efficient Rule generation, Other measures (lift, interest etc), correlation, Hierarchy based Frequent item set mining - Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining - Graph Pattern Mining.		
UNIT III	**CLASSIFICATION**	**9**
Classification and Prediction – Basic concepts – Decision tree, Decision tree induction , K-nearest neighbors, Naive Bayesian classifiers, Rule based classifiers, Lazy learner, Support vector machine, Underfitting/overfitting, Ensemble classifiers, Classification evaluation and model selection.		
UNIT IV	**CLUSTERING**	**9**
Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods : k-means, k-mediod (PAM) algorithms, Hierarchical clustering algorithms, Agglomerative algorithms--s-link, complete link, average link etc, Divisive algorithms,– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Cluster evaluation.		
UNIT V	**ADVANCED CONCEPTS**	**9**
Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.		

Text Book (s)

1	Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier, 2016.
2	Data Mining Introductory and Advanced topics – Margaret H Dunham, Pearson Education, 2014.

Reference (s)

1	Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

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09 MAY 2022

Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE003T	AGILE METHODOLOGIES	3	0	0	3

Prerequisite Course (s)

- Software Engineering

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

1	To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2	To provide a good understanding of software design and a set of software technologies and APIs.
3	To do a detailed examination and demonstration of Agile development and testing techniques
4	To understand the benefits and pitfalls of working in an Agile team.
5	To understand Agile development and testing.

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

CO1	Realize the importance of interacting with business stakeholders in determining the requirements for a software system
CO2	Perform iterative software development processes: how to plan them, how to execute them.
CO3	Point out the impact of social aspects on software development success.
CO4	Develop techniques and tools for improving team collaboration and software quality.
CO5	Perform Software process improvement as an ongoing task for development teams.

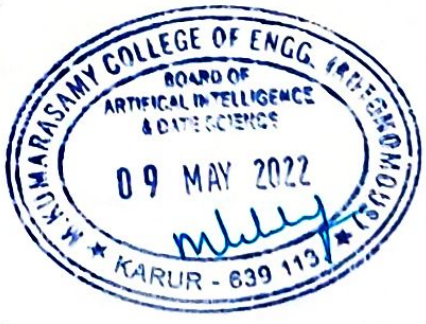
CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1	1	-	-	-	-	-	1	2	1
CO2	2	2	1	1	1	-	-	-	-	-	2	1	1	1
CO3	2	2	2	-	1	2	-	-	-	-	2	1	2	1
CO4	2	2	2	1	2	-	-	-	-	-	-	1	2	1
CO5	2	2	1	-	1	-	-	-	-	-	-	1	1	1
CO (Avg)	2	2	1.6	0.6	1.2	0.6	-	-	-	-	0.8	1	1.8	1

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

UNIT I	AGILE METHODOLOGY	9
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Benefits Vs Constraints Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values		
UNIT II	**AGILE PROCESSES**	**9**
Distributed Embedded Architectures - Networks for Embedded Systems - Network-Based Design - Internet-Enabled Systems - Vehicles as Networks - Sensor Networks - Design Example: Elevator Controller -How to use Agile practices in your project		
UNIT III	**AGILITY AND KNOWLEDGE MANAGEMENT**	**9**
Firmware Bootloader – Example: Sandstone - Embedded Firmware Design Approaches and Development Languages. Distinguishing between KM Agile and Traditional KM – KM Agile Principles and Practices		
UNIT IV	**AGILITY AND REQUIREMENTS ENGINEERING**	**9**
Artificial Intelligence, Machine Learning, Deep learning and Convolution Neural Network Processing of ML, DL, CNN and RNN in Embedded AI – Edge AI & Cloud AI - Embedded AI hardware and software development – Embedded AI Applications Requirement Engineering in Agile Practices. How can it be achieved?		
UNIT V	**AGILITY AND QUALITY ASSURANCE**	**9**
AI Robotics: Communicating between robots – Program modelling and programming in RTOS - Applications of Embedded systems in RFID and Finger Scan (Case Study) – Case study of Mobile phone software for Key inputs		

Text Book (s)	
1	Wesley Clark "Agile Methodology: A Beginner's Guide to Agile Method and Principles", Pearson Education Private Limited, 1st Edition, 2019.
2	Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.
Reference (s)	
1	Craig Larman, —Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
2	Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.
3	David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.



Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE004T	GPU PROGRAMMING	3	0	0	3

Prerequisite Course (s)

Computer Architecture

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

1	To learn the basics of GPU architectures.
2	To write programs for massively parallel processors
3	To understand the issues in mapping algorithms.
4	To interpret different GPU programming models.
5	To familiarize various algorithms for GPU programming.

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

CO1	Understand the theoretical concepts of automata and equivalence of automata
CO2	Remember the automata in applying to obtain regular expressions and languages
CO3	Apply the normalization in context free grammar to obtain optimized CFG
CO4	Understand PDA and turing machines and apply for making mathematical models
CO5	Understand the decidability and tractability problems and apply for developed models

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	-	2.2	1	1	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	3
CO5	2	2	2	2	3	-	1	2	-	-	3	3	3	3
CO (Avg)	2.4	2.4	1.0	2.0	2.4	0.6	1.2	0.8	0.2	-	2.0	1.8	2.0	2.0

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

UNIT I	GPU ARCHITECTURE	9
Evolution of GPU architectures – Understanding Parallelism with GPU –Typical GPU Architecture – CUDA Hardware Overview – Threads, Blocks, Grids, Warps, Scheduling – Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory		
UNIT II	**PROGRAMMING ISSUES**	**9**
Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.		
UNIT III	**OPENCL BASICS**	**9**
OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.		
UNIT IV	**ALGORITTHMS ON GPU**	**9**
Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix – Matrix Multiplication – Programming Heterogeneous Cluster.		
UNIT V	**CUDA PROGRAMMING**	**9**
Using CUDA – Multi GPU – Multi GPU Solutions – Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.		

Text Book (s)

1	David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors – A Hands-on Approach, Third Edition, Morgan Kaufmann, 2016.
2	David R. Kaeli, Perhaad Mistry, Dana Schaa, Dong Ping Zhang, - Heterogeneous computing with OpenCL, 3rd Edition, Morgan Kauffman, 2015.

Reference (s)

1	Shane Cook, CUDA Programming: —A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), First Edition, Morgan Kaufmann, 2012.
2	Nicholas Wilt, —CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison – Wesley, 2013
3	Jason Sanders, Edward Kandrot, —CUDA by Example: An Introduction to General Purpose GPU Programming, Addison – Wesley, 2010

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Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE005T	THEORY OF COMPUTATION	3	0	0	3

Prerequisite Course (s)

Nil

Course Objective (s):

The purpose of learning this course is to:

1	To understand the basic concepts of automata theory and finite automaton
2	To extend the concepts of automata theory in regular languages and expressions
3	To learn about context free grammars and the normalizations of CFG
4	To acquire the importance of push down automata with representations and various models of Turing machines with its applications
5	To discover the facts in decidability and tractability and to study the complexity classes

Course Outcome (s) (COs):

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

CO1	Understand the theoretical concepts of automata and equivalence of automata
CO2	Remember the automata in applying to obtain regular expressions and languages
CO3	Apply the normalization in context free grammar to obtain optimized CFG
CO4	Understand PDA and Turing machines and apply for making mathematical models
CO5	Understand the decidability and tractability problems and apply for developed models

CO-PO Mapping

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

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

UNIT I	INTRODUCTION TO AUTOMATA THEORY	9

Introduction-Need of automata theory-Formal proof- Additional Forms of Proof-Inductive Proofs-Central Concepts of Automata Theory-DFA and NDFA-Finite Automaton with Є- Transitions-Equivalence of DFA and NFA-Case Study: Finite Automata for Artificial Intelligence, Compilers, Probability		
UNIT II	**REGULAR EXPRESSIONS**	**9**
Regular Languages-Regular Expressions-Equivalence of finite Automaton and regular expressions-Minimization of DFA-Closure Properties and Decision Properties of Regular Languages-Problems based on Pumping LemmaCase Study: Regular Expressions for NLP, Pattern matching, Data extraction		
UNIT III	**CONTEXT FREE GRAMMARS**	**9**
Chomsky hierarchy of languages-Context-Free Grammar (CFG)-Parse Trees - Ambiguity in grammars and languages-Normal forms for CFG-Chomsky Normal Form (CNF)-Greibach Normal Form (GNF)-Pumping Lemma for Context Free Language (CFL)-Applications of Context Free Grammar. Case Study: Context Free Grammars in GCC compiler and in XML DTD		
UNIT IV	**PUSHDOWN AUTOMATA AND TURING MACHINES**	**9**
Definition of the Pushdown automata-Types of PDA-Languages of a Pushdown Automata - Equivalence of PDA and CFG-Definitions of Turing machines-Models-Computable languages and functions-Techniques for Turing machine construction-Multi head and Multi tape Turing Machines. Turing machines for machine learning and high performance computing applications		
UNIT V	**UNDECIDABILITY**	**9**
The Halting problem – Partial Solvability- Undecidability- Decidable and undecidable problems- Post correspondence problem and Undecidability of PCP-Basic Definition and properties of Recursive (RL) and Recursively enumerable (REL) languages. Intractable Problems- the Class P and NPIntroduction to NP-Hardness and NP-Completeness		

Text Book (s)

1	Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2016.
2	John C Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2011

Reference (s)

1	Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", Third Edition, Prentice Hall of India, 2016
2	Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2015.
3	Peter Linz, "An Introduction to Formal Language and Automata", Sixth Edition, Jones & Bartlett Learning, 2016

Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE006T	COMPUTER VISION	3	0	0	3

Prerequisite Course (s)

NIL

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

1	To review image processing techniques for computer vision.
2	To understand various features and recognition techniques.
3	To learn about histogram and binary vision.
4	Apply three-dimensional image analysis techniques.
5	Study real world applications of computer vision algorithms.

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

CO1	Explain low level processing of image and transformation techniques applied to images.
CO2	Explain the feature extraction, segmentation and object recognition methods.
CO3	Apply Histogram transform for detection of geometric shapes like line, ellipse and objects.
CO4	Illustrate 3D vision process and motion estimation techniques.
CO5	Apply vision techniques to real time applications.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	3	2	-	-	-	-	3	1	1	1
CO2	1	-	-	3	3	2	-	-	-	-	3	2	1	1
CO3	2	3	3	3	3	2	-	-	-	-	3	1	3	2
CO4	2	3	3	3	3	2	-	-	-	-	3	2	3	1
CO5	2	3	3	3	3	2	-	-	-	-	3	2	2	2
CO (Avg)	1.6	1.8	1.8	3	3	2	-	-	-	-	3	1.6	2	1.2

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

UNIT I	INTRODUCTION	9
What is Computer Vision - Low-level, Mid-level, High-level - Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.		
UNIT II	**IMAGES, HISTOGRAMS, BINARY VISION**	**9**
Simple pinhole camera model – Sampling – Quantisation – Colour images – Noise – Smoothing – 1D and 3D histograms - Histogrm/Image Equalisation - Histogram Comparison - Back-projection - k-means Clustering – Thresholding - Threshold Detection Methods - Variations on Thresholding - Mathematical Morphology – Connectivity.		
UNIT III	**FEATURE EXTRACTION AND SEGMENTATION**	**9**
Feature Extraction -Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Image Segmentation -Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.		
UNIT IV	**3D VISION AND MOTION**	**9**
Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion–spline-based motion-optical flow – layered motion.		
UNIT V	**APPLICATIONS**	**9**
Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Virtual Reality and Augmented Reality.		

Text Books

1	D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2012.
2	Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited, 2011.

Reference (s)

1	Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
2	Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
3	E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press. 5. Concise Computer Vision: An Introduction into Theory and Algorithms, by Reinhard Klette, 2014

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Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
C	18AIE007T	IOT AND ITS APPLICATIONS	3	0	0	3

Prerequisite Course (s)

Computer Networks & Digital Logic & Design

Course Objective (s):

The purpose of learning this course is to:

1	Understand the fundamentals of Internet of Things
2	Analyze the different IoT Architecture in the real world scenario.
3	Learn about the basics of various IOT protocols
4	Build a simple low cost IoT Systems using Arduino and Raspberry Pi
5	Demonstrate IoT infrastructure of different popular IOT Platforms

Course Outcome (s) (Cos):

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

CO1	Explain the concepts of IoT
CO2	Apply the different IoT Architecture in the real world scenario
CO3	Identify suitable protocols for different applications of IoT
CO4	Design a portable IoT applications using Arduino/Rasperry Pi
CO5	Summarize different applications of IoT in real time scenario

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	-	-	-	1	-	-	3	1
CO2	3	3	3	3	2	2	1	-	-	1	-	-	3	1
CO3	3	3	3	3	3	2	1	-	1	1	1	-	3	2
CO4	3	3	3	3	3	2	1	-	1	1	2	-	3	3
CO5	3	3	3	3	3	2	1	-	-	1	2	-	3	3
CO (Avg)	3	3	3	2.8	2.6	2	0.8	-	0.4	1	1	-	3	2

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

UNIT I	INTRODUCTION TO IoT	9
Internet of Things Overview - Evolution of Internet of Things – Characteristics - Challenges, Application areas - IoT ecosystem - Things in IoT - Functional building blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects – Simplified IoT Architecture - Web and core IoT Functional stack - Physical Design - Logical Design - IoT Enabling Technologies - IoT Levels - Domain Specific IoTs - IoT Platforms Design Methodology.		
UNIT II	**IoT ARCHITECTURE**	**9**
IoT Architectures: oneM2M, IoT World Forum (IoTWF)- M2M high-level ETSI Architecture - IETF Architecture For IoT - OGC Architecture - IoT Reference Model - Domain Model - Information Model - Functional Model - Communication Model- Basics of IoT System Management with NETCOZF and YANG.		
UNIT III	**IoT PROTOCOLS**	**9**
Protocol Standardization for IoT – Efforts – M2M - IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture - IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and LoRaWAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA- Application Layer Protocols: CoAP and MQTT.		
UNIT IV	**BUILDING IOT APPLICATIONS**	**9**
Arduino. Arduino : Architecture, Arduino Board details, IDE programming, Interfaces, Programming using python and Applications - Raspberry Pi : Architecture, Interfaces, Programming Raspberry Pi with Python and Applications.		
UNIT V	**CASE STUDIES AND REAL-WORLD APPLICATIONS**	**9**
Cisco IoT system - IBM Watson IoT platform- Amazon Web Services for IoT- Google Cloud IoT Core- Real World Design Constraints - Applications: Asset Management, Industrial Automation, Smart Grid, Commercial Building Automation, Smart Cities, Smart Lighting, Smart Parking and Smart Traffic Control.		

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Text Books	
1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017
2	Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
Reference (s)	
1	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.
2	Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
3	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
4	Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
5	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.
Web References	
1	https://myvuniversity.teachable.com/p/embedded-systems-internet-of-things-310252
2	https://www.arduino.cc/
3	https://www.ibm.com/smarterplanet/us/en/?ca=v smarterplanet

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Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE008T	WEB DEVELOPMENT	3	0	0	3

Prerequisite Course (s)

Basic Programming Concepts

Course Objective (s):

The purpose of learning this course is to:

1	To understand and practice Embedded Dynamic Client-side Scripting.
2	To understand Server-side Programming Language.
3	To implement manipulation of DOM events.
4	To learn basic architecture of Angular and React JS.

Course Outcome (s) (COs):

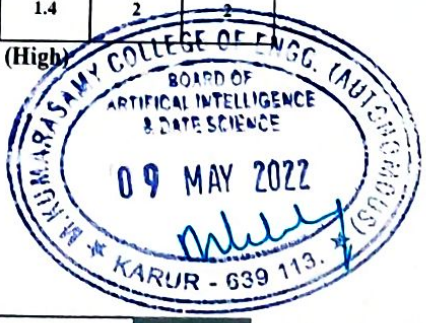
At the end of this course, learners will be able to:

CO1	Design and implement dynamic web page with validation and event handling by applying Java Script.
CO2	Design and implement Server-side Programming using Servlet.
CO3	Design and implement Server-side Programming using PHP.
CO4	Design and implement client side webpage using jQuery.
CO5	Learn and design web application using Angular and React JS.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	3	2	-	-	-	-	1	1	2	2
CO2	3	3	3	3	3	2	-	-	-	-	1	1	2	2
CO3	3	3	3	3	3	2	-	-	-	-	1	1	2	2
CO4	3	3	3	3	3	2	-	-	-	-	1	2	2	2
CO5	3	3	3	3	3	2	-	-	-	-	1	2	2	2
CO (Avg)	2.8	3	3	3	3	2	-	-	-	-	1	1.4	2	2

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



UNIT I	WWW and JAVASCRIPT	9
WWW: Internet technologies Overview – Internet Standards & Protocols - HTTP. JAVASCRIPT: Introduction to Scripting - Data types and Variables - Operators, Expressions and Statements - Functions - Arrays - Objects - Document Object Model - Event Handling – JSON.		
UNIT II	**SERVLETS**	**9**
Servlets: Java Servlet Architecture - Servlet Life Cycle - Form GET and POST actions- Session Handling - Understanding Cookies - Database Connectivity - JDBC.		
UNIT III	**PHP**	**9**
PHP: Variables – Conditions, Branches, Loops - Arrays & Strings - Regular Expressions - Date and Time Functions - Integer and Float Functions - User-Defined Functions - Program control - Form Processing - Cookies - Database Connectivity.		
UNIT IV	**JQUERY**	**9**
JQUERY: Introduction to jQuery – Selectors – Elements: Manipulations, Changing and Setting elements – Event Models: Event handlers – Animations & Effects – Functions – Plugins.		
UNIT V	**ANGULAR and REACTJS**	**9**
ANGULAR: TypeScript – Node.js - Angular Web Application - Components - Data Binding - Directives - Pipes - Service - Event Binding – Forms. REACTJS : React Features- ReactJS Vs React native-React JSX - Components - state-props-lifecycle-events-forms-router-animation-table.		

Text Book (s)

1	Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
2	Nate Murray, Felipe Coury, Ari Lerner, and Carlos, ng-book The Complete Guide to Angular, Fullstack.io, 2020.
3	Adam Freeman, Pro React 16, Apress, 2019.
4	Nln Lnc, Susan Fitzgerald,"React js: Hands-On full stack web development using React js", 2nd Edition, 2020.

Reference (s)

1	Jeffrey C and Jackson, —Web Technologies A Computer Science Perspectivel, Pearson Education, 2011.
2	Bear Bibeault and Yehuda Katz, jQuery in Action, 2008.
3	Gopalan N.P. and Akilandeswari J., Web Technology, Prentice Hall of India, 2011.
4	UttamK.Roy, Web Technologies, Oxford University Press, 2011.

Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE009T	STATISTICAL ANALYSIS USING R	3	0	0	3

Prerequisite Course (s)

- Basic concepts of programming language
- Basic knowledge of regression, analysis and statistical models

Course Objective (s):

The purpose of learning this course is to:

1	Learn to run/execute the code without any compiler
2	Perform calculations with the various R packages
3	Accomplish various regression, distribution and analysis models with necessary library files
4	Develop/generate the statistical model for various probability features and variable generators
5	Enhance the learning through industrial standards and research

Course Outcome (s) (COs):

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

CO1	Understand about the overviews of learning R
CO2	Apply the concepts of R packages and files
CO3	Explain about the various models of regression, distribution & analysis
CO4	Study & apply the usage of probability and statistics for review and generating random values
CO5	Visualize the integration, variance & Inference of statistical analysis with R

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	2	-	-	-	-	-	-	1	2	2
CO2	2	2	2	2	2	-	-	-	-	-	-	1	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO (Avg)	2.6	2.6	2.6	2.4	2.6	-	-	-	-	-	-	1	2.6	2.6

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

UNIT I	R – OVERVIEW	9
Evolution Of R - Features of R - Environment Setup - Basic Syntax, Data Types, Variables, Operators, Decision Making, Loops, Function, Strings. Vectors - Lists - Matrices - Arrays - Factors - Data Frames		
UNIT II	**R – PACKAGES & FILES**	**9**
R – Packages - Data Reshaping - Csv Files - Excel File - Binary Files - Xml Files - Json File - Web Data - Databases - Pie Charts - Bar Charts - Boxplots - Histograms - Line Graphs - Scatterplots - Mean, Median & Mode		
UNIT III	**REGRESSION, DISTRIBUTION & ANALYSIS**	**9**
R – Linear Regression - Multiple Regression - Logistic Regression - Normal Distribution - Binomial Distribution - Poisson Regression - Analysis of Covariance - Time Series Analysis - Nonlinear Least Square - Decision Tree - Random Forest - Survival Analysis - Chi Square Test		
UNIT IV	**PROBABILITY AND STATISTICS REVIEW & METHODS FOR GENERATING RANDOM VARIABLES**	**9**
Random Variables and Probability - Some Discrete & Continuous Distributions - Multivariate Normal Distribution - Limit Theorems – Statistics - Bayes' Theorem and Bayesian Statistics - Markov Chains - The Inverse Transform Method - The Acceptance-Rejection Method - Transformation Methods - Sums and Mixtures - Multivariate Distributions - Stochastic Processes		
UNIT V	**VISUALIZATION OF MULTIVARIATE DATA MONTE CARLO INTEGRATION, VARIANCE REDUCTION & INFERENCE**	**9**
Monte Carlo Integration - Variance Reduction - Antithetic Variables - Control Variates - Importance Sampling - Stratified Sampling - Stratified Importance Sampling - Monte Carlo Methods for Estimation - Monte Carlo Methods for Hypothesis Tests – Application - The Metropolis-Hastings Algorithm - The Gibbs Sampler - Monitoring Convergence – Application		

Text Book (s)

1	Garrett Grolemund, Hadley Wickham. "R for Data Science", O'Reilly Media, 1st Edition, 2017
2	Michael J. Crawley, "The R Book", John Wiley & Sons, Ltd, 1st Edition, 2013

Reference (s)

1	Brian S. Everitt and Torsten Hothorn , "A Handbook of Statistical Analyses Using R", London and Erlangen, December 2005
2	Norman Matloff, "THE ART OF R PROGRAMMING", No Starch Press, Inc. 2nd Edition, 2011
3	Maria L.Rizzo, " Statistical Computing with R", Chapman & Hall/CRC, Taylor & Francis Group, 2nd Edition. 2008

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Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE010T	WEB & SOCIAL MEDIA MINING	3	0	0	3

Prerequisite Course (s)

Basic Programming Concepts and Data Mining

Course Objective (s):

The purpose of learning this course is to:

1	To understand the components of web based social networks
2	To learn knowledge representation using ontology
3	To mine the users community in social networks
4	To understand the evolution of social networks through various models
5	To mine the opinions of the users in social networks

Course Outcome (s) (COs):

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

CO1	Work on the internals components of social networks
CO2	Represent Knowledge using Ontology
CO3	Mine the behaviour of the users in social networks
CO4	Predict the possible next outcome of social networks
CO5	Mine the opinions of the user social networks

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	-	-	-	-	1	1	2	3	1
CO2	3	2	1	1	1	-	-	-	-	1	1	2	2	1
CO3	3	1	1	-	-	-	-	-	-	1	1	2	3	2
CO4	3	2	2	2	2	-	-	-	-	1	1	2	1	2
CO5	3	2	1	1	-	-	-	-	-	1	1	2	1	2
CO (Avg)	3	2	1.4	1.4	1	-	-	-	-	1	1	2	2	1.6

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

UNIT I	INTRODUCTION	9
Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks - Development of Social Network Analysis - Key concepts and measures in network analysis – Electronic sources for network analysis - Discussion networks - Blogs and online communities - Web-based networks-Applications of Social Network Analysis		
UNIT II	**MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION**	**9**
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.		
UNIT III	**MINING COMMUNITIES AND SOCIAL MEDIA MINING**	**9**
Aggregating and Reasoning with Social Network Data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms – Social Media Mining-Classification- Challenges- Research issues –Applications.		
UNIT IV	**EVOLUTION**	**9**
Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction		
UNIT V	**TEXT, OPINION AND MULTIMEDIA DATA MINING CASE STUDIES**	**9**
Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis, Case Studies: Multimedia Data Mining		

Text Book (s)

1	Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2011
2	Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.
3	Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.

Reference (s)

1	Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2011.
2	Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010
3	Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.
4	Toby Segaran, "Programming Collective Intelligence", O'Reilly, 2012

Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE011T	CLEAN CODING AND DEVOPS	3	0	0	3

Prerequisite Course (s)

Basic Programming Concepts

Course Objective (s):

The purpose of learning this course is to:

1	Understand about the clean code.
2	Explain the importance of naming conventions
3	Understand the importance of comments in the applications
4	Understand and install different tools used in DevOps stack
5	Explain the benefits of DevOps and how various industries are benefitting

Course Outcome (s) (COs):

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

CO1	Study the concepts of coding principles.
CO2	Illustrate the importance of formatting and comments in the applications
CO3	Outline the principles, need and tools of DevOps.
CO4	Study the advanced DevOps concepts.
CO5	Explain why DevOps on cloud and various DevOps services available on IBM Cloud

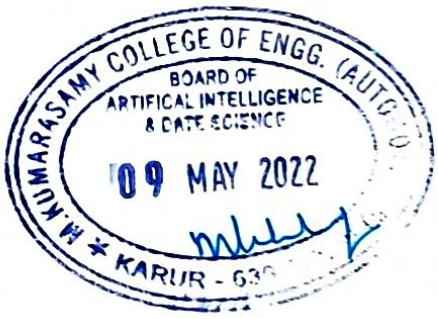
CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	1	-	-	-	-	-	-	-	2	-
CO2	2	1	1	-	1	-	-	-	-	-	-	-	2	-
CO3	2	1	1	-	2	-	-	-	-	-	-	-	2	-
CO4	1	2	1	2	-	-	-	-	-	-	-	-	2	-
CO5	2	2	1	2	1	-	-	-	-	-	-	-	2	-
CO (Avg)	2	1.4	1	0.8	1	-	-	-	-	-	-	-	2	-

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

UNIT I	INTRODUCTION TO CLEANCODING	9
Coding principles introduction-Bad and Good code-marshalling and unmarshalling - Names and Functions-distinct names-Defining meaningful context-Usage of domain and function names-Usage of exceptions and its error code names/descriptions. Exercise to implement JAXB.		
UNIT II	**COMMENTS, FORMATTING AND OBJECTS**	**9**
Right comments and types of formatting- Clean and bad comments-Vertical and horizontal formatting-Objects and data structures-Data abstraction-Data and object antisymmetric-Data transfer objects – Defining meaningful names and functions. Hands on: "**How to Write a clean, testable and high quality code in Python**"		
UNIT III	**INTRODUCTION TO DEV-OPS**	**9**
An overview about DevOps - Why it is needed? How it is different from traditional IT and Agile - DevOps Principles - DevOps Lifecycle - An overview about CI/CD pipeline and various tools - setup a complete CI/CD pipeline from scratch using DevOps tools - How DevOps is used in various technologies/industries.		
UNIT IV	**ADVANCED DEV-OPS**	**9**
An overview of advanced DevOps concepts - Automatic Rollback and Provisioning, Scalability, Clustering and Infrastructure as Code. Case Study: "**How to Adapt DevOps to Cognitive and AI Systems**"		
UNIT V	**DEV-OPS ON CLOUD**	**9**
An overview of Cloud computing - Introduction to IBM Cloud - Why DevOps on cloud - IBM Cloud services - Setup a CI/CD pipeline in IBM Cloud. Install tools in DevOps Stack- Build, Test and Deliver applications in IBM Cloud using DevOps Practices		

Text Book (s)	
1	Ingo M.Weber, Len Bass, and Liming Zhu, "DevOps: A Software Architect's Perspective", 2015.
2	Robert C Martin, "Clean Code: A Hand Book of Agile Software Craftsmanship", 2008.



Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE012T	AI FOR GAME PROGRAMMING	3	0	0	3

Prerequisite Course (s)

Basic Programming Concepts

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

1	To learn the fundamentals of Game programming.
2	To understand the 3D Graphics, vertex and pixel shader.scenes.
3	To learn the various PyGame Development process and its design attributes.
4	To interpret working knowledge in various game platforms.
5	To familiarize various games using reinforcement learning.

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

CO1	Explain the need for Game programming.
CO2	Integrate various concepts and techniques of 3D Game design.
CO3	Design and model interactive game.
CO4	Explain the need for advanced game development platforms.
CO5	Design and develop games using reinforcement learning.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	2	-	-	-	-	-	-	-	1	1
CO2	2	2	3	2	2	-	-	-	-	-	-	-	1	1
CO3	2	2	2	3	3	-	-	-	-	-	2	-	3	3
CO4	2	2	3	3	3	-	-	-	-	-	2	-	3	3
CO5	2	2	3	3	3	-	-	-	-	-	2	-	3	3
CO (Avg)	1.8	2	2.8	2.6	2.6	-	-	-	-	-	1.2	-	2.4	2.4

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

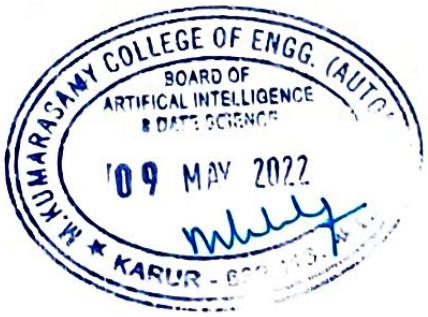
UNIT I	INTRODUCTION	9
Elements of Game-Game Architecture-Application Layer-Game Logic-Game View for the Human Player-Game View for AI agents-Networked Game Architecture-Remote Game View-Remote Game Logic		
UNIT II	**3D GRAPHICS**	**9**
3D Graphics Basics- Pipeline-3D MATH 101-Vector Classes-Matrix Mathematics-Quaternion Mathematics. 3D Vertex and Pixel Shader : Vertex Shader Syntax-Compiling the vertex shader-The pixel shader-Rendering the shader Helper Classes. 3D Scenes: Graph Basics-Special Scene Graph Nodes.		
UNIT III	**PYGAME AND 3D AND PYPLATFORMERS**	**9**
Installing Packages-Getting started with OpenGL-Adding the Pygame Library-Drawing the openGL-Basic Collision Detection Game-An introduction to Game Design-Introducing Pymunk-Building a Game Framework-Developing Pyplatformers.		
UNIT IV	**AUGMENTING A BOARD GAME WITH COMPUTER VISION**	**9**
Planning the checker application-setting up OpenCV and Other dependencies-Supporting multiple version of Open CV-Configuring Cameras-Working With Colors-Building the analyser-Converting OpenCV images for wxPythonBuilding the GUI Application-Troubleshooting the project.		
UNIT V	**REINFORCEMENT LEARNING AND GAMES**	**9**
Intelligence and Games- Reinforcement Learning - Heuristic Planning - Adaptive Sampling-Deep Supervised Learning-Deep Reinforcement Learning		

Text Book (s)

1	Learning to Play (Springer),Reinforcement Learning and Games by Aske Plaat, 2020.
2	Mike "MrMike" McShaffry and David "Rez" Graham, "Game Coding Complete, Fourth Edition", Course Technology PTR, A part of Cengage Learning.

Reference (s)

1	Jeremy Gibson, "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#", Addison-Wesley Professional, 2nd edition, 2016.
2	Jorge Palacios, "Unity 5.x Game AI Programming Cookbook", Packt Publishing Limited, 1st edition, 2016.
3	John Horton, "Learning Java by Building Android Games", Packt Publishing Limited, 1st edition, 2015.



Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE013T	NATURAL LANGUAGE PROCESSING	3	0	0	3

Prerequisite Course (s)

Theory of Computation

Course Objective (s):

The purpose of learning this course is to:

1	Provide basic mathematical models and methods used in NLP applications to formulate computational solutions.
2	Understand the syntax and semantics of natural languages. How they work and how machine can convert from one natural language to another.
3	Acquire the knowledge on designing procedures for natural language resource annotation and the use of related tools for text analysis and hands-on experience of using such tools.

Course Outcome (s) (COs):

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

CO1	Understand the fundamental mathematical models and algorithms in the field of NLP.
CO2	Apply the mathematical models and algorithms in the applications of software.
CO3	Implement a rule-based system to tackle morphology/syntax of a language.
CO4	Analyze the design and implementation issues in various NLP applications such as information retrieval and information extraction.
CO5	Apply the principles of language resource annotation and its use in machine learning applications.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	-	-	-	-	-	-	-	-	2	2
CO2	2	2	2	2	2	-	-	-	-	-	-	1	2	2
CO3	2	2	2	2	2	-	-	-	-	-	-	1	3	2
CO4	2	2	2	1	2	-	-	-	-	-	-	-	3	2
CO5	1	2	2	1	2	-	-	-	-	-	-	1	3	2
CO (Avg)	1.6	2	2	1.4	1.6	-	-	-	-	-	-	0.6	2.6	2

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

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UNIT I	INTRODUCTION	9
Introduction - Mathematical Foundations - Elementary Probability Theory - Essential Information Theory – Linguistic Essentials- Parts of Speech and Morphology- Phrase Structure- Semantics and Pragmatics - Regular Expressions, Text Normalization, Edit Distance - N-gram Language Models		
UNIT II	**SENTIMENT CLASSIFICATION AND LOGISTIC REGRESSION**	**9**
Naive Bayes Classification and Sentiment - Logistic Regression- Vector Semantics -Neural Nets and Neural Language Models - Sequence Labelling for Parts of Speech- Deep Learning-Architectures for Sequence Processing		
UNIT III	**SYNTACTIC PARSING**	**9**
Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar- Ambiguity – Cocke Kasami Younger (CKY) algorithm - Partial Parsing - Statistical Parsing- Dependency Parsing- Dependency Formalisms-Treebanks- Transition-Based Dependency Parsing- Graph-Based Dependency Parsing.		
UNIT IV	**COMPUTATIONAL SEMANTICS AND SEMANTIC PARSING**	**9**
Computational Desiderata for Representations- Model-Theoretic Semantics- First-Order Logic - Event and State Representations- Logics -Relation Extraction- Relation Extraction Algorithms- Word Senses - Relations between Senses- WordNet: A Database of Lexical Relations- Disambiguation- Alternate WSD algorithms and Tasks -Semantic Role Labelling		
UNIT V	**DISCOURSE COHERENCE AND COREFERENCE RESOLUTION**	**9**
Lexicons for Sentiment, Affect, and Connotation, Discourse Coherence -Coherence Relations- Discourse Structure Parsing- Centering and Entity-Based Coherence- Representation learning models for local coherence- Co reference Resolution- Co reference Tasks and Datasets- Architectures for Co reference Algorithms- A neural mention-ranking algorithm		

Text Book (s)

1	Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2	Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 2018

Reference (s)

1	Breck Baldwin, —Language processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2	Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media, 1st edition, 2009
3	Richard M Reese, —Natural Language Processing with Javal, O'Reilly Media, 2015.
4	Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

Regulation 2018		Semester VI	Total Hours			45
			Hours / Week			
Category	Course Code	Course Name	L	T	P	C
E	18AIE014T	AUGMENTED REALITY	3	0	0	3

Prerequisite Course (s)

Computer Vision

Course Objective (s):

The purpose of learning this course is to:

CO1	To Understand the concept of augmented reality
CO2	To effectively design and benefits of AR
CO3	To Incorporate of Geo-location with AR
CO4	To Apply AR for real-time applications
CO5	To acquire knowledge about augmented reality and to realize its benefits and features in various fields

Course Outcome (s) (COs):

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

CO1	Demonstrate understanding and perspective on the AR landscape; past, present and future
CO2	Demonstrate understanding of fundamental computer vision, computer graphics and human-computer interaction techniques related to AR
CO3	Demonstrate insights to key application areas for AR
CO4	Demonstrate the ability to design and implement AR experiences
CO5	Implement the Applications using various AR Methodologies

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	2	2	-	-	-	-	-	2	2	1	1
CO2	1	-	-	2	2	-	-	-	-	-	2	2	1	1
CO3	2	3	3	2	2	-	-	-	-	-	2	2	3	2
CO4	2	3	3	2	2	-	-	-	-	-	2	2	3	1
CO5	2	3	3	2	2	-	-	-	-	-	2	2	2	2
CO (Avg)	1.6	1.8	1.8	2	2	-	-	-	-	-	2	2	2	1.2

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

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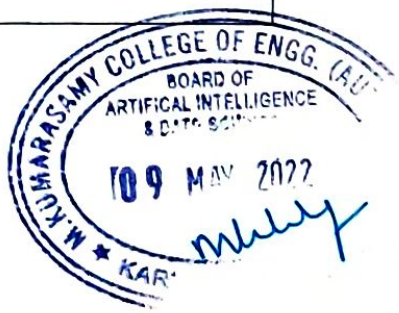
UNIT I	INTRODUCTION TO AUGMENTED REALITY	9
Augmented Reality History-Definition of Augmented Reality- Augmented Reality features - Mixed Reality Continuum-MAR Market , Actors and Value Chain- MAR System Architecture – mobile AR for android and iOS-Application vs. Browser.		
UNIT II	**AUGMENTED REALITY CONCEPTS AND HARDWARE**	**9**
Two-Step Process of Augmented Reality Applications- Augmented Reality Hardware- Sensor Roles of Sensors-Tracking- processor- Processor System Architectures -display- Stationary visual displays-Visual displays that move with the participant's head-Visual displays that move with the participant's hand or other parts of his or her body - other sensory displays-Haptics Smell (Olfaction)- Other Senses- Stereo Displays- Display - Characteristics of Displays Techniques. Computer Graphics – Dimensionality - Depth Cues - Registration and Latency		
UNIT III	**AUGMENTED REALITY DIMENSION AND INTERACTION**	**9**
Introduction to 3D objects in ARAF-advanced 3D modeling technique -Vuforia Overview: Interface, Navigation, Terminology, Image Targeting, Custom Images-Recognition process with Vuforia- Use of Vuforia descriptor in ARAF -Real World-Manipulation-Navigation-Mobile Augmented Reality.		
UNIT IV	**AUGMENTED REALITY WITH GEOLOCATION**	**9**
Create an AR Quiz using the authoring tool - Geolocation in ARAF- A basic example: Image PROTO-Enriching a prototype: add user interaction- Map PROTO- MapMarker PROTOMapOverlay PROTO-MapPlayer PROTO- An example of a functional map in ARAF.		
UNIT V	**APPLICATION**	**9**
Pokemon GO and its effect on AR & Augmented Reality Gaming - Survey of Current AR Games - ARKit GPS Template- Augmented Reality Wearable Survey of Augmented Reality Wearables, AR for Medical and Psychotherapy Bio-sensing and AR with the server - The future of augmented reality.		

Text Book (s)

1	Augmented Reality: Principles & Practice – 12 Oct 2016 by Schmalstieg / Hollerer
2	Steve Aukstakalnis, Practical Augmented Reality, A guide to technologies applications and human factors for AR and VR (usability), Addison-Wesley Professional, 1st Edition, 2016.
3	Augmented Reality a Practical Guide Paperback – 2008

Reference (s)

1	http://www.creativecrash.com/ http://www.cgsociety.org/
2	http://www.11secondclub.com/ http://www.learning-maya.com/
3	http://www.3Dlinks.com/tutorials_maya.cfm http://www.3D-tutorial.com/
4	http://www.thegnomonworkshop.com/tutorials.html



Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
E	18AIE015T	AUTONOMOUS SYSTEMS AND DRONES	3	0	0	3

Prerequisite Course (s)

Basic concepts of programming language

Course Objective (s):

The purpose of learning this course is to:

1	Learn classifications of drones (UAVs) according to technology focus and use.
2	Gain an understanding of the commercial and research capabilities of drones
3	Develop a crucial systems view of drones with hardware and software
4	Establish expertise in risk factors and counter technologies
5	Apply insights to forecasting, command and control, disaster relief operations, structural analysis, recovery

Course Outcome (s) (COs):

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

CO1	Understand about the technologies & measures in autonomous systems
CO2	Classify and aware about the various creative applications of drones
CO3	Categorize and understand the designing process of autonomous vehicles
CO4	Recognize and apply the concepts of networks in vehicle systems
CO5	Identify and model the drones based on control platform

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	1	3	-	-	1	-	2	2
CO2	3	3	2	2	2	2	2	2	-	-	1	-	2	2
CO3	3	3	3	3	3	3	3	2	2	-	2	3	2	3
CO4	3	3	3	3	3	3	3	-	2	-	3	3	2	3
CO5	3	3	3	3	3	3	3	1	2	-	3	3	2	3
CO (Avg)	3	3	2.6	2.6	2.6	2.6	2.4	1.6	1.2	-	2	1.8	2	2.6

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

UNIT I	DRONES AND AUTONOMOUS SYSTEMS I: FUNDAMENTALS	9
History and Introduction - Fundamentals of Drones and Autonomous Systems - Critical Technologies and Requirements - Technical Performance - Regulatory Framework (including Risk, Safety, Security, Policy) - Future of Drone Systems		
UNIT II	**DRONES AND AUTONOMOUS SYSTEMS 2**	**9**
Introduction to hazards, disasters and drone applications - Global natural disasters and drone applications - Man-made disasters and drone applications - Future drone applications		
UNIT III	**AUTONOMOUS VEHICLES AND DRONES I**	**9**
Fundamental Principles of Embedded Systems - ARM architecture – ROS - Performance characterization and power consumption optimization - Motion and positioning sensors - Introduction to positioning navigation (Dead Reckoning)		
UNIT IV	**AUTONOMOUS VEHICLES AND DRONES II**	**9**
Introduction to control systems - PID control - Machine Learning through Neural Networks - Anatomy of autonomous vehicles - Interrupt mechanisms		
UNIT V	**DRONE ANATOMY & APPLICATIONS**	**9**
Drone Anatomy - Embedded Drone Control Platform - Design of autonomous vehicles - Unmanned aerial vehicles programming - Unmanned aerial vehicles based on models – Drone Applications: Disaster Management - Military Reconnaissance & Combat Uses - Search and Rescue - Agricultural Application		

Text Book (s)

1	Diego Galar, Uday Kumar, Dammika Seneviratne "Robots, Drones, UAVs and UGVs for Operation and Maintenance" CRC Press, 2020

Reference (s)

1	John Baichtal, "Building Your Own Drones - A Beginner's Guide to Drones, UAVs, and ROVs", Que Publishing, 2016
2	Plamen Angelov "Autonomous Learning Systems: From Data Streams to Knowledge in Real-time", John Wiley & Sons, Ltd, 1st Edition, 2013
3	David Allen Blubaugh, Benjamin Sears, Steven D. Harbour, Michael J. Findler "Intelligent Autonomous Drones with Cognitive Deep Learning: Build AI-Enabled Land Drones with the Raspberry Pi 4", First Edition, 2022.

Regulation 2018		Semester VI	Total Hours			45
			Hours / Week			C
Category	Course Code	Course Name	L	T	P	
E	18AIE016T	XML AND WEB SERVICES	3	0	0	3

Prerequisite Course (s)

NIL

Course Objective (s):

The purpose of learning this course is to:

- Construct the web page using XML and service oriented architecture
- Implement the real time applications using XML technologies
- Analyze the design principles and applications of SOAP based Web Services
- Use the key technologies in web services.
- Evaluate the security issues in XML.

Course Outcome (s) (COs):

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

CO1	Construct the web page using XML and service oriented architecture
CO2	Implement the real time applications using XML technologies.
CO3	Analyze the design principles and applications of SOAP based Web Services.
CO4	Use the key technologies in web services
CO5	Evaluate the security issues in XML

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	-	-	-	-	2	2	3	2
CO2	2	2	2	2	2	2	-	-	-	-	2	2	3	2
CO3	2	3	3	2	3	2	-	-	-	-	2	2	3	2
CO4	2	2	2	2	2	2	-	-	-	-	2	2	3	2
CO5	2	2	2	2	2	2	-	-	-	-	2	2	3	2
CO (Avg)	2	2.2	2.2	2	2.2	2	-	-	-	-	2			

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

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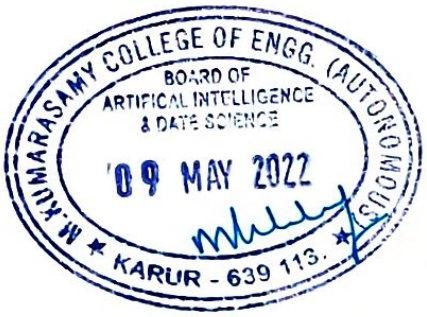
UNIT I	INTRODUCTION	8
Role of XML - XML and the Web - XML Language Basics - SOAP - Web Services - Revolutions of XML - Service Oriented Architecture (SOA)		
UNIT II	**XML TECHNOLOGY**	**9**
XML - Name Spaces - Structuring with Schemas and DTD - Presentation Techniques - Transformation.		
UNIT III	**SOAP SERVICES**	**9**
Overview of SOAP - HTTP - XML - RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns and Faults - SOAP with Attachments.		
UNIT IV	**WEB SERVICES**	**10**
Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP and Web Services in ECom - Overview of .NET and J2EE.		
UNIT V	**XML SECURITY**	**9**
Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines for Signing XML Documents - XML in Practice.		

Text Book (s)

1	Frank. P. Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2017.
2	David Hunter, Jeff Rafter, Joe Fawcett, Eric Van der Vlist, Danny Ayers, Jon Duckett, Andrew Watt, Linda McKinnon, Begining XML , Fourth Edition, Wrox publication.

Reference (s)

1	Deitel H M, Deitel P J, Nirto T R, Lin T M, XML How to Program, Pearson Edition, 2011



Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC001L	MACHINE LEARNING FOR ENGINEERS	0	0	2	1

Prerequisite Course (s)

NIL

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

To learn the concepts of machine learning project cycle and model buildings

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

CO1	Apply the various states of model building in machine learning projects.

CO-PO Mapping

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

UNIT I	Module – 1	6

Machine Learning - Data and Machine Learning Terminologies - Machine Learning Engineering - Machine Learning Project Life Cycle.

UNIT II	Module – 2	6

Machine Learning project - Priority , Cost Estimation, Goal , structuring, risk and Failure - Data Collection and Preparation

UNIT III	Module – 3	6

Feature Engineering – Model building(Training, Evaluation, Maintenance, Monitoring, deployment)

Reference(s)

1	Andriy Burkov ,"Machine Learning Engineering", True Positive Inc. (September 5, 2020) ISBN-13: 978-1999579579

Strategy(s)

- The student will be evaluated through assessment by an Industry panel formed under the approval of head of the department.

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC002L	KERAS (For Deep Learning)	0	0	2	1

Prerequisite Course (s)

NIL

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

To learn the basics of Keras library and deep learning concepts

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

CO1	Explain different layers of keras and various neural network strategies.

CO-PO Mapping

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

UNIT I	Module – 1	6

Keras- Installation of Keras library in Anaconda- Backends – Keras Ecosystem Models - Keras Model class - Keras Sequential class.

UNIT II	Module – 2	6

Keras Layers: Core Layers - Convolutional Layer - Pooling Layers- Locally-Connected layers- Recurrent Layers - Embedding Layers - Keras Merge Layers.

UNIT III	Module – 3	6

Deep Learning: Library -Artificial Neural Network- Convolutional Neural Network - Recurrent Neural Network-Self-Organizing Maps-Mega Case Study.

Reference(s)

1	https://keras.io/

Strategy(s)

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC003L	AI FOR DECISION MAKING	0	0	2	1

Prerequisite Course (s)

NIL

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

To understand the basic concepts of Big Data, ML, AL and its application domains

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

CO1	Explain the diverse application domains of Artificial Intelligence and other learning environments.

CO-PO Mapping

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

UNIT I	Module – 1	6

Business Strategies and Applications Fundamentals of Big Data, Machine Learning (Ml), and Artificial Intelligence.

UNIT II	Module – 2	6

AI for Marketing World, AI for the finance world and AI for Human resource Management.

UNIT III	Module – 3	6

AI in Food Industry, AI Driven Transformation: Economics and governance.

Reference(s)

1	https://sl-onlinetraining.wharton.upenn.edu/ai-program-for-decision-making

Strategy(s)

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC004L	JAVASCRIPT	0	0	2	1

Prerequisite Course (s)

NIL

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

To develop simple applications using concepts in JavaScript.

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

CO1	Apply various concepts of JavaScript in Real Time ML Projects.

CO-PO Mapping

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

UNIT I	Module – 1	6

Basics of HTML – JavaScript Overview and its Concepts

UNIT II	Module – 2	6

Functions – Events – Cookies - Page Redirect - JavaScript Objects- Number- Boolean - Strings - Arrays – Date - Math – RegExp - Error Handling

UNIT III	Module – 3	6

Validations-Animation- Multimedia –Debugging - Image Map- Browsers

Reference(s)

1	Thomas A. Powell and Fritz Schneider JavaScript: The Complete Reference, Third Edition, 2012.

Strategy(s)

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC005L	ANGULAR JS	0	0	2	1

Prerequisite Course (s)

NIL

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

Modularize your code with the custom services and directives in Angular JS.

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

CO1	Apply various concepts of Angular JS in Real Time Projects.

CO-PO Mapping

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

UNIT I	Module – 1	6

Introduction- Expressions and Data Biding- Working with Directives

UNIT II	Module – 2	6

Controllers- Filters- Forms

UNIT III	Module – 3	6

Modules – Services - Ajax in AngularJS

Reference(s)

1	https://docs.angularjs.org/guide

Strategy(s)

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC006L	RASPBERRY PI	0	0	2	1

Prerequisite Course (s)

NIL

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

Modularize your code with the custom services and directives in Angular JS.

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

CO1	Apply various concepts of Angular JS in Real Time Projects.

CO-PO Mapping

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

UNIT I	Module – 1	6
Introduction- Linux and Python overview- different physical hardware kids and requirements		
UNIT II	**Module – 2**	**6**
Programming with Raspberry Pi – Interfacing- APIs		
UNIT III	**Module – 3**	**6**
Application Building: Traffic lighting, Number Guessing Game, Dancing Christmas Tree, etc .,.		

Reference(s)

1	Simon Monk, Programming the Raspberry Pi: Getting Started with Python, TataMcgraw Hill,Second Edition, 2016.
2	https://codered.eccouncil.org/courseVideo/introduction-to-raspberry-pi?logged=true

Strategy(s)

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC007L	ETHICAL HACKING ESSENTIALS (EHE)	0	0	2	1

Prerequisite Course (s)

NIL

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

To understand the fundamentals of hacking concepts, Security threats and its countermeasures.

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

CO1	Demonstrate the techniques for attacks in different levels and its countermeasures.

CO-PO Mapping

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

UNIT I	Module – 1	6

Information Security Fundamentals - Ethical Hacking Fundamentals - Information Security Threats and Vulnerability Assessment- Password Cracking Techniques and Countermeasures.

UNIT II	Module – 2	6

Social Engineering Techniques and Countermeasures-Network Level Attacks and Countermeasures- Web Application Attacks and Countermeasures - Wireless Attacks and Countermeasures.

UNIT III	Module – 3	6

Mobile Attacks and Countermeasures - IOT & OT Attacks and Countermeasures - Cloud Computing Threats and Countermeasures - Penetration Testing Fundamentals.

Reference(s)

1	https://codered.eccouncil.org/course/ethical-hacking-essentials?logged=true

Strategy(s)

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Regulation 2018		Semester XX	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
OC	18AIOC008L	FOUNDATIONS OF ROBOTICS AND AUTOMATION	0	0	2	1

Prerequisite Course (s)

NIL

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

To Introduce the principles of robotics, Sensors and robot programming.

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

CO1	Explain and apply the concept of sensors and robot programming in Industrial applications.

CO-PO Mapping

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

UNIT I	Module – 1	6

Robotics : Introduction – Definition– Laws–Robot Anatomy– Components – Classification- Robotics & Machine Vision –Terminologies used for robotics specification.

UNIT II	Module – 2	6

Robotic Sensors: Introduction – Types of Sensors in Robots – Tactile Sensors – Proximity Sensors (Position sensors) – Range sensors – Machine Vision Sensors

UNIT III	Module – 3	6

Robot Programming - Industrial Automation- Automation system controllers- Artificial Intelligence in process control, Data flow with in automation system- Case Studies.

Reference(s)

1. Er.A.K.Gupta, S.K.Arora, "Industrial Automation and Robotics", University Science Press (An Imprint of Laxmi Publications pvt.Ltd), Third Edition 2013.

Strategy(s)

- The student will be evaluated through assessment by an Industry panel formed under the approval of head of the department.