

Manipal School of Information Sciences (MSIS)

Manipal Academy of Higher Education, Manipal

Outcome Based Education (OBE) Framework

Two Year full time Postgraduate Program

Master of Engineering - ME (Internet of Things)



TABLE OF CONTENTS

Contents

NATURE AND EXTENT OF THE PROGRAM:	.3
PROGRAM EDUCATION OBJECTICE (PEO):	.4
GRADUATE ATTRIBUTES:	.5
QUALIFICATIONS DESCRIPTORS	.7
PROGRAM OUTCOMES:	.9
COURSE STRUCTURE, COURSEWISE LEARNING OBJECTIVE, AND COURSE OUTCOMES (COS)	11
PROGRAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING1	72



NATURE AND EXTENT OF THE PROGRAM

An engineering graduate skillset requirement is changing with invent of the new technologies. The impact of Big data and its transformative technologies like Internet of Things (IoT) provide a high employability in the industry. IoT will become the mainstream phenomenon by 2020. IoT is a large-scale implementation technology which is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities which was not previously possible.

ME (Internet of Things) Program is a comprehensive two-year postgraduate program, which aims to provide hands-on experience to prepare industry ready IoT professionals. The program ME (Internet of Things) helps engineering graduates to specialize in the field of IoT and enables them to learn how IoT devices can be programmed and networked for the data communication and its analysis. Students will also understand the security issues, IoT protocols and the network stack of IoT. This two-year master's program will cover various domain like communication, sensors and actuators, cloud, data analytics.

ME (Internet of Things) postgraduate degree would welcome graduates from any discipline with 50% mark in qualifying exam. Students after successfully completing the program will get career opportunities as an IoT Architect, IoT Security Analyst, IoT application Developer and IoT Stack developer.



PROGRAM EDUCATION OBJECTICE (PEO)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for

ME (Internet of Things) program are as follows.

PEO No	Education Objective			
PEO 1	Enable to draw upon fundamental and advanced knowledge in order to apply			
	analytical and computational approach to solve problems in IoT Eco System.			
PEO 2	Introduce state of art technologies in the area of IoT and inculcate ethical practices			
I EO 2	to make industry ready professional.			
	Promote scientific and societal advancement through research and			
PEO 3 entrepreneurship.				



GRADUATE ATTRIBUTES

S No.	Attribute	Description			
1	Scholarship of Knowledge	Acquire in-depth knowledge of specific discipline professional area, including wider and global perspective, w an ability to discriminate, evaluate, analyse and synthe- existing and new knowledge, and integration of the same enhancement of knowledge.			
2	Critical Thinking Analyse complex engineering problems critically, apply independent judgement for synthesising information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.				
3	Problem Solving	Think laterally and originally, conceptualise and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.			
4	Research Skill	Extract information pertinent to unfamiliar problems throu literature survey and experiments, apply appropriate resear methodologies, techniques and tools, design, condu- experiments, analyse and interpret data, demonstrate high			
5	Usage of modern tools	Create, select, learn and apply appropriate technique resources, and modern engineering and IT tools, includir prediction and modelling, to complex engineering activitie with an understanding of the limitations.			



		Possess knowledge and understanding of group dynamics,					
		recognise opportunities and contribute positively to					
	Collaborative and	collaborative-multidisciplinary scientific research,					
6	Multidisciplinary	demonstrate a capacity for self-management and teamwork,					
	work	decision-making based on open-mindedness, objectivity and					
		rational analysis in order to achieve common goals and further					
		the learning of themselves as well as others.					
		Demonstrate knowledge and understanding of engineering an					
	Der in 14 Marson and	management principles and apply the same to one's own work,					
7	Project Management	as a member and leader in a team, manage projects efficiently					
	and Finance	in respective disciplines and multidisciplinary environments					
		after consideration of economic and financial factors.					
		Communicate with the engineering community, and with					
		society at large, regarding complex engineering activities					
		confidently and effectively, such as, being able to comprehend					
8	Communication	and write effective reports and design documentation by					
		adhering to appropriate standards, make effective					
		presentations, and give and receive clear instructions.					
		Recognise the need for and have the preparation and ability to					
		engage in life-long learning independently, with a high level of					
9	Life-long Learning	enthusiasm and commitment to improve knowledge and					
		competence continuously.					
		Acquire professional and intellectual integrity, professional					
		code of conduct, ethics of research and scholarship,					
10	Ethical Practices and	consideration of the impact of research outcomes on					
10	Social Responsibility	professional practices and an understanding of responsibility					
		to contribute to the community for sustainable development of					
		society.					
		Observe and examine critically the outcomes of one's actions					
11	Independent and	and make corrective measures subsequently and learn from					
	Reflective Learning	mistakes without depending on external feedback.					
L							



QUALIFICATIONS DESCRIPTORS

- 1. Demonstrate
 - (i) A systematic, extensive and coherent knowledge and understanding of an academic field of study as a whole and its applications, and links to related disciplinary areas/subjects of study; including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues in the field of Internet of Things.
 - (ii) Procedural knowledge that creates different types of professionals related to the Internet of Things, including research and development, teaching, government and public service.
 - (iii) Professional skills in the domain of internet of things, Wireless sensor networks, microcontrollers, Cloud computing, Big data analytics, Communication protocols, embedded systems, data structures, web-services, Security protocols and architectures, sensors, data analytics, actuators including a critical understanding of the latest developments, and an ability to use established techniques in the domain of Internet of Things.
- 2. Demonstrate comprehensive knowledge about Communication protocols, embedded systems, Wireless sensor networks, microcontrollers, Cloud computing, Big data analytics including current research, scholarly, and/or professional literature, relating to essential and advanced learning areas pertaining to the Internet of Things techniques and skills required for identifying problems and issues related.
- 3. Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, analysis and interpretation of data.
- 4. Methodologies as appropriate to the subject(s) for formulating evidence based solutions and arguments.
- 5. Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the chosen field of study.



- 6. Communicate the results of studies undertaken in an academic field accurately in a range of different contexts using the main concepts, constructs and techniques of the Internet of Things studies.
- 7. Address one's own learning needs relating to current and emerging areas of study, making use of research, development and professional materials as appropriate, including those related to new frontiers of knowledge.
- 8. Apply one's disciplinary knowledge and transferable skills to new/unfamiliar contexts, to identify, analyse problems, issues, and seek solutions to real-life problems.



PROGRAM OUTCOMES

After successful completion of Master of Engineering - ME (Internet of Things), Students will be able to:

PO No	Attribute	Competency				
PO 1	Scholarship of Knowledge	Acquire in-depth knowledge of IoT domain, with an ability to discriminate, evaluate, analyze, synthesize the existing and new knowledge, and integration of the same for enhancement of knowledge.				
PO 2	Critical Thinking	Analyze complex IoT Eco System critically, apply independent judgement for synthesizing information to make intellectual				
PO 3	Problem Solving	Think laterally and originally, conceptualize and solve IoT problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.				
PO 4	Research Skill	Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.				
PO 5	Usage of modern tools	Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.				



PO 6	Collaborative and Multidisciplinary work	and Multidisciplinary making based on open-mindedness, objectivity and ration		
DO 7	Project	Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work,		
PO 7	Management and Finance	as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economic and financial factors		
PO 8	Communication	Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.		
PO 9	Life-long Learning	Recognize the need for and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.		
PO 10	Ethical Practices and Social Responsibility	Acquire professional and intellectual integrity, profession code of conduct, ethics of research and scholarsh consideration of the impact of research outcomes professional practices and an understanding of responsibility contribute to the community for sustainable development society.		
PO 11	Independent and Reflective Learning	Observe and examine critically the outcomes of one's actions and make corrective measures subsequently and learn from mistakes without depending on external feedback.		



COURSE STRUCTURE, COURSEWISE LEARNING OBJECTIVE, AND COURSE OUTCOMES (COS)

FIRST YEAR: ME (Internet of Things)

Semester: 1

Semester: 2

Subject Code	Subject Title	L	Т	Р	С	Subject Code	Subject Title	L	Т	Р	С
CSE 601	Data Structures and Algorithms	3	-	-	3	BDA 614	Big Data and Data Visualization	3	-	-	3
IOT 601	Operating Systems for IoT	3	-	-	3	ESD 605	Embedded Systems	3	-	-	3
IOT 602	IoT Networks and Protocols	3	-	-	3	IOT 604	Embedded Sensing Systems and Networks	3	-	-	3
IOT 603	IoT Security	3	-	-	3	IOT 605	Responsive Web Application Development	3	-	-	3
	Elective - 1	3	-	-	3		Elective - 2	3	-	-	3
CSE 601L	Data Structures and Algorithms Lab	-	-	3	1	BDA 614L	Big Data and Data Visualization Lab	-	-	3	1
IOT 601L	Operating Systems for IoT Lab	-	-	3	1	ESD 605L	Embedded Systems Lab	-	-	3	1
IOT 602L	IoT Networks and Protocols Lab	-	-	3	1	IOT 604L	Embedded Sensing Systems and Networks Lab	-	-	3	1
IOT 603L	IoT Security Lab	-	-	3	1	IOT 605L	Responsive Web Application Development Lab	-	-	3	1
	Elective - 1 Lab	-	-	3	1		Elective - 2 Lab	-	-	3	1
IOT 695	Mini Project - 1	-	-	4	-	IOT 696	Mini Project - 2	-	-	-	4
IOT 697	Seminar - 1	-	-	1	-	IOT 698	Seminar - 2	-	-	-	1
	Total	15	-	15	25]	Fotal	15	-	15	25

SECOND YEAR (FINAL YEAR): ME (Internet of Things)

III and IV Semester				
IOT 799 Project Work 25				
Total Number of Cre	75			



List of Electives(Theory)

	Elective - 1	Elective - 2			
Code	Subject	Code	Subject		
BDA-601	Fundamentals of Machine Learning	BDA-605	Machine Learning for Big Data		
CDC-603	Cloud Application Development with JAVA	CSE-605	Mobile Application Development		
			using Android		
ESD-603	Digital Signal Processing	ENP-601	Entrepreneurship		
IOT-606	IoT Application Development	ESD-604	Device Drivers		
		CSE-631	IT Project Management		

List of Electives(Lab)

	Elective - 1	Elective - 2		
Code	Subject	Code Subject		
BDA-	Fundamentals of Machine Learning Lab	BDA-	Machine Learning for Big Data	
601L		605L	Lab	
CDC-603L	Cloud Application Development with JAVA Lab	CSE-605L	Mobile Application Development	
			using Android Lab	
ESD-603L	Digital Signal Processing Lab	ENP-601L	Entrepreneurship Lab	
IOT-606L	IoT Application Development Lab	ESD-604L	Device Drivers Lab	
		CSE-631L	IT Project Management Lab	



Name of the Institution / Department: Manipal School of Information Sciences (MSIS)

	e Program: Master of Engineering - ME (Internet of					
Traine of th	Things)					
Course Tit						
	le: CSE 601 Course Instructor:					
	Vear: 2020 - 2021 Semester: First Year, Semester 1					
No of Cred						
Synopsis:	This Course provides insight on					
	1. This course introduces students to elementary data structures and					
	design of algorithms.					
	2. Students learn how to design optimal algorithms with respect to					
	time and space					
	3. Students learn how to implement link list, stack, queues, searching					
	and sorting techniques, sets, trees and graphs.					
	4. Students learn the design of divide and conquer technique,					
	dynamic programming, greedy technique and back tracking.					
Course						
Outcomes	On successful completion of this course, students will be able to					
(COs):						
CO 1:	Specify and analyse algorithms.					
CO 2:	Learn and design programs for implementation of linear and non linear data structure.					
CO 3:	Learn and design programs for sorting and searching.					
CO 4:	Illustrate application of divide and conquer technique, dynamic					
	programming, greedy technique and back tracking.					
Mapping	of COs to POs					
COs PO						
CO 1 *						
CO 2 *	* *					
CO 3 *	*					
CO 4 *	* * *					
Course content and outcomes:						



Content *Competencies* **Unit 1: Introduction** Algorithm Specification, Performance At the end of the topic student should be Analysis able to: 1. Define algorithms (C1) 2. Analyse algorithms. (C6) **Unit 2: Algorithm Analysis Techniques** Analysis of Recursive Programs, 1. Define recursive programs (C2) Solving Recurrence Equations, General 2. Design simple recursive programs Solution for a large class of (C6)3. Solve recurrence relations (C6) Recurrences. **Unit 3: Elementary data structures** 1. Design singly linked list (C6) Implementation of Lists, Stacks, 2. Design doubly linked list(C6) Queues 3. Explain the concepts of arraybased stacks (C2) 4. Explain the concepts of pointerbased stacks (C2) 5. Design and implement Queues. (C6)Unit 4: Sorting & Searching Techniques Quick sort, Heap sort, Merge sort, 1. Develop algorithm for insertion Binary search, linear search, Fibonacci sort, bubble sort and selection sort. search (C6)2. Develop and analyse algorithm for quick sort (C6) 3. Develop and analyse algorithm for

bevelop and analyse algorithm for4. Develop and analyse algorithm for



binary, linear and Fibonacci search (C6) Unit 5: Operations on Sets Introduction to Sets, A Linked- List implementation of Set, The Dictionary, The Hash Table Data Structure 1. Develop data structures for sets (C6) 2. Design a linked list-based implementation of sets (C6) 3. Design a Dictionary (C6) 4. Design Data structure for hash table (C6) 4. Design Data structure for hash table (C6) Unit 6: Trees 1. Examine the concepts of trees. (C3) Basic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees 1. Examine the concepts of trees. (C3) 2. Design and implement general trees (C6) 3. Design and implement binary trees (C6) 4. Design and implement binary trees (C6) 4. Design and implement binary search trees (C6) Unit 7: Graphs 1. Define graphs (c6) Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Paths, 1. Define graphs (c6) 3. Formulate an algorithm to solve minimum cost spanning tree(c6) 3. Formulate an algorithm to solve	[]	
search (C6) Unit 5: Operations on Sets Introduction to Sets, A Linked- List 1. Develop data structures for sets (C6) The Hash Table Data Structure 2. Design a linked list-based implementation of sets (C6) The Hash Table Data Structure 2. Design a Dictionary (C6) 4. Design Data structure for hash table (C6) 4. Design Data structure for hash table (C6) Unit 6: Trees 3. Basic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees 1. Examine the concepts of trees. (C3) 2. Design and implement general trees (C6) 3. Design and implement general trees (C6) 4. Design and implement binary search trees (C6) 3. Design and implement binary search trees (C6) Unit 7: Graphs 1. Define graphs (c6) Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, 1. Define graphs (c6) All-Pairs Shortest Path 3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve 4. Formulate an algorithm to solve		5. Design and analyse algorithms for
Unit 5: Operations on SetsIntroduction to Sets, A Linked- List implementation of Set, The Dictionary, The Hash Table Data Structure1. Develop data structures for sets (C6)2. Design a linked list-based implementation of sets (C6)3. Design a Dictionary (C6)4. Design Data structure for hash table (C6)4. Design Data structure for hash table (C6)Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)2. Design and implement general trees (C6)2. Design and implement binary trees (C6)Unit 7: Graphs1. Define graphs (c6)Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define an algorithm to solve minimum cost spanning tree(c6)4. Formulate an algorithm to solve		binary, linear and Fibonacci
Introduction to Sets, A Linked- List implementation of Set, The Dictionary, The Hash Table Data Structure1. Develop data structures for sets (C6)The Hash Table Data Structure2. Design a linked list-based implementation of sets (C6)3. Design a Dictionary (C6)4. Design Data structure for hash table (C6)Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)2. Design and implement general trees (C6)3. Design and implement binary trees (C6)4. Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Path, All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6)		search (C6)
implementation of Set, The Dictionary, The Hash Table Data Structure(C6)2. Design a linked list-based implementation of sets (C6)3. Design a Dictionary (C6)4. Design Data structure for hash table (C6)Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)C3)2. Design and implement general 	Unit 5: Operations on Sets	
The Hash Table Data Structure2. Design a linked list-based implementation of sets (C6) 3. Design a Dictionary (C6) 4. Design Data structure for hash table (C6)Unit 6: TreesImage: Search (C3)1. Examine the concepts of trees. (C3)Basic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)Design and implement general trees (C6)2. Design and implement general trees (C6)Unit 7: GraphsImage: Search (C6)Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6)	Introduction to Sets, A Linked- List	1. Develop data structures for sets
Image: Constraint of the constra	implementation of Set, The Dictionary,	(C6)
3. Design a Dictionary (C6)4. Design Data structure for hash table (C6)Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)C3)2. Design and implement general trees (C6)3. Design and implement binary trees (C6)4. Design and implement binary trees (C6)4. Design and implement binary search trees (C6)5. Design and implement binary search trees (C6)6. Unit 7: Graphs7. Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path7. Design data structure for graphs (c6)7. Design data an algorithm to solve minimum cost spanning tree(c6)7. Formulate an algorithm to solve minimum cost spanning tree(c6)	The Hash Table Data Structure	2. Design a linked list-based
4. Design Data structure for hash table (C6)Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)Trees2. Design and implement general trees (C6)3. Design and implement binary trees (C6)4. Design and implement binary trees (C6)5. Design and implement binary trees (C6)6. Design and implement binary trees (C6)6. Design and implement binary search trees (C6)6. Design and implement binary search trees (C6)7. Design and implement binary search trees (C6)7. Design and implement binary search trees (C6)8. Design and implement binary search trees (C6)9. Design data structure for graphs (C6)9. All-Pairs Shortest Path9. Formulate an algorithm to solve minimum cost spanning tree(C6)9. Formulate an algorithm to solve minimum cost spanning tree(C6)9. Formulate an algorithm to solve		implementation of sets (C6)
table (C6)Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search Trees1. Examine the concepts of trees. (C3)Trees2. Design and implement general trees (C6)3. Design and implement binary trees (C6)3. Design and implement binary trees (C6)Unit 7: Graphs4. Design and implement binary search trees (C6)Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6)3. Formulate an algorithm to solve		3. Design a Dictionary (C6)
Unit 6: TreesBasic Terminology, Implementation of Trees, Binary Trees, Binary Search1. Examine the concepts of trees. (C3)Trees2. Design and implement general trees (C6)Trees3. Design and implement binary trees (C6)Unit 7: Graphs4. Design and implement binary search trees (C6)Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6)		4. Design Data structure for hash
Basic Terminology, Implementation of Trees, Binary Trees, Binary Search1. Examine the concepts of trees. (C3)Trees2. Design and implement general trees (C6)Trees3. Design and implement binary trees (C6)Unit 7: Graphs4. Design and implement binary search trees (C6)Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6)		table (C6)
Trees, Binary Trees, Binary Search Trees(C3)1Design and implement general trees (C6)2Design and implement binary trees (C6)3Design and implement binary trees (C6)4Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve	Unit 6: Trees	
Trees2. Design and implement general trees (C6)3. Design and implement binary trees (C6)4. Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6)4. Formulate an algorithm to solve	Basic Terminology, Implementation of	1. Examine the concepts of trees.
trees (C6)3. Design and implement binary trees (C6)4. Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6)4. Formulate an algorithm to solve	Trees, Binary Trees, Binary Search	(C3)
3. Design and implement binary trees (C6)4. Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path3. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve	Trees	2. Design and implement general
(C6)4. Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve		trees (C6)
4. Design and implement binary search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6) 3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve		3. Design and implement binary trees
search trees (C6)Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6) 2. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve		(C6)
Unit 7: GraphsBasic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6)2. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve		4. Design and implement binary
Basic definitions, Representation of Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path1. Define graphs (c6)2. Design data structure for graphs (c6)2. Design data structure for graphs (c6)3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve		search trees (C6)
 Graphs, Minimum Cost Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Path 2. Design data structure for graphs (c6) 3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve 	Unit 7: Graphs	
Single Source Shortest Paths,(c6)All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6)4. Formulate an algorithm to solve	Basic definitions, Representation of	1. Define graphs (c6)
All-Pairs Shortest Path3. Formulate an algorithm to solve minimum cost spanning tree(c6) 4. Formulate an algorithm to solve	Graphs, Minimum Cost Spanning Tree,	2. Design data structure for graphs
minimum cost spanning tree(c6) 4. Formulate an algorithm to solve	Single Source Shortest Paths,	(c6)
4. Formulate an algorithm to solve	All-Pairs Shortest Path	3. Formulate an algorithm to solve
		minimum cost spanning tree(c6)
Single source shortest path $(c6)$		4. Formulate an algorithm to solve
Single source shortest pair (co)		Single source shortest path (c6)
5. Formulate an algorithm to solve		5. Formulate an algorithm to solve
All- pair shortest path(c6)		All- pair shortest path(c6)
Unit 8: Algorithm Design Techniques	Unit 8: Algorithm Design Techniques	



Divide-and-Conquer Algorithms, Dynamic Programming, Greedy Algorithms, Backtracking	-	of divide and conquer	
	aigoriu	ums (C6)	
	Ū	nax min, Strassen's matrix	
		ication, multiplication of	
	-	egers problem. (C6)	
	U U	of dynamic programming	
		ues (C6)	
	-	natrix chain order problem	
	(C6)	Ĩ	
		of greedy algorithms(C6)	
	-	Knap-sack, job scheduling	
	with	deadlines and optimal	
	storage	on tapes problems. (C6)	
	7. Design	of Back tracking	
	algorith	ums (C6)	
Learning strategies, contact hours and	student learnin	g time	
Learning strategy	Contact hours	Student learning time	
		(Hrs)	
Lecture	30	60	
Seminar	-	-	
Quiz	02	04	
Small Group Discussion (SGD)	02	02	
Self-directed learning (SDL)	-	04	
Problem Based Learning (PBL)	02	04	
Case Based Learning (CBL)	-	-	
Clinic	-	-	
Revision	02	-	
Assessment	- 06		
TOTAL	44	74	
Assessment Methods:			
Formative:	Summativ	/e:	



Internal practical Tes	st	Sessional examination					
Theory Assignments	End semester examination						
Lab Assignment & Viva			Viva				
Mapping of assessm	nent with Cos	S					
Nature of asses	ssment	CO 1	CO 2	CO 3	CO 4		
Sessional Exami	nation 1	*	*				
Sessional Exami		*	*	*			
Assignment/Pres	sentation	*	*	*	*		
End Semester Exa	amination	*	*	*	*		
Feedback Process	• End-	Semester F	eedback				
Reference	1. "Introdu	ction to Alg	gorithms" Th	omas H. Cor	rmen, Charles		
Material	E. Leise	rson, Ronale	d L. Rivest.				
	2. "Data	Structures&	Algorithm	s" Aho, H	Iopcroft and		
	Ulmann						
	3. "Data structures and algorithm analysis in C" Mark Allen						
	Weiss						
	4. "Compu	ter Algorith	hms" : Ellis	Horowitz,	Sartaj Sahni,		
	Sanguth	evar Rajase	karan				



Name o	Name of the Program:				Mast	Master of Engineering - ME (Internet of Things)						
Course	Title:				Opera	Operating Systems for IoT						
Course	Code:	IOT 601			Cour	Course Instructor:						
	Academic Year: 2020 - 2021							ır, Semest				
No of C	No of Credits: 3						: Progra	mming sl	kills			
Synop	sis:	This C	ourse p	rovides	s insigh	t on						
		1. Bas	sics of o	operatii	ng syste	ems and	l real tir	ne operat	ting syste	ems.		
		2. Un	derstan	d the	conc	cepts	of pro	ocess n	nanagem	ent, sch	eduling,	
		syn	chroniz	zation a	and dea	d locks.						
		3. Co	ncept o	f memo	ory mar	nagemei	nt.					
		4. The	e salien	t featur	es of re	eal time	operati	ng syster	ns with c	case study	of RTx	
		5. To	unders	tand th	e conce	epts of e	event dr	iven pro	grammin	ig with ca	ise study	
		of	tiny OS	and Co	ontiki							
Course	e											
Outcon	mes	On suc	cessful	comple	etion of	f this co	ourse, st	udents w	ill be abl	e to		
(COs):	:											
CO 1:		Experi	ment pi	rocess c	creation	, proces	ss hiera	rchies an	d multi-t	hread con	ncepts.	
CO 2:		Apply	process	s-sched	uling al	gorithn	ns and p	rocess sy	nchroniz	zation cor	cepts on	
CO 2.		various	s scenai	rios.								
CO 3:		Analys	e the re	quirem	ent for	process	synchr	onizatior	n and coo	ordination	handled	
005.		by ope	rating s	ystem.								
CO 4:		Identit	fy the s	alient f	eatures	of real	time op	erating s	ystems v	vith prog	ramming	
		on RT	X									
CO 5:		Unders	stand th	e conce	ept of e	vent dri	ven pro	grammir	ng on ting	y OS and	Contiki	
Mappi	ng of (COs to 1	POs									
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*											
CO 2		*	*									
CO 3	*		*									
CO 4		*			*							
CO 5	*				*							
					-							



Course content and	outcomes:
--------------------	-----------

Content	Competencies
Unit 1: Introduction to Operating Sy	stems
OS vs RTOS, Functions of Operating	1. Identify the features of OS and RTOS (C2)
Systems, Introduction to Kernel, Types	2. Distinguish between single processor and
of Kernel, User space vs Kernel	multi-processor systems (C2)
Space.	3. Identify the features of batch processing, time
	sharing, multi programming and interactive
	systems (C2)
	4. Distinguish between user and kernel modes
	(C2)
	5. Distinguish between function and system calls
	(C2)
Unit 2: Process Management	
The process concept, synchronization,	1. Describe a process, process state, process
mutual exclusion, semaphores, and	control block (C2)
monitors, Threads, Inter-	2. Apply scheduling algorithms, scheduling
process communication	queues (C3)
	3. Examine process related system calls (C1)
	4. Experiment inter process communication
	through share memory and sockets (C4)
Unit 3: Resource Allocation, Deadloc	k prevention, avoidance, and detection
The OS Kernel, Micro and Monolithic	1. Examine methods for handling dead locks (C3)
kernels, Multi-tasking, privilege,	2. Write dead lock prevention algorithms (C3)
interrupt handling, System and user	3. Write dead lock avoidance algorithm (C3)
processes, System calls	4. Write dead lock recovery algorithm(C3)
Unit 4: Memory Management	
Description of problems of allocation,	1. Examine various memory management
protection and sharing, Virtual to	strategies(C3)
Physical memory mapping schemes,	2. Examine the evolution of memory
Segmented paged virtual memory,	management (C3)



TRED BY > (Deemea to be						
Paging control, replacement	3. Illustrate the benefit	s of paging and				
algorithms, the working set model,	segmentation(C2)					
Sharing code and data	4. Examine the impleme	entation of demand				
	paging(C3)					
	5. Examine the various	s virtual memory				
	concepts (C3)					
Unit 5: Time Management						
Time Management, CPU scheduling	1. Distinguish between sch	eduling algorithms				
algorithms, Real-time scheduling, Disc	(C2)					
access scheduling	ccess scheduling 2. Examine the criteria for scheduling (C3)					
	3. Examine Disc access sched	luling (C3)				
Unit 6: RealTime OS						
Real Time OS, OS calls in RTOS, RTx	1. Examine Real Time OS (C3)				
Kernel OS calls – Examples	2. Illustrate OS calls in RTOS (C3)					
	3. Illustrate OS calls in RTx (C3)					
Unit 7: Real Time Systems						
Operating systems for IoT, Pre emption	1. Examine the concepts inv	volved in the design				
vs Event Driven, Event Driven	of real time systems (C3)					
Programming, Tiny OS vs Contiki	2. Illustrate real time clocks	in various real time				
	languages(C3)					
	3. Describe the concepts of t	ime outs in message				
	passing, semaphores and r	monitors (C1)				
	4. Compare various pr	iority inheritance				
	algorithms (C4)					
	5. Explain the concept of res	sponse time analysis				
	(C2)					
	6. Examine Event driven j	programming using				
Tiny OS and Contiki (C2)						
Learning strategies, contact hours and	student learning time					
Learning strategy	Contact hours	Student learning				
		time (Hrs)				
Lecture	30	60				



Quia			02			04		
Quiz			02		04			
Small Group Discussi			02		02	02		
	Self-directed learning (SDL)					04		
Problem Based Learn	ing (PBL)		02			04		
Case Based Learning	(CBL)		-			-		
Revision			02			-		
Assessment			06			-		
TOTAL			44			74		
Assessment Methods	5:					I		
Formative:					Sum	native:		
Internal practical Test	-				Sessio	onal examin	nation	
Theory Assignments					End s	emester exa	ester examination	
Lab Assignment & V	iva		Viva					
Mapping of assessme	ent with Co	DS						
Nature of assessment		CO 1	CO 2	C	203	CO 4	CO 5	
Sessional Examinatio	n 1	*	*					
Sessional Examinatio	n 2			*		*		
Assignment/Presentat	ion		*	*			*	
End Semester Examir	nation	*	*	*		*	*	
Feedback Process	• En	d-Semeste	er Feedback			1		
Reference Material	1.	Abraha	am Silbersch	natz,	Peter	Galvvin,	Grag Gagne,	
	"O	perating S	System princi	ples'	', Sever	nth Edition,	,	
	John Wiley Publications, 2006.							
	2. Allan Burns, Andy Wellings, "Real – Time Systems and							
	Programming Languages", Fourth Edition,							
		Pearson Education Canada, 2009.						
	3.					g Stems (Concepts and	
	De			-		-		
		Design", McGraw Hill Higher Education, 1987.						



4. Maurice Bach (IPC), "Design of Unix Operating System",
Prentice-Hall, Inc., 1986.
5. Kerninghan & Ritchie, "The C Programming Language",
Second Edition, Prentice-Hall, 1988.
6. www.freertos.org, "The FreeRTOS Reference Manual",
Real Time Engineers Ltd. 2016.



Name of	Name of the Program:					Master of Engineering - ME (Internet of Things)							
Course '	Title:				IoT N	letworks	and Pro	otocols					
Course	Code:	IOT 602	2		Cour	Course Instructor:							
Academ			- 2021			Semester: First Year, Semester 1							
No of C						-	Basic I	Network C	Concepts				
Synops	is:	This C	ourse p	rovides	s insigh	t on							
		1. To	IoT Ar	chitect	ure, eco	o system	n, differ	ent level	s and IoT	C commu	nication.		
		2. To understand the concepts of basic wired and wireless networks											
		3. To	unders	tand ne	twork of	compon	ents.						
		4. To	learn d	ifferen	t layers	of OSI	Model.						
		5. To	learn	about	Softwa	re Defi	ned Ne	tworks ((SDN), 1	Network	Function		
		Vii	rtualiza	tion (N	FV).								
Course													
Outcon	nes	On suc	cessful	compl	etion of	f this co	ourse, st	udents w	ill be abl	e to			
(COs):													
CO 1	1.	Explai	n IoT a	rchitec	ture, ec	o syste	m, diffe	erentiate	between	IoT and	Machine		
CO .	1:	to Mac	hine.										
CO	2:	Illustra	te class	sificatio	on of ne	tworks							
CO S	3:	Descri	be diffe	erent ne	twork of	compon	ents.						
CO 4	4:	Explai	n differ	ent pro	tocols	used in	OSI La	yers.					
CO	5:	Descri	be Soft	ware D	efined	Networl	ks (SDN	N), Netwo	ork Funct	tion Virtu	alization		
001		(NFV)	•										
Mappir	ng of (COs to	POs										
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11		
CO 1	*												
CO 2	*	*											
CO 3			*	*									
CO 4	*	*											
CO 5				*									
Course	conte	ent and	outcon	nes:	1	1	1	1	1	1			



Content	Competencies
Unit 1: Introduction to IoT	
IoT Characteristics, Architecture, IoT	At the end of the topic student should be able to:
Ecosystem, IoT Enabling Technologies,	1. Explain IoT characteristics, IoT eco system
IoT Levels, IoT vs M2M,	(C2)
Technologies of IoT, Layers of IoT	2. Describe IoT architecture, different levels and
Network, IoT Communications	Machine to Machine architecture (C3)
	3 . Describe IoT design methodologies (c2)
	4. Explain IoT enabling technologies (c2)
Unit 2: Introduction to Basic Networks	5
Classification of Networks, Wired vs	1. Distinguish between wired and wireless
Wireless Networks.	network, classification of network (c2)
Unit 3: Components of Networks	
Network Interface card, modem, hub,	1. Describe different network components(C2)
switch, repeater, bridge, router and	2. Explain MAC and IP address (C3)
gateway, MAC address, IP Address	
Unit 4: Network OSI Model	
Physical, Data link, Network, Session,	1. Explain different OSI Layer (C3)
Transport, Applications Layer, OSI vs	2. Differentiate OSI vs TCP/IP Model vs IoT
TCP/IP Model vs IoT Model	Model(C1)
	3. Demonstrate simple network using NS2(C3)
Unit 5: Application layer	
http, ftp, SMTP, CoAP, MQTT, XMPP,	1. Explain working of http protocol. (C2)
AMQP, SSH, DNS, NTP, DHCP	2. Describe ftp and SMTP protocol. (C2)
	3. Illustrate CoAP, MQTT, XMPP, AMQP
	protocol. (C3)
	4. Demonstrate SSH, DNS, NTP, DHCP protocol
	(C2)
Unit 6: Transport Layer	
Ipv6/ IPv4, RPL, TCP/UDP, uIP, SLIP,	1. Demonstrate various transport layer protocol
6LowPAN	(C2)
Unit 7: Physical Layer & Network L	ayer



(Deemed to be University under Section 3 of the UGC Act, 1956)

IEEE 802.15.4, 802.3, 802.11	1. Describe IEEE 802.3 architecture. (C2)						
		2. Des	cribe IEE	E 802.11 arc	hitecture. (C2)		
		3. Describe IEEE 802.15.4 architecture. (C2)					
Unit 8: SDN NFV							
Software Defined Networks	(SDN),	1. Exp	lain Softv	ware Define	d Networks (SDN),		
Network Function Virtualization	(NFV)	Net	work Fund	ction Virtual	ization (NFV). (C2)		
Learning strategies, contact how	urs and	student	learning t	time			
Learning strategy			Contact h	ours	Student learning		
					time (Hrs)		
Lecture			30		60		
Quiz			02		04		
Small Group Discussion (SC	GD)		02		02		
Self-directed learning (SDI	L)		-		04		
Problem Based Learning (PI	BL)		02		04		
Case Based Learning (CBI	Ĺ.)		-	-			
Revision			02	-			
Assessment			06	-			
TOTAL			44		74		
Assessment Methods:							
Formative:				ve:			
Internal practical Test				Sessional examination			
Theory Assignments				End semes	ster examination		
Lab Assignment & Viva				Viva			
Mapping of assessment with Co	S						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examination 1	*	*					
Sessional Examination 2			*	*			
Assignment/Presentation	*	*	*	*	*		
End Semester Examination	*	*	*	*	*		



Feedback Process	•	End-Semester Feedback
Reference Material	1.	Jim Doherty, "SDN and NFV Simplified: A Visual Guide to
		Understanding Software Defined Networks and Network
		Function Virtualization", Addison-Wesley Professional, 2016.
	2.	Larry L Peterson & Bruce S Davie, "Computer Networks – a
		Systems Approach", 5th Ed. Elsevier, MK Publishers, 2011.
	3.	Behrouz A Forouzan, "TCP/IP Protocol Suite", TMH, 3rd
		Edition, 2005.
	4.	Arshdeep Bhaga, Vijay Madishetti, "Internet of things: A hands
		on Approach", Universities Press, ISBN:978172719547, 2015.
	5.	William Stallings, "Wireless Communications & Networks",
		Pearson, 2nd Edition, 2004.
	6.	Jean-Philippe Vasseur and Adam Dunkels." Interconnecting
		Smart Objects with IP - The Next Internet", Morgan
		Kaufmann, 2010.
	7.	Zach Shelby, Carsten Bormann, "6LoWPAN: The Wireless
		Embedded Internet", Willey, 2009.
	8.	RFC's on COAP, XMPP, MQTT, AMQP - Internet resources.



Name of the Program:				Mast	Master of Engineering - ME (Internet of Things)						
Course Title:					IoT Security						
Course Code: IOT 603				Cour	Course Instructor:						
Academic Year: 2020 - 2021				Seme	ester: I	First Yea	r, Semeste	er 1			
No of C	Credits:	3				_	• 1	ography E	Basics, N	Vetworking	g Basics,
<u> </u>		T 1 · 0		• 1	-	amming	aspects				
Synop	SIS:	This C	This Course provides insight on								
			The Se	ecurity	Archite	ecture a	nd requi	rements of	of IoT.		
		2. Basics of Cryptography, Symmetric Key Cryptography, Asymmetric								mmetric	
			Key C	ryptog	raphy, l	PKI, Ha	shing, D	Digital sig	natures.		
		3.	Variou	is types	s of Th	reats, A	ttacks ir	n network	and Io7	Г architec	ture and
			the m strateg		to mi	tigate tl	ne same	e using v	various	network	security
		4.	-		Blocke	hain Ci	wnto-cu	rrencies,	ΙΟΤΑ		
		т.					• 1			vetome I	ntrusion
		Cyber security strategies like Intrusion Detection Systems, Intrusion Prevention System.									
			Prever	mon S	ystem.						
Course	Course										
Outcomes		On successful completion of this course, students will be able to									
(COs):	:										
0.0			Describe the core components of Security requirements and architecture of								
CO	1:	IoT.									
CO 2:		Apply the concepts of cryptography to maintain the Confidentiality, Integrity									
		and Availability of a data against the threats in the networks.									
		Analyse various types of Threats, Attacks in network and IoT architecture and									
CO 3:		the methods to mitigate the same using various network security strategies.									
CO	4:	Illustrate the concepts of blockchain and cyber security strategies.									
		COs to]		Ľ			5		5	0	
rr											
COs	PO 1	PO 2	<i>PO 3</i>	<i>PO</i> 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11
CO 1	*										
CO 2		*	*	*	*						
CO 3	*	*	*		*						
			*		*						
CO 4			Ť		ጥ						



course content and outcomes.	Course content and outcomes:						
Content	Competencies						
Unit 1: Introduction							
Need for Security in IoT, CIA triad,	At the end of the topic student should be able to:						
Security Concerns in IoT Applications,	1. Outline the Need for Security in IoT, CIA						
Security Architecture in the Internet of	triad. (C1)						
Things - Security Requirements in IoT,	2. Identify Security Concerns in IoT						
threats to CIA in IoT, Cross layer	Applications. (C2)						
architecture, IoT Security life cycle.	3. Explain Security Architecture in the						
	Internet of Things - Security Requirements						
	in IoT, threats to CIA in IoT, Cross layer						
	architecture, IoT Security life cycle. (C2)						
Unit 2: Security Fundamentals							
Cryptography basics, A Taxonomy of	1. Demonstrate Cryptography basics, A						
Cryptography and cryptanalysis,	Taxonomy of Cryptography and						
Characteristic of Cryptographic	cryptanalysis. (C3)						
Systems, Symmetric Key	2. Practice Characteristic of Cryptographic						
Cryptography, Asymmetric Key	Systems, Symmetric Key Cryptography,						
Cryptography, PKI, Hashing, Digital	Asymmetric Key Cryptography, PKI,						
signatures.	Hashing. (C3)						
	3. Apply various cryptographic algorithms						
	like AES, DES, SHA256, SHA512 using						
	JAVA, Python Programming. (C3)						
Unit 3: Threats, Attacks and Mitigatio	on in IoT						
Vulnerabilities, Attacks, and	1. Describe various types of Vulnerabilities,						
Countermeasures, Attacks specific to	Threats, Attacks in network and IoT						
IoT, Identity and Access Management	architecture. (C2)						
Solutions for the IoT, Mitigating IoT	2. Identity access management solutions for						
Privacy Concerns, DoS, DDoS	the IoT, Mitigating IoT Privacy Concerns,						
	DoS, DDoS. (C2)						

Unit 4: Network Security



	University under Section 3 of the UGC Act, 1956)
Web security, SQL injection,	1. Interpret the concepts of web security,
Authentication. Worm hole, Tunneling,	SQL injection, Authentication, Worm
TLS, SSH, Certificates	hole, Tunneling, TLS, SSH, Certificates.
	(C3)
	2. Demonstrate the SQL injection technique.
	(C3)
	3. Interpret TLS, SSH, Certificates. (C3)
Unit 5: Block chain	
Crypto-currencies, Bitcoin P2P	1. Explain the concepts of Bitcoin P2P
network, distributed consensus,	network, distributed consensus, Crypto-
incentives and proof-of-work, mining,	currencies. (C2)
scripts and smart contracts, wallets: hot	2. Describe smart contracts, wallets storage,
and cold storage, anonymity, altcoins,	anonymity, altcoins, IOTA. (C2)
IOTA (next generation Blockchain).	3. Illustrate a use case of block chain
	implementation showing distributed
	consensus, incentives and proof-of-work.
	(C3)
Unit 6: IDS, IPS	
Intrusion Detection Systems, Intrusion	1. Describe cyber security strategies like
Prevention System.	IDS, IPS. (C2)
Learning strategies, contact hours and	student learning time
Learning strategy	Contact hours Student learning
	time (Hrs)
Lecture	30 60
Quiz	02 04
Small Group Discussion (SGD)	02 02
Self-directed learning (SDL)	- 04
Problem Based Learning (PBL)	02 04
Case Based Learning (CBL)	
Revision	02 -
Assessment	06 -



TOTAL		44	4		74	
Assessment Methods	5:					
Formative:				Summa	tive:	
Internal practical Test	ţ			Session	al examination	
Theory Assignments				End sen	nester examination	
Lab Assignment & Viva				Viva		
Mapping of assessme	ent with Co	S				
Nature of assessment		CO 1	CO 2	CO 3	CO 4	
Sessional Examinatio	n 1	*	*			
Sessional Examinatio	n 2			*		
Assignment/Presentat	ion		*	*	*	
End Semester Examin	nation	*	*	*	*	
Laboratory examinati		*		*		
Feedback Process	• End	d-Semester H	Feedback			
 Reference Material Fei Hu," Security and Privacy in Internet of Things (IoTs Models, Algorithms, and Implementations", CRC Press, 2016. Stephen Northcutt, Donald McLachlan, Judy Novak, "Network Intrusion Detection: An Analyst's Handbook", New Riders, 2000 Stephen A. Thomas, "SSL & TLS Essentials: Securing the Web John Wiley & Sons, 2000. Don Tapscott and Alex Tapscott, "Blockchain Revolution: Ho 				, CRC Press, 2016. Judy Novak, "Network k", New Riders, 2000. als: Securing the Web",		
	the Tec the Wo 5. B Securit 6. A. N A Com 7. A	chnology Bel orld", Portfol Rusell and y", Packt Pu arayanan et a prehensive I	hind Bitcoin io, 2016. D. Van Du Iblishing, 20 al., "Bitcoin ntroduction" pulos, "Mas	Is Changing uren, "Praction 16. and Cryptoon ", Princeton utering Bitco	g Money, Business, and ical Internet of Things currency Technologies: University Press, 2016. bin: Unlocking Digital	



8.	T. Alpcan and T. Basar, "Network Security: A Decision and
	Game-theoretic Approach", Cambridge University Press, 2011.



Name of the Program:	Master of Engineering - ME (Internet of Things)							
Course Title:	Fundamentals of Machine Learning							
Course Code: BDA-601	Course Instructor:							
Academic Year: 2020 - 2021	Semester: First Year, Semester 1							
No of Credits: 3	Prerequisites: Basic Programming – preferably Python							
Synopsis: This Course provides in	nsight on							
-	ide the concept of machine learning, applications,							
techniques, design	issues and approaches to machine learning.							
2. This course provide	2. This course provide the fundamental knowledge about concept learning,							
hypothesis and bias								
3. To implement mach	hine learning algorithms such as Decision Tree learning,							
Probably Approxim	mately Correct (PAC) learning, Bayesian learning,							
Instance-based lea	arning, Principal Component Analysis (PCA) and							
Ensemble methods	in real time data set for various analysis.							
Course								
Outcomes On successful completi	pletion of this course, students will be able to							
(COs):								
CO 1: Identify the goals, app.	Identify the goals, applications, types and design issues of machine learning							
techniques.	techniques.							
CO 2: Relate concept learning	Relate concept learning and hypothesis space.							
CO 3: Apply PCA learning ap	Apply PCA learning approach to reduce the dimension.							
CO 4: Analyse different mach	Analyse different machine learning algorithms.							
CO 5: Design ensemble metho	Design ensemble methods.							
Mapping of COs to POs								
	PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11							
CO 1 *								
CO 2 *								
CO 3 *								
CO 4 *								
CO 5 *								
Course content and outcomes:								



Content	Competencies
Unit 1: Introduction	
Definition of Machine Learning, Goalsand applications of machine learning,Basic design issues and approaches tomachine learning, Types of machinelearning techniquesUnit 2: Inductive ClassificationThe concept learning task, Conceptlearning as search through a hypothesisspace, General-to-specific ordering ofhypotheses, Finding maximally specifichypotheses, Version spaces and thecandidateeliminationalgorithm,	 Define Machine Learning (C1) Describe about any three applications for which machine learning approaches seem appropriate. (C2) Illustrate different types of machine learning techniques (C3) Relate concept learning and hypothesis space (C4). Apply different algorithms to obtain most general and most specific hypotheses from the training examples. (C3)
Inductive bias. Unit 3: Decision Tree learning Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute, Entropy and information gain, Searching for simple trees and computational complexity.	 Apply decision tree algorithm to find the hypothesis space (C3) Construct decision tree machine learning algorithm (C5) Explain the method of choosing training examples and target function in the design of a machine learning system (C2) Explain different validation technique to find the accuracy in training and testing of data set (C5)
Unit 4: Computational learning the Models of learnability: learning in the limit, Probably Approximately Correct (PAC) learning, Sample Complexity: quantifying the number of examples	1. Define various terms related to computational learning approach (C1).



complexity of training. Sample complexity for finite hypothesis spaces, Noise Learning Multiple Classes, Bias- variance trade-off, under-fitting and over-fitting conceptslimit (C2)3. Calculate the number of training examples required in different types of learning approaches (C4).Unit 5: Bayesian learningProbability theory and Bayes rule, Naive Bayes learning algorithm - Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies1. Write the applications of Bayes theorem (C3)Unit 6: Instance-based learning examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C5) 2. Discriminate Instances Based and Case- based learning (C4)Unit 7: Continuous Latent Variables1. Describe use of Principal Component Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C2).Unit 8: Ensemble methods (bagging uting committees of multiple1. Choose a suitable method of ensemble	needed to PAC learn, Computational	2. Describe different models learning in the				
complexity for finite hypothesis spaces, Noise Learning Multiple Classes, Bias- variance trade-off, under-fitting and over-fitting concepts3. Calculate the number of training examples required in different types of learning approaches (C4).Unit 5: Bayesian learning	complexity of training. Sample					
Noise Learning Multiple Classes, Biasvariance trade-off, under-fitting and over-fitting conceptsrequired in different types of learning approaches (C4).Unit 5: Bayesian learningrequired in different types of learning approaches (C4).Probability theory and Bayes rule, Naive Bayes learning algorithm - Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies1. Write the applications of Bayes theorem (C3)Unit 6:Instance-based learning2.Constructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C5)Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2).Unit 8:Ensemble methods (bagging and boosting)UsingCommittees1. Choose a suitable method of ensemble		3. Calculate the number of training examples				
variance trade-off, under-fitting and over-fitting conceptsapproaches (C4).Unit 5: Bayesian learning	Noise Learning Multiple Classes, Bias-	required in different types of learning				
Unit 5:Bayesian learningProbability theory and Bayes rule, Naive Bayes learning algorithm - Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies1.Write the applications of Bayes theorem (C3)2.Describe the use of Logistic Regression in Machine Learning (C2)3.Predict the target value for the new instance using Naïve Bayes classifier. (C3)Unit 6:Instance-based learningConstructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1.Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1.Describe use of Principal Component Analysis for the complex data set (C2).2.Apply PCA to choose principal components for the given data set (C3)Unit 8:Ensemble methods (bagging and boosting)Using committees of multiple1.Using committees of multiple1.	variance trade-off, under-fitting and	approaches (C4).				
Probability theory and Bayes rule, Naive Bayes learning algorithm - Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies1. Write the applications of Bayes theorem (C3)2. Describe the use of Logistic Regression in Machine Learning (C2)3. Predict the target value for the new instance using Naïve Bayes classifier. (C3)Unit 6: Instance-based learning1. Construct explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C5) 2. Discriminate Instances Based and Case- based learning (C4)Unit 7: Continuous Latent Variables1. Describe use of Principal Component Analysis for the complex data set (C2).Principal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2).Unit 8: Ensemble methods (bagging and boosting)1. Choose a suitable method of ensemble						
Naive Bayes learning algorithm - Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies1. Write the applications of Bayes theorem (C3)Unit 6: Instance-based learning Constructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C5) 2. Discriminate Instances Based and Case- based learning (C4)Unit 7: Continuous Latent Variables3. Explain K-nearest neighbour learning (C5) 2. Discribe use of Principal Component Analysis (PCA), Applications of PCAPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C3)Unit 8: Ensemble methods (bagging and boosting)1. Choose a suitable method of ensemble	Unit 5: Bayesian learning					
Naive Bayes learning algorithm - Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies(C3)2. Describe the use of Logistic Regression in Machine Learning (C2)3. Predict the target value for the new instance using Naïve Bayes classifier. (C3)Unit 6: Instance-based learning Constructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C5) 2. Discriminate Instances Based and Case- based learning (C4)Unit 7: Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2).Unit 8: Ensemble methods (bagging and boosting)Using committees of multiple1. Choose a suitable method of ensemble	Probability theory and Bayes rule,	1 Write the applications of Bayes theorem				
Parameter smoothing, Generative vs. discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies2. Describe the use of Logistic Regression in Machine Learning (C2)Unit 6:Instance-based learning2.Predict the target value for the new instance using Naïve Bayes classifier. (C3)Unit 6:Instance-based learning1.Construct explicit generalizations (C5)Constructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1.Construct explicit generalizations (C4)Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1.Describe use of Principal Component Analysis for the complex data set (C2).Unit 8:Ensemble methods (bagging and boosting)1.Choose a suitable method of ensembleUsing committees of multiple1.Choose a suitable method of ensemble	Naive Bayes learning algorithm -					
discriminative regression, Bayes nets and Markov nets for representing dependenciesMachine Learning (C2)Unit 6:Instance-based learningConstructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1.Construct explicit generalizations (C5) 2.Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1.Describe use of Principal Component Analysis for the complex data set (C2).Unit 8:Ensemble methods (bagging and boosting)Usingcommittees1.Construct explicit generalizations of multiple1.Component Analysis (PCA), Applications of PCA1.Describe use of Principal Component Analysis for the complex data set (C2).2.Apply PCA to choose principal components for the given data set (C3)Unit 8:Ensemble methods (bagging and boosting)	Parameter smoothing, Generative vs.					
regression, Bayes nets and Markov nets for representing dependencies3. Predict the target value for the new instance using Naïve Bayes classifier. (C3)Unit 6:Instance-based learningConstructing explicit generalizations versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C5) 2. Discriminate Instances Based and Case- based learning (C4)Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C3)Unit 8:Ensemble methods (bagging and boosting)Using committees of multiple1. Choose a suitable method of ensemble	discriminative training, Logistic					
for representing dependencies using Naïve Bayes classifier. (C3) Unit 6: Instance-based learning Constructing explicit generalizations 1. versus comparing to past specific 2. examples, K-Nearest Neighbour 1. learning algorithm, Case-based 2. reasoning (CBR) learning 3. Explain K-nearest neighbour learning (C4) Principal Component Analysis (PCA), Applications of PCA Applications of PCA Image: Resemble methods (bagging and boosting) Unit 8: Ensemble methods (bagging and boosting) Using committees of multiple 1. Choose a suitable method of ensemble	regression, Bayes nets and Markov nets					
Constructingexplicitgeneralizations past1.Construct explicit generalizations (C5)versuscomparingtopastspecific based2.DiscriminateInstancesBased and Case- based learning (C4)learningalgorithm,Case-based reasoning (CBR) learning3.Explain K-nearest neighbour learning (C5)Unit 7:Continuous Latent VariablesPrincipalComponentAnalysis (PCA), Applications of PCA1.Describeuse ofPrincipalComponent Analysis for the complex data set (C2). 2.2.ApplyPCAtochooseprincipalUnit 8:Ensemble methods (bagging and boosting)Usingcommitteesofmultiple1.Choose a suitable method of ensemble	for representing dependencies					
versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning1. Construct explicit generalizations (C3)Unit 7:Continuous Latent Variables3. Explain K-nearest neighbour learning (C4)Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2).2.Apply PCA to choose principal components for the given data set (C3)Unit 8:Ensemble methods (bagging and boosting)Using committees of multiple1. Choose a suitable method of ensemble	Unit 6: Instance-based learning					
versus comparing to past specific examples, K-Nearest Neighbour learning algorithm, Case-based reasoning (CBR) learning2. Discriminate Instances Based and Case- based learning (C4) 3. Explain K-nearest neighbour learning (C5)Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C3)Unit 8:Ensemble methods (bagging uting committees of multiple1. Choose a suitable method of ensemble	Constructing explicit generalizations	1 Construct explicit generalizations (C5)				
examples, K-Nearest Neighbour based learning (C4) learning algorithm, Case-based 3. Explain K-nearest neighbour learning (C5) reasoning (CBR) learning	versus comparing to past specific					
learning reasoning (CBR) learningCase-based as Explain K-nearest neighbour learning (C5)Unit 7:Continuous Latent VariablesPrincipal Component Analysis (PCA), Applications of PCA1. Describe use of Principal Component Analysis for the complex data set (C2).2.Apply PCA to choose principal components for the given data set (C3)Unit 8:Ensemble methods (bagging and boosting)Usingcommittees1.Choose a suitable method of ensemble	examples, K-Nearest Neighbour					
The second of	learning algorithm, Case-based					
Principal Component Analysis (PCA), Applications of PCA 1. Describe use of Principal Component Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C3) Unit 8: Ensemble methods (bagging and boosting) Using committees of 1. Describe use of Principal Component Analysis for the complex data set (C2). 2. 1. Describe use of Principal Component Analysis for the complex data set (C2). 2. 1. Describe use of Principal Component Analysis for the complex data set (C3) 1.	reasoning (CBR) learning	3. Explain K-nearest neighbour learning (C5)				
Applications of PCA I. Describe use of Principal Component Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C3) Unit 8: Ensemble methods (bagging and boosting) Using committees of multiple 1. Choose a suitable method of ensemble	Unit 7: Continuous Latent Variable	s				
Image: Construction of the complex data set (C2). Analysis for the complex data set (C2). 2. Apply PCA to choose principal components for the given data set (C3) Unit 8: Ensemble methods (bagging and boosting) Using committees of multiple 1. Choose a suitable method of ensemble	Principal Component Analysis (PCA),	1. Describe use of Principal Component				
Unit 8: Ensemble methods (bagging and boosting) Using committees of multiple 1. Choose a suitable method of ensemble	Applications of PCA	Analysis for the complex data set (C2).				
Unit 8: Ensemble methods (bagging and boosting) Using committees of multiple 1. Choose a suitable method of ensemble		2. Apply PCA to choose principal				
Using committees of multiple 1. Choose a suitable method of ensemble		components for the given data set (C3)				
1. Choose a suitable method of ensemble	Unit 8: Ensemble methods (bagging and boosting)					
	Using committees of multiple	1. Choose a suitable method of ensemble				
learning approach (C3).	hypotheses, Bagging, Boosting,					
DECORATE Active learning with	DECORATE, Active learning with	 Explain various ensemble techniques (C5) 				
ensembles	ensembles	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
Learning strategies, contact hours and student learning time						



(Deemed to be University under Section 3 of the UGC Act, 1956)

Learning strategy			Contact hours			Stu	Student learning time		
					(Hr	(Hrs)			
Lecture			30	30			60		
Quiz			02			04			
Small Group Discussi	on (SGD)		02	02					
Self-directed learning	(SDL)		-			04			
Problem Based Learn	ing (PBL)		02	02					
Case Based Learning	(CBL)		-			-			
Revision			02			-			
Assessment			06			-			
TOTAL			44			74			
Assessment Methods	5:								
Formative:					Su	mmative	mative:		
Internal practical Test					Se	Sessional examination			
Theory Assignments					En	End semester examination			
Lab Assignment & Viva					Vi	Viva			
Mapping of assessme	ent with Co)S							
Nature of assessment		CO 1	CO 2	C	0	CO 4	CO 5		
				3					
Sessional Examinatio	*	*			•				
Sessional Examinatio			*		*				
Assignment/Presentat	ion	*	*	*		*			
End Semester Examination*			*	* *		*	*		
Feedback Process	• En	d-Semes	ster Feedbac	ck					
Reference Material	1. T. Mitc	hell, "M	lachine Lea	rning", I	McC	Graw-Hill	, 1997.		
	aydin, "Machine Learning", MIT Press, 2010.								
	op," Pat	tern Recogn	nition an	nd M	lachine Lo	earning", Springer,			
	2006.								



4. E. Hart, R. Duda and D. Stork, "Pattern Classification", Wiley-
Interscience, 2000.
5. T. Hastie, R. Tibshirani and J. Friedman, "The Elements of
Statistical Learning: Data Mining,
Inference and Prediction", Springer, 2nd Edition, 2009.
6. Jason Bell, "Machine Learning for Big Data", Wiley Big Data
Series, 2016.
7. Rama Murthy G," Multidimensional Neural Networks Unified
Theory", New Age International, 2008.
 Statistical Learning: Data Mining, Inference and Prediction", Springer, 2nd Edition, 2009. 6. Jason Bell, "Machine Learning for Big Data", Wiley Big Da Series, 2016. 7. Rama Murthy G," Multidimensional Neural Networks Unified



Name	of the H	Program	:		Mast	er of Eng	gineering	g - ME (In	ternet of	Things)				
Course	e Title:				Clou	Cloud Application Development with Java								
						Course Instructor:								
								ır, Semest						
No of (Credits	: 3				-				s, OOP's	concepts,			
9	<u> </u>						ming lar	iguage, Io	T Basics					
Synop	SIS:	This Course provides insight on												
		1. Cloud application development with IoT devices using Java												
		Programming.2. To Provide practical knowledge of design and develop of Java												
			applica	ation w	ith We	bSocket	t, MQT	Г protoco	ol and cre	eate RES	Γful			
			API's.											
Cours	e	On su	poossful	compl	ation o	f this co	ureo et	udents w	ill bo obl	a to				
Outco	mes	On suc		compi			uise, si			e 10				
(COs)	:													
CO 1:		Write	Java ap	plicatio	on using	n using swings.								
CO 2:		Model	Relati	onal da	tabase	abase to communicate with Java application.								
CO 3:		Show	interact	ive con	nmunic	munication with IoT enabled devices. (C3)								
CO 4:		Model	applic	ation as	S REST	RESTful API and deploy in Cloud Application Platform.								
Mappi	ing of	COs to	POs											
~ ^														
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	<i>PO</i> 8	<i>PO</i> 9	PO 10	PO 11			
CO 1	*													
CO 2	*		*											
CO 3	*	*												
CO 4	*				*									
Cours	e conte	ent and	outcon	nes:										
Conter	nt				(Compet	encies							
Unit 1	: Int	roducti	on											



ARED BY Cideemea to b		rsity unaer Section 5 of the UGC Act, 1956/
Design Considerations for cloud	1.	Explain Design Considerations for cloud
Applications: Scalability – Reliability		Applications(C2)
& Availability – reference	2.	Discuss Reference Architecture for Cloud
Architecture for Cloud Applications –		Applications like CDN, analytics etc (C2)
cloud Application Design	3.	Explain cloud Application Design
Methodologies: Service Oriented		Methodologies like SOA, CCM, MVC
Architecture – Cloud Component		etc.(C3)
Model – Services of cloud Applications	4.	Discuss Data Storage Approaches Relational
– Model View Controller – Restful		and Non-Relational.(C2)
Web Services – Data Storage		
Approaches: SQL – NOSQL		
Approaches.		
Unit 2: Introduction to OOPS	<u>ı </u>	
OOPS - Procedural vs Object Oriented	1.	Explain advantages of object-oriented
languages – Abstraction –		programming over Procedural oriented
Encapsulation – Polymorphism –		programming language. (C1)
Inheritance.	2.	Explain OOPS concepts like Class, Object
		Abstraction, Encapsulation, Polymorphism,
		Inheritance. (C1)
Unit 3: Introduction to JAVA		
JAVA Features – Present JAVA	1.	Know about JAVA Features, advantages of
language and JVM – JVM		Java over other programming languages. (C1)
Architecture - JAVA Datatypes,	2.	Explain what is JVM and its Architecture.
Variables, Arrays– JAVA Basic		(C2)
Constructs.	3.	Discuss Java basics - Datatypes, Variables,
		Arrays, Operators, methods, reserved Java
		keywords. (C1)
	4.	Explain "this" keyword, Exception handling,
		Constructs, access specifiers. (C1)
	5.	Discuss about Encapsulation and Abstraction
		in java. (C1)
	I	



Unit 4: Class Concepts	
Objects – Methods – Revisiting	1. Explain Inheritance and its types in Java. (C1)
Inheritance – Multilevel – Method	2. Why multiple inheritance cannot be
Overriding – Abstract Class – Interface	achieved.? (C1)
– Package-IO.	3. Discuss about implementing of method
	overloading and method overriding. (C1)
	4. Importance of using Packages in java. (C1)
	5. Explain Abstract class and why it is important.
	(C1)
	6. Achieve Multiple inheritance using Interfaces.
	(C1)
Unit 5: Internet of Things	1
Introduction – IoT Architecture –	1. Outline the integration of various elements of
Physical Design – Logical Design – IoT	IoT ecosystem. (C2)
Enabling technologies –IOT Levels and	
Deployment Templates –IoT-Cloud	
Platform - IoT Protocols: MQTT -	
WebSockets.	
Unit 6: JAVA Websockets	
Websocket Lifecycle – Basic	1. Outline Client Server Architecture using Java.
Messaging – Advanced Messaging –	(C1)
Securing Web Sockets.	
Unit 7: REST API	1
REST Style Architecture – http – URI –	1. Illustrate REST API. (C3)
Request Methods – Status Codes –	
JAVA JSON Processing – JAX RS API.	
Unit 8: JAVA MQTT	l
M2M with JAVA – MQTT	1. Illustrate MQTT Protocol. (C3)
Applications with PAHO	
Learning strategies, contact hours and	student learning time



Learning	strategy		Contac	t ho	ours	Student learning
						time (Hrs)
Lectu	ure		1	2	-	
Semi	nar		-	-	-	
Qui	iz		-	-	-	
Small Group Dis	cussion (SG	D)	-	-		-
Self-directed le	arning (SDI	L)	-	-		-
Problem Based L	earning (PE	BL)	-	-		-
Case Based Lea	arning (CBL	.)	0	3		-
Clin	nic		-	-		-
Practi	ical		2	4		-
Revis	sion		0	3		-
Assess	ment		0	6		-
ТОТ	AL		4	8		-
Assessment Methods	:					
Formative:					Summa	ative:
Internal practical Test					nal examination	
Theory Assignments					mester examination	
Lab Assignment & Viva						
Mapping of assessme	ent with Co	s				
Nature of assessment		CO 1	CO 2		CO 3	CO 4
Sessional Examination	n 1	*	*			
Sessional Examination	n 2		*	L	*	
Assignment/Presentat		*			*	
End Semester Examin	*	*	<u> </u>	*	*	
Feedback Process	• Enc	l-Semester I	Feedback	<u> </u>		1
Reference Material	• William	n Hohl, Chi	ristopher Hi	ind	s,"ARM	Assembly Language:
Fundamentals and Techniques",2nd Edition, ISBN-13: 1482229851, ISBN-10: 1482229854						tion, ISBN-13: 978-
	110222703	1, 1501, 10	. 1 10222/01	/ '		



• Andrew Sloss, Dominic Symes, Chris Wright,"ARM System
Developer's Guide: Designing and Optimizing System Software",1st
Edition, The Morgan Kaufmann Series in Computer Architecture and
Design, ISBN-13: 978-1558608740, ISBN-10: 1558608745
• David Seal, "ARM Architecture Reference Manual", 2nd Edition,
Addison-Wesley Professional.
• Steve Furber,"ARM System-on-Chip Architecture",2nd
Edition, Addison-Wesley Professional, ISBN-13: 078-
5342675191,ISBN-10: 0201675196
• Douglas V. Hall,"Microprocessors and Interfacing",Mcgraw Hill
Educatin ,ISBN-10 1259006158,ISBN-13 9781259006159,2012.
Websites & Transaction Papers



Name of the Program:Master of Engineering								g - ME (Int	ternet of	Things)				
Course	Title:					Digital Signal Processing								
						Course Instructor:								
Academic Year: 2020 - 2021						Semester: First Year, Semester 1								
No of Credits: 3						-		wledge of	0	s and Syst	ems and			
							ledge of	f MATLA	B					
Synopsis: This Course provides i					s insigh	t on								
1. Understanding of b				basics	of Sign	al and S	Systems a	s pre-ree	quisite.					
		2. Un	2. Understanding the concepts of Fast Fourier Transforms.											
		3. Lea	arning l	nardwa	re impl	ementat	tion of s	systems.						
		4. Lea	arning l	FIR and	l IIR Fi	lter Des	signs.							
		5. Lea	arning o	concept	ts of m	ulti-rate	signal	processing	g in the	form of s	ampling			
		rate	e conv	version,	struct	tures o	f samp	oling rate	e conve	erters an	d some			
		app	olicatio	ns of sa	mpling	g rate co	nverter	8						
6. Understanding the					hree oj	ree optimum Weiner filters, adaptive algorithm and								
		tra	nsformi	ng We	iner filt	ner filters in to adaptive filters								
		7. Un	derstan	ding ar	chitect	chitecture, memory management and pipelining concepts								
		of '	TMS32	0C67X	X proc	X processor through self-stud.								
Course	e	On suc	cessful	compl	etion of	tion of this course, students will be able to								
Outco	mes													
(COs):	•													
CO 1:		Analys comple		t Four	rier Tr	er Transform (FFT) algorithms on computational								
CO 2:		Descri	be the s	structur	es for I	IR and I	FIR filte	ers.						
CO 3:		Interpr	et Mult	irate Si	ignal Pı	rocessin	g and A	Adaptive F	Filters.					
					memory management and pipelining concepts of General Digital Signal Processor.									
Mappi	Mapping of COs to POs													
COs	<i>PO</i> 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11			
CO 1	*	*	*		*									
CO 2	*	*	*	*	*									
CO 3		*	*	*										
CO 4	*	*												
						1	1	1	1	1				



Course content and outcomes:							
Content	Competencies						
Unit 1: Review: (Self Study)							
Introduction Classification of signals	1. Outline types of signals and system. (C1)						
and systems, brief discussions on z-	2. Summarize z-transform, Fourier transform,						
transform, inverse z-transform	convolution. (C2)						
& Fourier transform, DFT, linear							
convolution using circular convolution							
& DFT							
Unit 2: FFT Algorithms							
Radix-2 DIT-FFT Algorithm, DIF-FFT	3. Identify Computation complexity of DFT,						
Algorithm. Assignments (Problems).	Introduction to Fast Fourier Transform (FFT)						
	algorithm (C1)						
	4. Describe and Sketch Radix-2 Decimation in						
	Time FFT (DIT-FFT) Algorithm and analyse						
	its computation complexity (C2, C3, C4)						
	5. Describe and Sketch Radix-2 Decimation in						
	Frequency FFT (DIF-FFT) Algorithm and						
	analyse its computation complexity (C2, C3,						
	C4)						
Unit 3: Filter Structures							
IIR Filter Structure – Direct Form I & II,	1. List Components used in filter structures,						
CSOS, PSOS & Transpose structures -	System Representations, relation between the						
FIR Filter Structures - Direct Form,	representations, classify of IIR and FIR						
Cascade form, Linear Phase Filter	Systems (C1, C2)						
structures. Assignments (Problems).	2. Explain and construct IIR Filter Structure –						
	Direct Form-I, Direct Form-II, Cascade Form						
	(CSOS), Parallel Form (PSOS) & Transpose of						
	structures (C2, C5)						
	3. Explain and construct FIR Filter Structures –						
	Direct Form, Cascade form (C2, C5)						



	4.	Explain Linear Phase FIR Filter structure:
		Derivation, Frequency Response, Compute
		Computation Complexity and construct with
		number of filter coefficients being even and
		odd. (C3, C5)
Unit 4: Design of FIR filters		
Using Frequency Sampling & Windows	1.	Introduction to Frequency sampling technique
- Assignments (Problems).	1.	design
- Assignments (1100ienis).	2	Describe Derivation of a Transfer Function for
	2.	
		the system designed using frequency sampling
		technique when number of samples of impulse
		response / number of point DFT is even or odd.
		Construct hardware for the transfer functions.
		Concept of Comb filter and resonator (C6, C5)
	3.	Sample example to Design and implement FIR
		filter using Frequency Sampling technique to
		meet required impulse response (C5, P4)
	4.	Illustrate Frequency responses of frequency
		selective (LP, HP, BP and BR) filters, concept
		of frequency sampling in the frequency
		responses (C3)
	5.	Sample examples to Design and implement FIR
		filters with ideal frequency response using
		frequency sampling technique (C5, P4)
	6.	Discuss Concept of windowing in the design of
		FIR filter, Concept of Gibb's Phenomenon and
		its effect on frequency response, Use of
		window functions to eliminate Gibb's effect
		(C2)
	7.	Comparison of performances of filters
		designed with different window functions (C4)
		5



	8.	Explain Steps involved in the design of FIR
	0.	filters with ideal frequency response and non-
	0	ideal frequency response (C2)
	9.	Express Impulse responses of frequency
		selective filters (C2)
	10.	Sample examples to design ideal and non-ideal
		frequency selective filters using windows. (C5,
		P4)
Unit 5: Design of IIR Filters		
Butterworth & Chebychev filters design	1.	Discuss Concepts of Analog Butterworth LP
using impulse invariance & bilinear		filter, concept of Cut-off frequency, order of
transformation techniques, Design of		the filter, compute poles, pole locations in S-
IIR filter using pole placement		Plane, transfer function (C2, C3)
technique. Assignments (Problems).	2.	Explain Design steps of Analog Butterworth
		LP filter (C2)
	3.	Explain Chebychev polynomials, their
		properties, Analog Chebychev LP filter
		function, concepts of frequency response, order
		of filter, pole placements of Chebychev LP
		filters on S-Plane, compute poles, Transfer
		function of LP Chebychev filter (C2, C3)
	4.	Discuss Concepts of Impulse Invariance
		Transformation, S-Plane to Z-Plane mapping,
		steps in transformation (C2)
	5.	Discuss Concepts of Bilinear Transformation,
		frequency warping, pre-warping for the
		purpose of analog filter (Butterworth /
		Chebychev) design (C2)
	6.	Sample examples to design Butterworth and
		Chebychev LP filter using impulse invariance
		and bilinear transformations (C5)
Unit 6: Multirate Signal Processing	 {	· · /
	,	



Define by the contract of the	University under Section 3 of the UGC Act, 1956)
Decimation, Interpolation, Sampling	1. Introduction, need for multi-rate signa
rate conversion by a rational factor,	processing, explain concept of sampling rat
structures, Polyphase filter structures,	conversion (C2)
Time variant Filter structure,	2. Explain Decimation by an integer factor, bloc
Application of Multirate signal	diagram, analyse of decimator in time domai
processing to Phase Shifter, Subband	and frequency domain (C2, C4)
coding of Speech signal, Digital Filter	3. Explain Interpolation by an integer factor
Bank Implementation, QMF Filter bank	block diagram, analyse of interpolator in tim
	domain and frequency domain (C2, C4)
	4. Explain Sampling rate conversion by a rational
	factor, block diagram, analyse in time domai
	and frequency domain (C2, C4)
	5. Construct Implementation of Sampling rat
	converters (C5)
	6. Discuss Concepts and construction of Poly
	phase filter (C2, C5)
	7. Construct Time variant Filter (C5)
	8. Apply Multi-rate signal processing concept t
	Phase Shifter, Sub-band coding of Speec
	signal, Digital Filter bank Implementation
	QMF Filter bank. (C3)
Unit 7: Adaptive Filters	
Class of Optimal Filters – Predictive	1. Outline adaptive filters, some matri
Configuration, Filter Configuration,	operation.(C1)
Concept of adaptive noise cancellation,	2. Explain Optimal Weiner Filters – Predictiv
Noise Canceller Configuration. LMS	Configuration, Filter Configuration, Nois
adaptive Algorithm, Application of LMS	Canceller Configuration (C2)
algorithm to the optimal filter	3. Explain Concept of LMS adaptive Algorithm
configurations. Adaptive noise canceller	(C2)
as a high-pass filter	4. Apply LMS algorithm to the optimal filte
	configurations (C3)
Unit 7: DSP Processor	



Introduction to PDSPs – Multiplier and	1.	Discuss Introduction to PDSPs - Multiplier
Multiplier Accumulator (MAC),		and Multiplier Accumulator (MAC), Modified
Modified Bus structures and memory		Bus structures and memory access schemes
access schemes, Multiple access		(C2)
memory, Multiported Memory, VLIW	2.	Explain Concept of Multiple access memory,
architecture, Pipelining, Special		Multiported Memory, VLIW architecture (C2)
addressing modes, On-chip Peripherals.	3.	Explain Concept of Pipelining, Special
TMS320C6711 DSP processor:		addressing modes, On-chip Peripherals. (C2)
Architecture, Instruction set and	4.	Explain Concepts on Architecture, memory
assembly language programming		organization and pipelining of TMS320c67XX
		(C2)

Learning strategies, contact	hours and	student lea	arning t	ime	
Learning strategy		C	ontact h	Student learning	
					time (Hrs)
Lecture			30	60	
Quiz			02		04
Small Group Discussion	(SGD)		02		02
Self-directed learning (SDL)		-		04
Problem Based Learning	(PBL)		02		04
Case Based Learning (CBL)		-	-	
Revision		02	-		
Assessment			06	-	
TOTAL			44		74
Assessment Methods:					
Formative:				Summat	ive:
Internal practical Test				examination	
Theory Assignments				ester examination	
Lab Assignment & Viva			Viva		
Mapping of assessment with	Cos			<u> </u>	
Nature of assessment	CO 1	CO 2	C	203	CO 4
Sessional Examination 1	*	*			



Sessional Examinatio	n 2			*		
Assignment/Presentat		*	*			
End Semester Examin	ation	*	*	*	*	
Feedback Process	• Enc	l-Seme	ster Feedback	1	I	
Reference Material	1. Sanjitl	n K M	litra, "Digital	Signal Proc	cessing", McGraw Hill	
	Education,	4 Editi	on, July 2013.			
	2. Oppenh	eim and	l Schafer, "Dig	gital Signal Pro	ocessing", Pearson, First	
	Edition, 19	75.				
	3. Roman	Kuc, "I	Digital Signal l	Processing", N	AcGraw-Hill Education,	
	1988.					
	4. Proakis and Manolakis, "Digital Signal Processing", Prentice –					
	Hall, Inc., Third Edition, 1996.					
	5. Rabind	er and	Gold, "Theor	y and Applic	cation of Digital Signal	
	Processing", Prentice Hall India Learning Private Limited, 1988.					
	6. Hwei P Hsu, Schaum's Outline of "Signals and Systems", 3rd					
	Edition, 2013.					
	7. Symon Haykins, "Signals and Systems", Wiley, Second Edition,					
	2002.					



Name o	of the P	e Program: Master of Engineering - ME (Internet of						Things)			
Course Title:				IoT A	IoT Application Development						
Course Code: IOT-606				Cour	Course Instructor:						
Academic Year: 2020 - 2021					Seme	ester: I	First Yea	ur, Semeste	er 1		
No of Credits: 3					Prer	equisites	: Intro	ductory (Course in	n IoT, Ne	tworking
					Basic	es, Progra	amming	aspects, C	Operating	system, L	inux
Synop	sis:	This C	ourse p	provides	s insigh	it on					
		1. Various steps involved in the development of application for IoT.						oT.			
		2.	Functi	onal as	pects o	of linux	Operati	ng systen	n for des	sktop app	lications
			and en	nbedde	d board	ls.					
		3.	Script	ing lang	guages	like she	ll and p	ython.			
		4.	Clien	t Serve	r archit	ecture a	nd Pyth	on APIs	of Socke	et progran	nming.
			Databa	ase a	nd Py	ython	Databa	se conn	nectivity,	Pytho	n Web
			Progra	amming	g, IoT F	Framewo	ork.				
Course	e										
Outco	mes	On successful completion of this course, students will be able to									
(COs):	:										
CO	1:	Descri	be the o	levelop	mental	aspects	of the a	applicatio	on in IoT	•	
CO	2.	Demor	nstrate (the usa	ge of li	inux Op	erating	system f	or deskto	op and er	nbedded
CO	2:	enviror	nment.								
CO	2.	Demor	nstrate (the pro	gramm	ing ski	lls in s	cripting	language	es like s	hell and
CO	3:	python	l .								
	_	Demor	nstrate (the fur	ndamen	tal con	cepts in	n Client	Server	architect	ure and
CO	4:	databa	se.								
Mappi	ing of (COs to]	POs								
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11
CO 1	*			*							
CO 2		*	*								
CO 3				*	*						
CO 4			*	*	*						
Course	e conte	ent and	outcon	nes:	1	1	1	1	_1	1	<u>.</u>



Content	Competencies
Unit 1: IoT Application	
Development Cycle of IoT, Software &	At the end of the topic student should be able to:
Hardware, Application Types, IoT	1. Outline the various elements of IoT ecosystem.
Platforms, Cloud Platforms for	(C2)
ΙοΤ	
Unit 2: Booting	
Introduction to Linux, Functions of an	1. Explain the Linux OS structure. (C2)
OS, OS Structure, Linux Structure,	2. Operate Boot Loaders, Toolchain, Cross
Booting of Process, GRUB, GRUB2,	Compilation of the Kernel. (C2)
UEFI, Booting with Embedded boards,	
Embedded Boot Loaders, Toolchain,	
Cross Compilation of the Kernel .	
Unit 3: Embedded Linux	
Introduction to Embedded Linux, Boot	1. Distinguish various types of Linux Kernel,
Loaders: U-Boot, Compiling U-Boot,	Monolithic vs Microkernel . (C3)
U-boot Source Code, Kernel	2. Interpret and Analyse concepts of make file.
Compilation, Types of Linux Kernel,	(C3)
Monolithic vs Microkernel, Makefile	
Concepts	
Unit 4: Linux Commands - File Com	mands
Viewing & Creating, Properties,	1. Demonstrate the usage of linux commands.
Location, Manipulation, Compression,	(C3)
Disk & File Systems, Process -	
Scheduling, Networking	
Unit 5: Shell Scripting	1
Introduction, Constructs, File and	1. Usage of various shell commands and scripting
Directory Reading, Scripting for real	for real time applications. (C3)
time applications, Document Here -	
Make Concepts, sed, grep, awk, Regular	
Expressions	
Unit 6: Python Scripting	l



Introduction to Python, Python 1.	Demonstrate the programming skills in Python			
Datatypes, Constructs, Sockets, Python	for socket communication, database, MQTT			
Socket Programming, Python Database	application. (C3)			
Connectivity, MQTT Application				
Unit 7: Sockets				
Introduction to Sockets, Client Server	1. Outline Client Server Architecture. (C1)			
Architecture, Unix Sockets, PORTS,	2. Illustrate the socket communication using			
Python APIs of Sockets, TCP socket	python API's for stream and datagram-			
programming using Python, UDP - RAW	oriented use cases. (C4)			
packets python programming				
Unit 8: Databases & Web Programmin	g			
Introduction to Databases, File System vs	1. Discuss File System vs RDBMS (C2)			
RDBMS, ER Diagram, Python Database	2. Describe Python Database connectivity			
connectivity (CRUD), Web Server	(CRUD) (C2)			
Concepts, Python Web Programming, IoT	3. Describe web Server Concepts (C2)			
Framework	4. Demonstrate Python Web Programming			
	and IoT Framework (C3)			
Unit 9: IoT Applications with Cloud				
Case Study	1. Discuss a case study on IoT Applications			
	with Cloud. (C2)			
Learning strategies, contact hours and stu	ident learning time			
Learning strategy	Contact hours Student learning			
	time (Hrs)			
Lecture	30 60			
Quiz	02 04			
Small Group Discussion (SGD)	02 02			
Self-directed learning (SDL)	- 04			
Problem Based Learning (PBL)	02 04			
Case Based Learning (CBL)				
Revision	- 02			
Assessment	- 06			
<u> </u>	1			



ТОТ	AL		4	4	74	
Assessment Methods	5:					
Formative:				Summat	ive:	
Internal practical Test	ţ			Sessiona	l examination	
Theory Assignments				End sem	ester examination	
Lab Assignment & Viva				Viva		
Mapping of assessme	ent with Co	8				
Nature of assessment		CO 1	CO 2	CO 3	CO 4	
Sessional Examinatio	n 1	*	*			
Sessional Examinatio	n 2			*	*	
Assignment/Presentat	ion	*	*	*	*	
End Semester Examin	nation	*	*	*	*	
Feedback Process	• Enc	l-Semester	Feedback			
Reference Material	1. Arshdee	p Bhaga, V	'ijay Madish	etti, "Internet	of things: A hands on	
	Approach"	, Universiti	es Press,			
	ISBN:9781	72719547,	2015.			
	2. "Beginn	ing Linux l	Programmin	g", Wrox, 3rd	l edition, 2004.	
	3. Yaswan	nt Kannetk	ar, "Unix S	hell Scripting	g", BPB Publications,	
	2003.					
	4. Brando	on Rhodes	and John	Goerzen, "Fo	oundations of Python	
	Network Pr	Network Programming", 2nd Edition,				
	Apress, 20	10.				
	5. Pankaj	Fanwar, "So	ocket Progra	mming Articl	le Series", 2011.	



Name o	of the P	the Program: Master of Engineering - ME (Internet of Things)										
Course Title:					Data	Data Structures and Algorithms Lab						
Course Code:					Cour	Course Instructor:						
Academic Year: 2020 - 2021					Seme	ster: F	irst Yeaı	r, Semeste	er 1			
No of Credits: 1					Prere	equisites	: C Prog	gramming				
Synop	sis:	This C	ourse p	rovides	s insigh	t on						
		1.	This c	course	introdu	ces stu	dents t	o elemei	ntary da	ta structi	ures and	
		des	design of algorithms.									
		2.	Studer	nts lear	n how	to desig	n optim	nal algori	thms wi	th respec	t to time	
		anc	l space									
		3.	Studer	nts leari	n how t	o imple	ment lir	nk list, sta	ack, quei	ues, searc	hing and	
		sor	ting tec	hnique	s, sets,	trees an	id graph	IS.				
		4.	Studer	nts lear	n the d	esign o	f divide	e and con	nquer te	chnique,	dynamic	
		pro	gramm	ing, gr	eedy te	chnique	and ba	ck tracki	ng			
Course	e											
Outcon	mes	On suc	cessful	compl	etion of	f this co	ourse, stu	udents wi	ill be abl	e to		
(COs):	:											
CO 1:		Specify and analyse algorithms										
CO 2:		Learn	and de	sign pr	ograms	for im	plement	tation of	linear a	nd non-li	near data	
002		structu	re.									
CO 3:		Learn	and des	ign pro	grams	for sorti	ing and	searching	g.			
CO 4:		Illustra	ite ap	plicatio	on of	divid	e and	conque	er tech	inique,	dynamic	
		program	mming	, greedy	y techni	ique and	l back ti	racking.				
CO 5:		Learn	to orgai	nise the	code f	or scala	bility ar	nd mainta	ainability	/.		
Mappi	ing of (COs to]	POs									
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 1		*										
CO 2		*	*		*			*				
CO 3		*	*		*			*				
CO 4		*	*		*			*				
CO 5		*	*		*			*				
	1	1	1	1	<u> </u>	1	I	I			1	



Course content and outcomes:					
Content	Competencies				
Unit 1: Elementary data structures	*				
Implementation of Lists, Stacks,	1. Design and Implement singly linked list				
Queues	2. Design and Implement doubly linked list				
	3. Design and Implement array-based stack				
	4. Design and Implement pointer-based stack				
	5. Design and Implement array-based				
	queues.				
	6. Design and Implement pointer-based				
	queues.				
Unit 2: Sorting & Searching Techniqu	ies				
Quick sort, Heap sort, Merge sort,	1. Design and implement programs for				
Binary search, linear search, Fibonacci	insertion sort, bubble sort and selection sort.				
search	2. Design and implement programs for quick				
	sort				
	3. Design and implement programs for heap				
	sort				
	4. Design and implement programs for merge				
	sort				
	5. Design and implement programs for binary,				
	linear and Fibonacci search				
Unit 3: Trees					
Basic Terminology, Implementation of	1. Write a program to implement binary trees				
Trees, Binary Trees, Binary Search	2. Write a program to implement binary				
Trees	search trees				
	3. Tree traversal technique				
Unit 4: Graphs					
Basic definitions, Representation of	1. Write programs to represent a graph using				
Graphs, Minimum Cost Spanning Tree,	adjacency matrix and adjacency list				
	techniques				



	e University under Section 3 of the UGC Act, 1956)				
Single Source Shortest Paths, All-Pairs	2. Write a program to implement minimum				
Shortest Path	cost spanning tree				
	3. Write a program to	solve Single source			
	shortest path problem				
	4. Write a program to so	lve All- pair shortest			
	path problem				
Unit 5: Algorithm Design Techniques					
Divide-and-Conquer Algorithms,	Write a program to solve max	min problem Write			
Dynamic Programming, Greedy	a program to solve Strassen's	matrix multiplication			
Algorithms, Backtracking	problem				
	3. Write a program to solve	e matrix chain order			
	problem				
	4.Write programs to solv	e knap-sack, job			
	scheduling with dead line and optima storage on				
	taps problems.				
	5. Write programs to solve	n queens and graph			
	colouring problems				
Learning strategies, contact hours and	student learning time				
Learning strategy	Contact hours	Student learning			
		time (Hrs)			
Lecture	12	-			
Seminar	-	-			
Quiz	-	-			
Small Group Discussion (SGD)	-	-			
Self-directed learning (SDL)	-	-			
Problem Based Learning (PBL)	-	-			
Case Based Learning (CBL)	03 -				
Clinic	-	-			
Practical	24	-			
Revision	03 -				
Assessment	06	-			
	48				



Assessment Methods:							
Formative:				Su	mmative:		
Internal practical Test	t			Ses	sional examin	ation	
Theory Assignments				Ene	d semester exa	imination	
Lab Assignment & Viva				Viv	/a		
Mapping of assessm	ent with Co	s					
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5	
Sessional Examinatio	n 1	*	*				
Sessional Examinatio	n 2		*	*	*		
Assignment/Presentat	tion	*	*	*	*	*	
Laboratory Examinat	ion	*	*	*	*	*	
Feedback Process	End-Semester Feedback						
Reference Material	1. "Intro	duction	to Algorith	ims" Th	omas H. Corr	nen, Charles	
	E. Leiserson, Ronald L. Rivest.						
	2. "Data Structures& Algorithms" Aho, Hopcroft and Ulmann						
	3. "Data structures and algorithm analysis in C" Mark Allen Weiss						
	4.	"Compu	ıter	Algorithr	ns" :	Ellis	
	Horowitz,	SartajSah	ni, Sanguthe	evarRajase	ekaran		



Name of the Program: Master of Engineering - ME (Internet of Things)								
Course Title:	Operating Systems for IoT Lab							
Course Code: IoT 601L	Course Instructor:							
Academic Year: 2020 - 2021	Semester: First Year, Semester 1							
No of Credits: 1	Prerequisites: Programming skills							
Synopsis: This Course provides								
 Understand the synchronization a Concept of memory The salient feature 	 synchronization and dead locks. 3. Concept of memory management. 4. The salient features of real time operating systems with case study of RTx 5. To understand the concepts of event driven programming with case study 							
Course Outcomes On successful complete	letion of this course, students will be able to							
(COs):								
CO 1: Implementation of va	Implementation of various scheduling algorithms							
CO 2:	implement and evaluate FCFS, SJF, PS, RR, Multi-level queues, multi-level feedback queues scheduling algorithms							
CO 3: Understand real time	e scheduling concepts through RTx programming							
CO 4: Understand the conce	cept of IoT operating system through tiny OS programming							
CO 5: Understand the conce	cept of event driven programming through Contiki							
Mapping of COs to POs								
COs PO 1 PO 2 PO 3 PO 4	PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11							
CO 1 * *	*							
CO 2 * *								
CO 3 *								
CO 4 *	*							
CO 5 *	*							
Course content and outcomes:								
Content	Competencies							
Unit 1: Introduction								



OS vs RTOS, Functions of Operating Systems, Introduction to Kernel, Types of Kernel, User space vs Kernel Space.	 Identify the features of OS and RTOS (C2) Distinguish between single processor and multi-processor systems (C2) Identify the features of batch processing, time sharing, multi programming and interactive systems (C2) Distinguish between user and kernel modes (C2) Distinguish between function and system calls (C2)
Unit 2: Process Management	
The process concept, synchronization, mutual exclusion, semaphores, and monitors, Threads, Inter- process communication Unit 3: Resource Allocation, Deadlock The OS Kernel, Micro and Monolithic kernels, Multi-tasking, privilege, interrupt handling, System and user	 Describe a process, process state, process control block (C2) Apply scheduling algorithms, scheduling queues (C3) Examine process related system calls (C1) Experiment inter process communication through share memory and sockets (C4) prevention, avoidance, and detection Examine methods for handling dead locks (C3) Write dead lock prevention algorithms (C3) Write dead lock recovery algorithm(C3)
processes, System calls	
Unit 4: Time Management	
Time Management, CPU scheduling algorithms, Real-time scheduling, Disc access scheduling	 Distinguish between scheduling algorithms (C2) Examine the criteria for scheduling (C3) Examine Disc access scheduling (C3)
Unit 5: Real Time OS	· · · · · · · · · · · · · · · · · · ·
Real Time OS, OS calls in RTOS, RTx Kernel OS calls – Examples Unit 6: Real Time Systems	 Examine Real Time OS (C3) Illustrate OS calls in RTOS (C3) Illustrate OS calls in RTx (C3)



Operating systems for IoT, Pre emption vs Event Driven, Event Driven Programming, Tiny OS vs Contiki	 Examine the concepts involved in the design of real time systems (C3) Illustrate real time clocks in various real time languages(C3) Describe the concepts of time outs in message passing, semaphores and monitors (C1) Compare various priority inheritance algorithms (C4) Explain the concept of response time analysis (C2) Examine Event driven programming using Tiny OS and Contiki (C3) 		
Learning strategies, contact hours and	student learning ti	me	
Learning strategy	Contact he	ours Student learning time (Hrs)	
Lecture	12	-	
Seminar	-	-	
Quiz	-	-	
Small Group Discussion (SGD)	-	-	
Self-directed learning (SDL)	-	-	
Problem Based Learning (PBL)	-	-	
Case Based Learning (CBL)	03	-	
Clinic	-	-	
Practical	24	-	
Revision	03	-	
Assessment	06	-	
TOTAL	48	-	
Assessment Methods:			
Formative:		Summative:	
Internal practical Test	Sessional examination		
Theory Assignments	End semester examination		
Lab Assignment & Viva		Viva	



Mapping of assessme	nt with Co)S							
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5			
Sessional Examination	*	*							
Sessional Examination			*	*					
Assignment/Presentati	on	*		*		*			
Laboratory Examination	on	*	*	*	*	*			
Feedback Process	• En	d-Semester	Feedback						
Reference Material	1.	Abraham	Silbersc	hatz, Peter	Galvvin,	Grag Gagne,			
	"O	perating Sys	stem princ	iples", Seve	enth Edition,				
	Jol	John Wiley Publications, 2006.							
	2.	2. Allan Burns, Andy Wellings, "Real - Time Systems and							
	Pro	Programming Languages", Fourth Edition,							
	Pe	Pearson Education Canada, 2009.							
	3.	3. Milan Milenkovic, "Operating Stems Concepts and							
	De	Design", McGraw Hill Higher Education, 1987.							
	4.	4. Maurice Bach (IPC), "Design of Unix Operating System",							
	Pre	Prentice-Hall, Inc., 1986.							
	5.			5. Kerninghan & Ritchie, "The C Programming Language",					
	Sec			Second Edition, Prentice-Hall, 1988.					
	6.	www.freer	tos.org,'	'The FreeR'	TOS Refere	nce Manual",			
	Re	al Time Eng	gineers Ltc	1. 2016.					



Name	of the F	rogram	:		Mas	Master of Engineering - ME (Internet of Things)						
Course	e Title:				IoT N	oT Networks and Protocols Lab						
Course	e Code:	IoT 602	L		Cou	ourse Instructor:						
Academic Year: 2020 - 2021 Sen					Sem	ester:	First Yea	ır, Semeste	er 1			
No of Credits: 1 Pre					Prer	equisites	s: Basic	Programm	ing Skill	s		
Synop	sis:	This C	ourse p	rovides	s insigł	nt on						
		1. 2. 3.	To lea To lea	rn diffe	erent la it Soft	yers of ware De	OSI Mo	wired an del. etworks (
Cours	e					,						
Outco	mes	On suc	cessful	comple	etion o	of this co	ourse, st	udents wi	ll be abl	e to		
(COs)	:											
CO 1:		Illustra	te class	sificatio	on of n	etworks	•					
CO 2:		Impler	nent dif	ferent	protoco	ols used	in OSI	Layers.				
CO 3:		Impler Virtua	nent S lization	Softwar (NFV)		efined	Networ	ks (SD	N), Ne	etwork	Function	
Mapp	ing of (COs to]	POs									
COs	PO 1	PO 2	<i>PO 3</i>	PO 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*				*	*						
CO 2	*					*						
CO 3	*				*	*						
Cours		ent and	outcon	nes:		Comer	onoice	1				
						Compet	encies					
Unit 1		<u></u>	1		0.97							
Components of Networks, Network OSI					OSI	1. Demo	onstrate	simple ne	etwork u	sing NS2	2	
Model Unit 2												
		aver. Tr	ansport	Laver		1	Demons	trate HT7	P Proto	col		
Application layer, Transport Layer					 Demonstrate HTTP Protocol Demonstrate FTP and SMTP Protocol 							
								trate CoA			~ 01	
						3.	Jemons		M F1010			



		4.	Demonstra	te MQT	Γ Protocol
		5. Demonstrate SSH, DHCP Protocol			
Unit 3:					
Software Defined Networks (S	SDN), 2	. Dem	onstrate SI	DN in a v	irtual environment
Network Function Virtualization ((NFV)				
Learning strategies, contact hou	irs and st	uden	learning t	ime	
Learning strategy			Contact h	ours	Student learning
					time (Hrs)
Lecture			12		-
Seminar			-		-
Quiz			-		-
Small Group Discussion (SG	iD)		-		-
Self-directed learning (SDL	L)		-		-
Problem Based Learning (PB	BL)	-			-
Case Based Learning (CBL	L)	03			-
Clinic		-			-
Practical		24			-
Revision		03			-
Assessment		06			-
TOTAL		48			-
Assessment Methods:					
Formative:				Summ	ative:
Internal practical Test				Session	nal examination
Theory Assignments				End set	mester examination
Lab Assignment & Viva			Viva		
Mapping of assessment with Cos	S				
Nature of assessment	CO 1		CO 2		CO 3
Sessional Examination 1	*				



Sessional Examinatio	n 2		*		
Assignment/Presentat	ion	*	*	*	
Laboratory Examinati	on	*	*	*	
Feedback Process	End-Semester Feedback				
Reference Material	Under Virtua 2. Larry Syster 3. Behrou 2005. 4. Arshde Appro 5. Willian Pearso 6. Jean-P Object 7. Zach	standing Sof lization", Ac L Peterson ns Approach 12 A Forouza eep Bhaga, V ach", Univer n Stallings, on, 2nd Editio hilippe Vasse ts with IP – T Shelby, Car	tware Defined Network Idison-Wesley Professio & Bruce S Davie, "C ", 5th Ed. Elsevier, MK an, "TCP/IP Protocol Su "ijay Madishetti, "Intern rsities Press, ISBN:9781 "Wireless Communi on, 2004. eur and Adam Dunkels. The Next Internet", Mor	omputer Networks – a Publishers, 2011. hte", TMH, 3rd Edition, et of things: A hands on 172719547, 2015. cations & Networks", "Interconnecting Smart	
	8. RFC's	on COAP, X	KMPP, MQTT, AMQP	- Internet resources.	



Name	of the P	rogram	:		Mast	er of Er	gineerii	ng - ME	(Internet	of Thing	s)	
Course	Title:					IoT Security Lab						
Course	Code:	IOT 603	SL		Cour	Course Instructor:						
Academic Year: 2020 – 2021					Seme	ester: I	First Yea	r, Semest	er 1			
No of Credits: 3						Prerequisites: Cryptography Basics, Networking Basics, Programming aspects						
Synopsis: This Course provides					s insigh	it on						
		1.	The Se	ecurity	Archite	ecture a	nd requi	irements	of IoT.			
		2.	Basics	of Cr	yptogra	phy, Sy	mmetri	c Key C	ryptogra	phy, Asy	mmetric	
			Key C	ryptogi	aphy, l	PKI, Ha	shing, I	Digital sig	gnatures.			
		3.	Variou	is types	s of Th	reats, A	ttacks ir	n networl	k and Io	Г architec	ture and	
			the m	ethods	to mi	tigate tl	ne same	e using	various	network	security	
			strateg	gies.								
		4.	Conce	epts of	Blockc	hain, Cı	ypto-cu	irrencies,	IOTA			
			Cyber	securit	ty strat	egies lil	ke Intru	sion Det	ection S	ystems, I	intrusion	
			Prever	ntion Sy	ystem.							
Cours	e											
Outco	mes	On suc	cessful	compl	etion o	f this co	urse, stu	udents w	ill be abl	e to		
(COs)	:											
CO 1:				-				-		nature to he netwo		
CO 2:		Model	and co	nstruct	the blo	ck chai	n applic	ation.				
CO 3:		Experi	ment th	ne SQL	injecti	on vulne	erability	attack o	n websit	es.		
Mappi	ing of (COs to]	POs									
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*		*	*	*					*		
CO 2	*		*	*	*					*		
CO 3	*		*	*	*					*		
	1	1										

Course content and outcomes:



Content	Competencies				
Unit 1: Installation and usage of Eclip	ose IDE				
Installation of Java SDK, Eclipse IDE, environment setting, Project creation, building a project, running a sample project	At the end of the topic student 1. Demonstrate the usage (C3)				
Unit 2: Implementation of Cryptograp	hic Algorithms				
Implementation of Cryptographic Algorithms: Transposition cipher, Hill Cipher, playfair cipher, Ceaser Cipher, AES, DES, RSA.	1. Practice various Cryp Algorithms (C3)	tographic			
Unit 3: Implementation of Hashing A	lgorithms				
SHA0, SHA1, SHA 256.	1. Experiment various H (C4)	Hashing Algorithms.			
Unit 4: Usage of Digital Signatures					
How to get a Digital Signatures, verification of digital signatures.	1. Discover the Usage of	f Digital Signatures			
Unit 5: Block chain					
Creation and verification of block chain	1. Model a simple block	chain scenario. (C4)			
Unit 6: SQL Injection					
Evaluating and launching of SQL injection attack for different cases.	 Experiment SQL injection attack for different cases. (C4) 				
Learning strategies, contact hours and	student learning time				
Learning strategy	Contact hours	Student learning time (Hrs)			



Lecture		30		60		
Quiz		02		04		
Small Group Discuss	ion (SGD)	02		02		
Self-directed learning	(SDL)	-		04		
Problem Based Learn	ing (PBL)	02		04		
Case Based Learning	(CBL)	-		-		
Revision		02		-		
Assessment		06		-		
TOTAL		44		74		
Assessment Methods	5:					
Formative:				Summative:		
Internal practical Tes	t			Sessional examination		
Theory Assignments				End semester examination	ı	
Lab Assignment & Viva				Viva		
Mapping of assessm Nature of assessment	ent with Co	s CO 1	CO 2	CO 3		
Sessional Examinatio	n 1	*	*			
Sessional Examinatio	n 2		*	*		
Assignment/Presentat	tion	*	*			
Laboratory examinati	on	*	*	*		
Feedback Process	End-Semester Feedback					
Reference Material	 Fei Hu," Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations", CRC Press, 2016. Stephen Northcutt, Donald McLachlan, Judy Novak, "Network Intrusion Detection: An Analyst's Handbook", New Riders, 2000 Stephen A. Thomas, "SSL & TLS Essentials: Securing the Web", John Wiley & Sons, 2000. 				5. work 2000.	



4. Don Tapscott and Alex Tapscott, "Blockchain Revolution:
How the Technology Behind Bitcoin Is Changing Money,
Business, and the World", Portfolio, 2016.
5. B. Rusell and D. Van Duren, "Practical Internet of Things
Security", Packt Publishing, 2016.
6. A. Narayanan et al., "Bitcoin and Cryptocurrency
Technologies: A Comprehensive Introduction", Princeton
University Press, 2016.
7. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital
Cryptocurrencies", O'Reilly, 2014.
8. Internet Resources.
T. Alpcan and T. Basar, "Network Security: A Decision and Game-
theoretic Approach", Cambridge University Press, 2011.



Name of the Program: Mas					Master of Engineering - ME (Internet of Things)							
Course		8				Fundamentals of Machine Learning Lab						
Course	Code:	BDA-60)1L			Course Instructor:						
						Semester: First Year, Semester 1						
No of C	Credits:	1			Prer	equisites	: Basics	of Progra	mming			
Synopsis: This Course provides insignment					s insigh	nt on						
Course		0			ation o	filia aa		- do a to	11 h a ah1	a 4a		
Outco	mes	On suc	cessiui	compi	etion o	1 this co	urse, su	udents wi	II be abi	eto		
(COs):												
CO 1:								g machin	e learnir	ng applica	ations.	
CO 2:		Apply	concep	t learni	ng and	hypothe	esis spa	ce.				
CO 3:		Apply	machir	e learn	ing app	proach to	o reduce	e the dime	ension.			
CO 4:		Analys	se diffe	rent ma	chine l	earning	algorith	nms.				
CO 5:		Design	n ensem	ble me	thods.							
Mappi	ng of (COs to 2	POs									
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 1	*											
CO 2		*										
CO 3			*									
CO 4				*								
CO 5				*								
Course	e conte	ent and	outcon	nes:								
Content					(Compet	encies					
Unit 1	: Int	roducti	on									
Definit	ion of	Machin	e Learn	ing		1. I	dentify	progr	amming	envir	onments	
Goals	and	applicat	ions o	f mac	hine	available for the machine learning (C1)						
learnin		appiredt	10115 0	i mae								



Basic design issues and approaches to	2. Classify the pros and cons of various
machine learning	environments for ML coding (C2)
Types of machine learning techniques	
Unit 2: Inductive Classification	
The concept learning task.	1. Design a machine learning model to get a Maximally Specific Hypothesis for the
Concept learning as search through a	given training examples (C5).
hypothesis space. General-to-specific ordering of	 Construct a machine learning model to obtain most general and most specific
hypotheses.	hypotheses for the given training examples
Finding maximally specific hypotheses.	(C5)
Version spaces and the candidate	
elimination algorithm. Inductive bias.	
Unit 3: Decision Tree learning	
Unit 3: Decision Tree learning Representing concepts as decision trees.	1. Develop a machine learning classifier using
	decision tree and random forest (C5)
Representing concepts as decision trees. Recursive induction of decision trees.	decision tree and random forest (C5)2. Examine different applications of decision
Representing concepts as decision trees.	decision tree and random forest (C5)
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain.	decision tree and random forest (C5)2. Examine different applications of decision
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute	decision tree and random forest (C5)2. Examine different applications of decision
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain. Searching for simple trees and	 decision tree and random forest (C5) 2. Examine different applications of decision tree and random forest (C4)
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain. Searching for simple trees and computational complexity.	 decision tree and random forest (C5) 2. Examine different applications of decision tree and random forest (C4)
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain. Searching for simple trees and computational complexity. Unit 4: Computational learning theor	 decision tree and random forest (C5) 2. Examine different applications of decision tree and random forest (C4)
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain. Searching for simple trees and computational complexity. Unit 4: Computational learning theor Models of learnability: learning in the limit.	decision tree and random forest (C5) 2. Examine different applications of decision tree and random forest (C4) Y 1. Design a learning method to determine the sample complexity of training examples (C5)
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain. Searching for simple trees and computational complexity. Unit 4: Computational learning theor Models of learnability: learning in the	 decision tree and random forest (C5) 2. Examine different applications of decision tree and random forest (C4) Ty 1. Design a learning method to determine the sample complexity of training examples



Sample complexity: quantifying the	
number of examples needed to PAC	
learn.	
Computational complexity of training.	
Sample complexity for finite hypothesis	
spaces. Noise. Learning Multiple	
Classes. Bias-variance trade-off, under-	
fitting and over-fitting concepts.	
Unit 5: Bayesian learning	
Probability theory and Bayes rule.	1. Design a machine learning model using
Naive Bayes learning algorithm -	Bayes learning (C5).
	2. Develop a machine learning classifier
Parameter smoothing.	models using different approach (C5)
Generative vs. discriminative training	3. Design Bayes nets and Markov nets for
Logistic regression.	representing dependencies (C5)
Bayes nets and Markov nets for	
representing dependencies	
Unit 6: Instance-based learning	
Constructing explicit generalizations	1. Design machine learning models to classify
versus comparing to past specific	the instances using K-NN and CBR
examples.	approaches (C5).
K-Nearest Neighbour learning	
algorithm.	
Case-based reasoning (CBR) learning.	
Unit 7: Continuous Latent Variables	
Principal Component Analysis (PCA),	1. Apply PCA for different complex
Applications of PCA	applications (C3)
Unit 8: Ensemble methods (bagging a	nd boosting)



(Deemed to be University under Section 3 of the UGC Act, 1956)

Using committees of multiple	1. Design a Bayesian Networks (C5)
hypotheses.	2. Develop machine learning models usin
	Ensemble models. (C5)
Bagging	
Boosting	
DECORATE	
Active learning with ensembles.	
Learning strategies, contact hours and	student learning time
Learning strategy	Contact hours Student learning
	time (Hrs)
Lecture	12 -
Seminar	
Quiz	
Small Group Discussion (SGD)	
Self-directed learning (SDL)	
Problem Based Learning (PBL)	
Case Based Learning (CBL)	03 -
Clinic	
Practical	24 -
Revision	03 -
Assessment	06 -
TOTAL	48 -
Assessment Methods:	
Formative:	Summative:
Internal practical Test	Summative. Sessional examination
Theory Assignments	End semester examination
Lab Assignment & Viva	Viva
Mapping of assessment with Cos	
Nature of assessment CO 1	CO 2 CO 3 CO 4 CO 5



Sessional Examination 1		*	*			
Sessional Examination 2				*	*	
Assignment/Presentation		*	*	*	*	*
Laboratory Examination		*	*	*	*	*
Feedback Process	End-Semester Feedback					
Reference Material	1. Machine Learning, T. Mitchell, McGraw-Hill, 1997					
	2. Machine Learning, E. Alpaydin, MIT Press, 2010					
	3. Pattern Recognition and Machine Learning, C. Bishop, Springer,					
	2006					
	4. Pattern Classification, R. Duda, E. Hart, and D. Stork, Wiley-					
	Interscience, 2000					
	5. T. Hastie, R. Tibshirani and J. Friedman, The Elements of Statistical					
	Learning: Data Mining,					
	Inference and Prediction. Springer, 2nd Edition, 2009					
	6. Machine Learning for Big Data, Jason Bell, Wiley Big Data Series					
	7. Multidimensional Neural Networks Unified Theory, Rama Murthy					
	G					
	8. Current	literature				



Name of the Program:	Master of Engineering - ME (Internet of Things)							
Course Title:	Cloud Application Development with JAVA Lab							
Course Code: CDC-603L	Course Instructor:							
Academic Year: 2020 - 2021	Semester: Year, Semester							
No of Credits: 1	Prerequisites: Cloud Application Basics, OOP's concepts,							
	Java programming language, IoT Basics							
Synopsis: This Course provides	insight on							
1. Cloud applicat	tion development with IoT devices using Java							
Programming.								
2. To Provide pra	actical knowledge of design and develop of Java							
application with	th WebSocket, MQTT protocol and create RESTful							
API's.								
Course								
Outcomes On successful comple	etion of this course, students will be able to							
(COs):								
CO 1: Develop java applicat	n using MySQL database.							
CO 2: Develop Java Web ap	lication for client server communication.							
CO 3: Deploy web application	on to cloud.							
Mapping of COs to POs								
	PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11							
CO 1 * *	*							
CO 2 *	*							
CO 3 *	*							
Course content and outcomes:								
Content	Competencies							
Unit 1: Basic Java Programming								
OOPS Concepts, Basics of Ja	ava 1. Basic Java program to Implement							
	mathematical calculation concepts. (C1)							
Programming, IDE usage.	mathematical calculation concepts. (C1)							



CRUD Operations	1. Using MySQL database	to implement create					
Citob operations	select, update and delete	_					
	 Develop java application to connect to MySQL 						
	database and interact. (C.	• -					
Unit 3: Server Client Implementation							
_		le alvet? a vesia a ieve for					
Web Socket Programming.	1. Implementation of Web S						
	real time communication	. ,					
	2. Develop Java Web applic						
	communication for sim	ple chat application.					
	(C3)						
Unit 4: Web Application Developmen							
Web Application Development using	1. Develop Java Applicati						
Swings.	registration portal using	swings and MySQL					
	database. (C2)						
	2. Deploy web application to cloud hosing. (C4)						
Learning strategies, contact hours and	student learning time						
Learning strategy	Contact hours	Student learning					
		time (Hrs)					
Lecture	12	-					
Seminar	-	-					
Quiz	-	-					
Small Group Discussion (SGD)	-	-					
Self-directed learning (SDL)	-	-					
Problem Based Learning (PBL)	-	-					
Case Based Learning (CBL)	03	-					
Clinic	-	-					
Practical	24	-					
Revision	03	-					
Assessment	06	-					
TOTAL	48	-					
Assessment Methods:							



Formative:				Summati	ive:	
Internal practical Test		Sessional examination				
Theory Assignments			End seme	ester examination		
Lab Assignment & Vi	iva			Viva		
Mapping of assessme	ent with Co)S				
Nature of assessment		CO 1	CO 2	C	CO 3	
Sessional Examination	n 1	*	*	*		
Assignment/Presentat	ion	*	*			
Laboratory Examinati	on	*	*	*		
Feedback Process	• En	d-Semester F	feedback	·		
Reference Material	1. Williar	n Hohl, Chr	istopher Hind	s,"ARM	Assembly Language:	
	Fundamentals and Techniques", 2nd Edition, ISBN-13: 978-					
	148222	29851, ISBN	-10: 14822298	354		
	2. Andrew	v Sloss, Do	minic Symes	, Chris W	right,"ARM System	
	Develo	oper's Guid	le: Designin	g and (Optimizing System	
	Softwa	are",1st Editio	on,The Morga	n Kaufman	n Series in Computer	
	Archit	ecture and D	esign, ISBN-	13: 978-15	58608740, ISBN-10:	
	1558608745					
	3. David	Seal, "ARM	Architecture F	Reference N	Ianual", 2nd Edition,	
	Addiso	on-Wesley Pr	ofessional.			
	4. Steve	Furber,"A	RM Syster	n-on-Chip	Architecture",2nd	
	Edition, Addison-Wesley Professional, ISBN-13: 078-					
			10: 02016751			
	_		-		facing", Mcgraw Hill	
				SBN-13 9	781259006159,2012.	
	6. Websit	es & Transac	tion Papers			



Name of	f the F	rogram.			Mas	ter of Fr	ngineeri	ng - MF	(Internet	of Thing	c)
						aster of Engineering - ME (Internet of Things) Γ Application Development Lab					5)
						purse Instructor:					
Academ								ar, Semes	ter 1		
No of Ci										oT, Networ	rking
										system, L	
Synopsi	is:	This Co	ourse p	rovides	insigh	t on					
								•		tion for Io	
		2.	Function	onal as	pects o	f Linux	Operati	ing syste	m for dea	sktop app	lications
		and embedded boards.									
		3.	Scripti	ng lang	guages	like shel	l and p	ython.			
		4.	Client	Server	archite	ecture ar	nd Pythe	on APIs	of Socket	t program	ming.
		5. Database and Python Database connectivity, Python We									n Web
			Progra	mming	, IoT F	ramewo	rk.				
Course											
Outcom	nes	On suce	cessful	comple	etion of	f this cou	irse, str	idents wi	ill be able	e to	
(COs):		011 5000		••mp1							
CO 1:		Demon	strate t	he deve	elopme	ntal aspe	ects of t	he applic	cation in	IoT.	
CO 2:		environ	ment.		-	f Linux Operating system for desktop and embedded					
CO 3:		Demon python.		the pro	ogramn	ning ski	lls in s	scripting	languag	es like sl	nell and
CO 4:		Demon	strate t	he func	lamenta	al conce	pts of d	atabase r	nanagem	ent.	
COs	PO 1	PO 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO9	PO 10	PO 11
CO 1	*				*						
CO 2	*			*	*						
CO 3	*			*	*						
CO 4	*			*	*						
Content	Content						Competencies				
Unit 1											
IoT Application, IoT Applications with Cloud, Booting, Embedded Linux						Demonstrate the various levels of IoT from level-1 to level-6. (C3)					



Unit 2						
Linux Commands - File Commands,	1. usage of	linux commands for various				
Shell Scripting, Python Scripting	operational purposes. (C3)					
	2. Practice scr	ipting for real time applications.				
	(C3)					
	3. Demonstrat	te the programming skills in				
	Python f	for socket communication,				
	database, N	IQTT application. (C3)				
Unit 3						
Sockets, Databases & Web	1. Demonstrat	te client server application using				
Programming	socket prog	gramming. (C3)				
	2. Demonstrat	te the use case for database				
	application	in python. (C3)				
	3. Show the	server-side implementation of				
	Web Programming using python. (C3)					
Learning strategy	Contact h	ours Student learning				
2000.000 000000000000000000000000000000		time (Hrs)				
Lecture	30	60				
Quiz	02	04				
Small Group Discussion (SGD)	02	02				
Self-directed learning (SDL)	-	04				
Problem Based Learning (PBL)	02	04				
Case Based Learning (CBL)	-	-				
Revision	02	-				
Assessment	06					
TOTAL	44	74				
Assessment Methods:	1	I				
Formative:	Sum	native:				
Internal practical Test	Sessional examination					
Theory Assignments	End s	emester examination				



Lab Assignment & Viva		Viva						
Nature of assessment		CO 3	CO 4					
Sessional Examinatio	n 1	*	*					
Sessional Examinatio	n 2			*	*			
Assignment/Presentat	ion	*	*	*	*			
Laboratory Examinati	on	*	*	*	*			
Feedback Process	• En	End-Semester Feedback						
Reference Material	Approach' ISBN:978 2. "Begin 3. Yaswa 2003. 4. Brand Network F Apress, 20	', Universiti 172719547, ning Linux I ant Kannetk lon Rhodes Programming 010.	es Press, 2015. Programm ar, "Unix and Joh g", 2nd Ec	ning", Wrox, 3rc Shell Scripting n Goerzen, "Fo dition,	e of things: A hands on l edition, 2004. g", BPB Publications, pundations of Python le Series", 2011.			



Name of the Program:						Master of Engineering - ME (Internet of Things)						
					Digit	Digital Signal Processing Lab						
Course Code: ESD-603L				Cour	Course Instructor:							
Academ	nic Ye	ear: 202	20 - 202	21	Seme	ester:	Year 1,	Semeste	er 1			
No of C	Credit	s: 1				-		wledge o Matlab	f Signals	s and Syst	ems and	
Synops	sis:	This C	ourse p	rovides	s insigh	t on						
		1. Un	derstan	ding of	basics	of Sign	al and S	Systems a	as pre-rec	quisite.		
		2. Un	derstan	ding th	e conce	epts of H	Fast Fou	rier Tran	sforms.			
		3. Lea	arning l	nardwa	re impl	ementat	ion of s	ystems.				
		4. Lea	arning 1	FIR and	l IIR Fi	lter Des	igns.					
		5. Lea	arning	concept	s of m	ulti-rate	signal j	processin	g in the	form of s	ampling	
		rate	e conv	version,	struct	ures o	f samp	oling rat	e conve	erters an	d some	
		app	licatio	ns of sa	mpling	rate co	nverters	8				
		6. Un	derstan	ding t	hree op	otimum	Weine	r filters,	adaptiv	e algorit	hm and	
		trai	nsformi	ing We	iner filt	ers in to	o adapti	ve filters				
		7. Un	derstan	ding ar	chitectu	ure, mei	nory ma	anageme	nt and pi	pelining of	concepts	
		of '	ГMS32	0C67X	X proc	essor th	rough s	elf-stud.				
Course	;											
Outcom	nes	On suc	cessful	compl	etion of	f this co	urse, stı	udents wi	ill be abl	e to		
(COs):												
CO 1:		Use ma	atlab to	impler	nent va	rious D	SP tech	niques. (C3)			
CO 2:		Experi	ment D	FT, LT	'I techn	iques a	nd analy	vse the re	sults. (C	4)		
CO 3:		Design	FIR,	Butterw	orth ar	d Cheb	ychev f	ilters in r	natlab. (C5)		
Mappi	ng of (COs to 1	POs									
COs	<i>PO 1</i>	PO 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*	*		*	*							
CO 2	*	*			*							
CO 3	*	*		*	*							
Course	conte	ent and	outcon	nes:	<u>I</u>	1	1	1	I	1	1	



Content	Competencies
Unit 1:	
 Write matlab programs to Generate waves Write matlab programs to Addition of two sequences Write matlab programs to Find convolution of two sequences and verify the result using built-in function User defined Matlab function to find convolution of two sequences and verify the result 	 Use Matlab to generate waves.(C3) Use Matlab for addition of two sequences.(C3) Compute convolution of two sequences using Matlab. (C3) Analyse the convolution usinf built in functions. (C4) Practice convolution user defined function in Matlab (C3)
Unit 2:	I
 Write matlab programs to Find DTFT of a sequence. Write matlab programs to Find DFT of a sequence and verify using built- in function User defined Matlab function to find DFT and verify the result Write matlab programs to Find convolution of two sequences using DFT Write matlab programs to Find the time response of an LTI system defined by either difference equation or transfer function 	 Experiment DTFT of a sequence using Matlab (C4) Analyse the DFT of a sequence with built in function (C4) Experiment DFT using Matlab (C4) Compute convolution of two sequence using DFT in Matlab. (C3) Experiment time response of an LTI system in Matlab (C4)
Unit 3:	1
Write Matlab programs to find DFT usingDIT-FFT and DIF-FFT algorithms, compare the result using built in function.Design FIR filters with frequency domain specification (LP, HP, BP)	 Analyse DIT-FFT and DIF-FFT algorithms. (C4) Design FIR filters with frequency domain specifications. (C5)



(Deemed to	be University under Section 3 of the UGC Act, 1956)
and BR) using Frequency Sampling Technique and verify frequency response.	
Design FIR filter to meet required	
impulse response using Frequency	
Sampling Technique.	
Unit 4:	
 Write Matlab programs to Design FIR filters with frequency domain specification (LP, HP, BP and BR) using different window functions and verify frequency response. Design analog Butterworth and Chebychev filters using built-in 	 Design FIR filters with frequency domain specifications. (C5) Design analog Butterworth and Chebychev filters using built-in functions. (C5) Design digital Butterworth and Chebychev
functions, transform them to digital filter and verify their frequency response (C2). Design digital Butterworth and Chebychev filters using built-in	filters using built-in functions. (C5)

Chebychev filters using built-in functions verify the frequency response (C2)

Learning strategies, contact hours and student learning time

Learning strategy	Contact hours	Student learning
		time (Hrs)
Lecture	12	-
Seminar	-	-
Quiz	-	-
Small Group Discussion (SGD)	-	-
Self-directed learning (SDL)	-	-
Problem Based Learning (PBL)	-	-
Case Based Learning (CBL)	03	-
Clinic	-	-
Practical	24	-



Revis	sion			03		-
Assess			06		-	
ТОТ	TOTAL					-
Assessment Methods	:					
Formative:					Summa	ative:
Internal practical Test					Session	al examination
Theory Assignments					End ser	nester examination
Lab Assignment & Vi	va				Viva	
Mapping of assessme	ent wit	h Co	S		I	
Nature of assessment		CO 1	CO 2		CO 3	
Sessional Examination	n 1		*	*		
Assignment/Presentat	ion					*
Laboratory Examinati	on		*	*		*
Feedback Process	•	Enc	l-Semester H	Feedback		
Reference Material	1.	"Di	igital Signal	Processing", S	anjith K	Mitra
	2.	"Di	igital Signal	Processing", (Oppenhei	m and Schafer
	3.	"Di	igital Signal	Processing", R	oman Ku	ıc
	4.	"Di	igital Signal	Processing", H	Proakis a	nd Manolakis
	5.	"Di	igital Signal	Processing ",	Rabinde	r and Gold Shaum Out-
		Lin	e Series			
	6.	"Si	gnals and Sy	ystems", Symo	on Hayki	ns DSP Processors and
		Fur	ndamentals			
	7.	"M	ultirate signa	al processing",	Vaidyar	nathan
	8.	"Ha	andbook of I	DSP", Elliot		



Name of the Pr	ogram:	:		Mas	ster of Er	ngineerin	g - ME (Internet	of Thing	(s)		
Course Title:				Min	i Project ·	- 1						
Course Code:	IOT 69	5		Cou	rse Instr	uctor:						
Academic Year	: 2020	- 2021		Sem	ester:	First Year	, Semeste	r1				
No of Credits:	4			Prei basi	r equisite s cs	s: Any	⁷ program	ming la	nguage ai	nd circuit		
Synopsis:	Studen	ts are e	expecte	d to se	elect a p	roblem i	n the area	a of the	ir interes	t and the		
	area of	their sp	pecializ	zation	that wou	ld requir	e an imp	lementa	tion in ha	ardware /		
	softwa	re or bo	oth in a	semes	ster							
Course												
Outcomes	On suc	cessful	compl	etion of	of this co	ourse, stu	dents wil	ll be abl	e to			
(COs):												
CO 1:	Apply	the obj	ectives	of the	e project	work and	d provide	an ade	quate bac	kground		
	with a	detailed	l literat	ure su	irvey							
CO 2	Breakd	lown th	e proje	ect into	o sub blo	cks with	sufficien	t details	to allow	the work		
CO 2:	to be re	eproduc	ed by	an ind	ependent	t research	ner					
CO 3:	Compo	se hard	lware/s	oftwa	tware design, algorithms, flowchart, methodology, and							
0.0.5:	block d	liagram	L									
CO 4:	Evalua	te the r	esults									
CO 5:	Summa	arize th	e work	carrie	ed out							
Mapping of C	Os to l	POs										
COs PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11		
CO 1	102	105	*	105	100	107	100	107	1010	1011		
CO 2				*			*					
CO 2 CO 3						*			*			
					*					*		
CO 4					-r-	*				-1-		
CO5:						*						
Course conten	nt and (outcon	nes:		<i>a</i>	•						
Content					Compet	encies						
Phase 1												



$\mathcal{D}_{R_{ED}} \mathcal{B}^{\gamma} \mathcal{V}^{\gamma}$ (Deemed to b	e University under Section 3 of the UGC Act, 1956)
Problem identification, synopsis	At the end of the topic student should be able to:
submission, status submission, mid	1. Identify the problem/specification (C1)
evaluation.	2. Discuss the project (C2)
	3 . Prepare the outline (C3)
	4. Describe the status of the project (C2)
	5. Prepare a mid-term project presentation report
	(C3)
	6. Prepare and present mid-term project
	presentation slides (C3, C5)
	7. Develop project implementation in
	hardware/software or both in chosen platform
	(C5)
Phase 2	
Status submission, final evaluation.	1. Prepare the progress report (C3)
	2. Prepare the final project presentation report
	(C3)
	3. Prepare and present final project presentation
	slides (C3, C5)
	4. Modify and Develop implementation in
	hardware/software or both in chosen platform
	(C3, C5)
	5. Justify the methods used and obtained results
	(C6)
Learning strategies, contact hours and	student learning time
Learning strategy	Contact hours Student learning
	time (Hrs)
Lecture	
Seminar	
Quiz	
Small Group Discussion (SGD)	48 -
Self-directed learning (SDL)	
Problem Based Learning (PBL)	



Case Based Learning (C	CBL)	-			-			
Clinic			-					
Practical			-			-		
Revision			-			_		
Assessment			03			-		
TOTAL			51			09		
Assessment Methods:								
Formative:					Summative:			
Project Problem Selection	on				Mid-Term Presentation			
Synopsys review					Second status review			
First status review					Demo & Final Presentation			
Mapping of assessmen	t with Cos							
Nature of assessment	C	CO 1	CO 2	CO 3	CO 4	CO 5		
Mid Presentation	*	:	*					
Presentation	*	*	*	*				
Feedback Process	ess End-Semester Feedback							
Reference Material F	Material Particular to the chosen project							



Name o	of the P	rogram:			Mast	Master of Engineering - ME (Internet of Things)							
Course Title:						Seminar - 1							
Course	Code:	IOT 697			Cours	Course Instructor:							
Acaden	nic Yea	r: 2020 -	2021		Seme	ester: F	irst Year,	Semester	ŕ2				
No of C	redits:	1			Prere	quisites	: Comm	nunication	Skill				
Synops	sis:	1. To	select,	search	and lea	arn tech	inical lite	erature.					
		2. То	Identif	y a curr	ent an	d releva	nt resea	rch topic					
		3. То	prepar	e a top	ic and o	deliver a	present	tation.					
		4. То	develo	p the sl	kill to w	vrite a to	echnical	report.					
		5. De	velop a	bility to	o work	in group	os to rev	iew and r	nodify t	echnical	content.		
Course	9												
Outco	mes	On suc	cessful	compl	etion o	f this co	ourse, stu	udents wi	ill be ab	le to			
(COs):													
60 1		Show o	ompet	ence in	identif	fying rel	evant inf	formatio	n, defini	ng and e	plaining		
CO 1:		topics	under d	discussi	ion.								
		Show o	ompet	ence in	workir	ng with a	a method	dology, st	ructurir	ng their o	ral work,		
CO 2:		and sy	nthesiz	ing info	ormatic	on.							
		Use ap	propria	ite regi	sters a	nd voca	bulary, a	and will d	emonst	rate com	mand of		
CO 3:		voice r	nodula [.]	tion, vo	oice pro	jection	, and pac	cing.					
CO A :		Demor	nstrate	that th	ey hav	e paid c	lose atte	ention to	what o	thers say	and can		
CO 4:		respon	d cons	tructive	ely.								
		Develo	p pers	uasive	speed	h, pres	ent info	ormation	in a d	compellin	ig, well-		
CO F.		structu	ired, a	nd logi	cal sec	quence,	respond	d respect	tfully to	opposin	ideas,		
CO 5:		show a	depth c	of know	vledge	of com	olex sub	jects, and	d develo	op their a	ability to		
		synthe	size, ev	aluate	and re	flect on	informa	tion.					
Mappi	ng of C	Os to P	Os										
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		
CO 1	*							*	*		*		
CO 2	*							*	*		*		
CO 3	*							*	*		*		
				l			1		I	1			



CO 4	*							*	*		*	
CO5:	*							*	*		*	
	nø strat	egies.	contact	hours	and stu	udent lea	rning tin) 10				
						Contact				Student	learning	
Learning strategy										time (Hi	_	
Lectur	e					-				-		
Semina	ar					-				-		
Quiz						-				-		
	Group D	iscussi	on (SGD))		14				-		
	rected l					-				-		
Proble	m Base	d Learn	ing (PB	L)		-				-		
Case B	ased Le	arning	(CBL)			-				-		
Clinic						-			-			
Practic	al					-			-			
Revisio	on					-			-			
Assess	ment					-			-			
TOTAL						14			-			
Assess	ment N	1ethod	s:			1						
Forma	tive:							Sum	mativ	/e:		
Semina	ar Topic	Select	ion									
Synop	sys revi	ew										
PPT Re	eview											
Mappi	ng of a	ssessm	ent wit	h Cos				1				
Nature of assessment CO 1					CO 1	CO 2	CO 3	CO 4		CO	5	
Preser	itation			:	*	*	*	*		*		
Feedb	ack Pro	cess	•	End-S	Semest	er Feedba	ack	1		·		
Reference Material Particular to the chosen Seminar												



Name of the	Program:	Master of Engineering - ME (Internet of								
		Things)								
Course Title		Big Data and Data Visualization								
Course Code		Course Instructor:								
	ear: 2020-2021	Semester: First Year, Semester 2								
No of Credit		Prerequisites: Programing in Python or Java								
Synopsis:	This Course provides insight on									
	1. This course aims t	o help students get started with Architectures of								
	distributed file sys	stems and distributed computing.								
	2. Students learn pro	bability and statistical Inference techniques.								
	3. Students learn ma	chine learning algorithms required for big data								
	applications.	-								
		map data attributes to graphical attributes, and								
	-	ncoding based on known properties of visual								
	perception.									
Course										
Outcomes	On successful completion of this course, students will be able to									
(COs):										
CO 1.	Understand the archi	itecture of distributed systems and distributed								
CO 1:	computing.									
	Identify the characteri	stics of datasets and compare the trivial data and								
CO 2:	big data for various ap	pplications.								
		rning task and hypothesis space, distinguish								
CO 3:		specific hypotheses, identify the maximally								
	specific hypotheses,	Describe version spaces and candidate								
	elimination algorithm									
	To solve problems ass	ociated with batch learning and online learning,								
CO 4:	and the big data of	characteristics such as high dimensionality,								
	_	data and in particular scalability issues.								
CO 5:		uilding and evaluating visualization systems.								
	-									
Mapping of										
COs PO 1		PO PO PO 7 PO 8 PO 9 PO 10 PO 11								
		5 6								



(Deemed to be University under Section 3 of the UGC Act, 1956)

CO 1	*	*	*									
CO 2	*	*	*									
CO 3	*	*	*	*								
CO 4	*	*	*									
CO 5	*	*	*				*					
Course content and outcomes:												
Conten						Com	petencie	?S				
			ion to B									
				-					ecture	of Goo	ogle	file
Archite	ectures	—	Distrib	outed	File	S	ystem. (C2)				
System	IS —	Google	e File	System	1 –	6. I	escribe	arch	itectur	e of	Hado	oop
Hadooj	p File	e Sys	stems	- Had	loop	systems. (C2)						
Ecosys	tems.											
Unit 2	: Stati	istics										
Sampli	ng	Techn	iques	- I	Data	1 . I	efine T	rue Er	ror of	a hypotl	hesis	, ε-
classifi	cation,	Tabı	ulation,	Freque	ency	exhausted Version Space, PAC						
and Gr	aphic r	epores	entation	- Meas	ures	Learning and Agnostic Learning (C1).						
of cen	tral va	alue -	Arithm	netic m	ean,	2. Describe data sampling techniques.						ies.
Geome	tric n	nean,	Harmo	nic m	ean,	(C2)					
Mode,	Medi	an, (Quartiles	s, Dec	iles,							
Percent	tile - 1	Measu	res of	variatio	n –							
Range,	IQR,	Quarti	le devia	ation, M	lean							
deviati	on,	stanc	lard	deviat	ion,							
coeffic	ient	varia	ince,	skewn	less,							
Momen	nts & K	Surtosi	s.									
Unit 3	: Dat	abases	s for Big	g Data								
Data so	cience	proces	s – role	es, stage	s in	1. I	escribe	is Data	a Scier	nce. (C2))	
data sc	ience p	roject -	– workii	ng with	data	2 . I	2. Describe the characteristics of					
from f	iles –	worki	ng witl	n relatio	onal	Ν	loSQL.	(C2)				
databas	ses - es	xplorir	ng data -	– manag	ging							



data – cleaning and sampling for	3. Describe the principle of Map Reduce
modeling and validation – Big Table vs	technique. (C2)
HBase introduction to NoSQL -	
HiveQL - Querying Data - Sorting And	
Aggregating, Map Reduce Scripts, Joins	
& Subqueries, HBase concepts-	
Advanced Usage, Schema Design,	
Advance Indexing.	
Unit 4: Machine Learning for Big Da	ita
Choosing and evaluating models –	5. Apply candidate-elimination
mapping problems to machine learning,	algorithm to obtain most general and
evaluating clustering models, validating	most specific hypotheses for the
models – cluster analysis – K-means	training examples. (C3)
algorithm, Naïve Bayes – Memorization	6. Apply the concept of entropy and
Methods – Linear and logistic	information gain to find the root node
regression – supervised and	of the decision tree (C3).
unsupervised learning - Issues regarding	7. Design a model using K-means
classification and prediction, Bayesian	classifier to predict how well products
Classification, Classification by	are accepted by the clients (C3).
backpropagation, Classification based	
on concepts from association rule	
mining, Other Classification Methods,	
Classification accuracy.	
Unit 5: Stream Computing in Big Dat	a
Introduction - Streaming Data – Sources	1. Understanding issues with stream
- Difference between Streaming Data	processing in big data (C3).
and Static Data. Overview of Large	2. Describe how big data systems achieve
Scale Stream Processing Engines –	high availability and low latency. (C2)
Issues in Stream Processing - Phases in	3. Describe how Spark does in memory
Streaming Analytics Architecture -	processing. (C3)
Vital Attributes - High Availability -	
Low Latency – Horizontal Scalability-	



Fault Tolerance - Service Configuration	
and Management - Apache ZooKeeper -	
Distributed Stream Data Processing:	
Co-ordination, Partition and Merges,	
Transactions. Duplication Detection	
using Bloom Filters - Apache Spark	
Streaming Examples Choosing a	
storage system – NoSQL Storage	
Systems.	
Unit 6: Security in Big Data	
Privacy – Identification of Anonymous	1. Describe why Big Data Privacy is self-
People – Why Big Data Privacy is self-	regulating. (C2)
regulating? - Ethics - Ownership -	2. Describe the steps to secure big data
Ethical Guidelines – Big Data Security	systems. (C2)
- Organizational Security - Steps to	
secure big data - Classifying Data -	
Protecting – Big Data Compliance -	
HADOOP SECURITY DESIGN	
Unit 7: Data Visualization, Characteri	zation – Data Wrangling
Combining and Merging DataSets -	1. Understanding various formats of
Reshaping and Pivoting – Data	data. (C1)
Transformation – String Manipulation,	2. Design programs to dynamically
Regular Expressions - DATA	extract data from web. (C4)
AGGREGATION, GROUP	3. Design programs to read data from
OPERATIONS ,TIMESERIES -	various data sources. (C4)
GoupBy Mechanics – Data Aggregation	4. Create visualization for time series
– Groupwise Operations and	data. (C4)
Transformations – Pivot Tables and	5. Create visualization for statistical
Cross Tabulations – Date and Time Date	distributions. (C4)
Type tools – Time Series Basics – Data	6. Create visualization for maps,
Ranges, Frequencies and Shifting - WEB	Hierarchical data and network data.
SCRAPING - Data Acquisition by	(C4)
l	



(Deemed to be University under Section 3 of the UGC Act, 1956)

Scraping web applications – Submi	ittinga						
form - Fetching web pag							
Downloading web pages through							
submission – CSS Selectors -	Data						
Visualization Tools				• .•			
Learning strategies, contact hou	irs and						
Learning strategy		Сог	ntact hou	ers	Student	learning	
-					time (Hr	·s)	
Lecture		30			60		
Quiz		02			04		
Small Group Discussion (SGD)		02			02		
Self-directed learning (SDL)		-			04		
Problem Based Learning (PBL)		02			04		
Case Based Learning (CBL)		-			-		
Revision		02			-		
Assessment		06	- 06				
TOTAL		44			74		
Assessment Methods:					•		
Formative:				Summa	ative:		
Internal practical Test				Session	nal examin	nation	
Theory Assignments				End ser	mester exa	amination	
Lab Assignment & Viva				Viva			
Mapping of assessment with Co	s			1			
Nature of assessment	CO 1		CO 2	CO 3	CO 4	CO 5	
Sessional Examination 1	*		*	*			
Sessional Examination 2				*	*	*	
Assignment/Presentation	*		*	*	*	*	
End Semester Examination		*	*	*	*		
		*	*	*	*		



Feedback Process	•	End-Semester Feedback
Reference	1.	HADOOP: The definitive Guide, Tom White 4 th edition,
Material		O Reilly Publication
	2.	Python for Data Analysis, Wes Mc Kinney, O Reilly
		Publication.
	3.	Practical Data Science with R, Nina Zumel, John Mount,
		Manning Publications.
	4.	Machine Learning, E. Alpaydin, MIT Press, 2010



Name	of the P	rogram	:		Mast	Master of Engineering - ME (Internet of Things)								
Course	e Title:				Embe	Embedded Systems								
Course	e Code:	ESD 60)5			Course Instructor:								
		ar: 2020) - 2021				First Year,							
No of (Credits	: 3				-	: Micropro							
~							Assembly	language	e and Nu	imber syst	ems.			
Synop	sis:	This C	ourse p	provides	s insigh	it on								
		1. Th	is cour	rse pro	vides	the kno	wledge o	of ARN	I Corte	ex M3 P	rocessor			
		arc	hitectu	re										
		2. Th	is cour	se prov	vides th	ie know	ledge of	Microc	ontrolle	r based o	on ARM			
		Pro	ocessor	archite	ecture	and its	Register	s and]	Instructi	on sets	to write			
		As	sembly	and Er	nbedde	ed C Pro	grammin	g.						
		3. Th	is cours	se prov	ides the	e concej	ot of Inter	facing a	nd Prog	ramming	Sensors			
		and	d Peripl	herals to	o Micro	ocontrol	lers.							
		4. Th	is cours	se provi	ides the	concep	ot of Com	municat	ion Prot	ocols req	uired for			
		mu	ılti-proc	cessor c	commu	nication	l.							
		5. Th	is cour	se pro	vides t	he con	cept of F	Real tim	ne opera	ating sys	tems on			
		Mi	crocon	trollers										
		6. Th	is cour	se pro	vides t	he con	cept of D	Designin	g Real	Time Ei	nbedded			
		Sy	stems u	sing A	RM Mi	crocont	roller.							
Cours	e													
Outco	mes	On suc	ccessful	compl	etion of	f this co	ourse, stud	lents wil	ll be abl	e to				
(COs)	:													
CO 1:		Emplo	y the k	nowled	ge of N	licroco	ntrollers to	o build l	Embedd	ed system	ns. (C3)			
CO 1		Explain the concept of Programming ARM Microcontrollers using Assembly												
CO 2:		and Embedded C. (C2)												
		Design	n a Real	l time E	Embedd	led Syst	ems by in	nterfacin	g Senso	ors, Actua	ators and			
CO 3:		porting	g Real t	ime op	erating	system	s. (C5)							
Mappi	ing of (COs to	POs											
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	<i>PO</i> 8	<i>PO</i> 9	PO 10	PO 11			
CO 1	*	*												
CO 2	*	*	*		*									
CO 3	*	*	*		*									
				1					1					



Course content and outcomes:	
Content	Competencies
Unit 1: Introduction to Embedded	Systems
Design Challenges, Processors	At the end of the topic student should be able to:
Technology, Design Technology	1. Describe the Design issues in designing the
	Embedded Systems.(C1)
	2. Discuss the design technology associated with
	Embedded Systems.(C2)
Unit 2: Introduction to ARM Cortex	processor
Variants of Cortex and ARM versions,	1. Explain about ARM Processor architecture
Comparison of M-series processor,	(C2)
Architecture, Programmers Model,	2. Describe ARM Cortex m3 processor data path,
APSR register, Memory Model,	Register set, Programming models and memory
Exception, Interrupts, Reset	map (C2)
	3. Describe about ARM Cortex M3 Processor
	Instruction set. (C2)
	4. Describe about ARM Processor system bus and
	Interrupt controller (C2)
	5. Describe about interrupt and Exception
	handling (C2)
	6. Describe ARM Microcontroller architecture.
	(C2)
Unit 3: Instruction Set Architecture	
More on Memory System, Exceptions	1. Describe ARM Cortex memory system.
and Interrupts, NVIC, Memory	2. Describe interrupt and Exception handling (C2)
Protection Unit, Assembly	3. Describe NVIC, Memory Protection Unit. (C2)
Programming, Embedded C	4. Discuss CMSIS implementation in ARM
programming, CMSIS, Startup Code	Cortex.(C2)
Unit 4: Introduction to LPC13/17xx	
Memory Mapping, Registers involved	
and programming with GPIO, PWM	and programming with GPIO, PWM. (C3)



	2. Apply	kno	owledge of ARM Microcontroller		
			e to rig up Embedded system		
	circuit				
Unit 5: Data Acquisition System	circuit	.5(C.	,,		
	1 Identi	for the second	eventions trace of ADC (C1)		
ADC, Types of ADC, Choosing the			g various types of ADC. (C1)		
ADC, DAC	2. Review ADC and DAC selection criteria. (C2)				
Unit 6: Serial Communication					
UART, I2C, SPI, Interfacing	1. Discu	ssing	y various types of Serial		
	Comn	nunic	cation mechanism. (C2)		
Unit 7: USB BUS					
Speed Identification on the bus, States	, Packets,	1.	Identify USB types, Firewire		
Data flow types, Enumeration, Descrip	tors, USB		devices, ports, cables.		
Interface – C Programs		2.	Describing Enumeration,		
			Descriptors mechanism in		
			USB.(C2)		
Unit 8: CAN BUS					
Introduction, Frames, Bit stuffing, Types	of errors,	1.	Describe the nature of CAN and the		
Nominal Bit Timing, A simple applica	ation with		basic CAN protocol, and the basic		
CAN			structure of a CAN network. (C2)		
		2.	Prepare a simple application with		
			CAN. (C3)		
Unit 9: Introduction to Multitaskin	ng in Micro	ocon	trollers		
Variants of RTOS, FreeRTOS, UCOS,	uCLinux,	1.	Describe about Real time operating		
FreeRTOS on Cortex based Microco	ontrollers,		systems role in building real time		
TASK CREATION, QUEQUES, SEMA	APHORE,		systems (C3)		
MUTEX, Application development			Describe about Designing Real		
			Time Embedded systems by		
			interfacing peripherals and actuators		
			(C2)		
		3.	Design a Real time Embedded		
		5.	C		
			system by writing applications on		



			top		ne operating systems	
Unit 10: Designing a Dig	ital Camera		(C.))		
Introduction, Requirement,			1. Su	mmarize the	e stages involved in	
Implementation, Testing	Speen.	,,	designing a digital camera. (C2)			
Learning strategies, contact h	nours and s	tudent le			(- <i>-</i> /	
Learning strategy	Contact			Student learning		
0 0,					time (Hrs)	
Lecture		30			60	
Quiz		02			04	
Small Group Discussion (SGD)	02			02	
Self-directed learning (SDL)		-			04	
Problem Based Learning (PBL)	02			04	
Case Based Learning (CBL)		-			-	
Revision		02			-	
Assessment		06			-	
TOTAL		44			74	
Assessment Methods:						
Formative:				Summati	ive:	
Internal practical Test				Sessional examination		
Theory Assignments			End semester examination			
Lab Assignment & Viva				Viva		
Mapping of assessment with	Cos					
Nature of assessment	CO 1		CO 2		CO 3	
Sessional Examination 1	*		*			
Sessional Examination 2			*		*	
Assignment/Presentation	*		*			
End Semester Examination	*		*		*	
Feedback Process	Mid-Semest	er feedba	ck			



	End-Semester Feedback
Reference Material	1. Joseph Yiu, "The definitive guide to the ARM Cortex-M3",
	Elsevier, 2nd Edition, 2010.
	2. Frank Vahid, Tony Givargis, "Embedded System Design: A
	Unified Hardware/Software Introduction", Wiley India, ISBN:81-265-
	0837-X, 2007.
	3. Richard Barry, "NXP Semiconductors, LPC13xx/17xx User
	Manual", 2012.
	4. NXP Semiconductors, "LPCzone Examples", 2012.
	5. "FreeRTOS Reference Manual", Real Time Engineers Ltd., 2016.



Name	of the P	rogram	:		Mast	ter of Er	gineer	ing - ME	(Internet o	of Things)		
Course		8				Embedded Sensing Systems and Networks						
		IOT 60)4			course Instructor:						
Acade	nic Yea	ar: 2020	- 2021		Seme	emester: First Year, Semester 2						
No of (Credits	: 3			Prer	equisite	e s: Basi	cs of sense	ors, Basics	of commur	nication	
Synop	sis:	This C	ourse p	orovides	s insigh	nt on:						
		1.	Variou	is type	es of	sensors	used	in practi	ical appli	cations a	nd their	
characteristics.												
		2.	Protoc	ols for	Wirele	ess Com	munica	tions.				
		3.	Princi	ple of v	vorking	g of Glo	bal Pos	itioning S	System			
		4.	Conce	pts and	l applic	ations o	f Wire	less Senso	or Networl	ks		
Cours	e											
Outco	mes	On suc	cessful	compl	etion o	f this co	ourse, s	tudents w	ill be able	to		
(COs)	:											
CO 1:		Identify various types of sensors available and its applications.										
CO 2:		Discuss different wireless communication protocols used and the standards.								rds.		
CO 3:		Descri	be the v	working	g of Gl	obal Pos	sitionin	g System	and issue	s related ir	n it.	
CO 4:		Descri	be the v	working	g of Wi	Wireless Sensors Networks and its applications.						
Mappi	ing of (COs to	POs									
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*		*		*							
CO 2	*				*					*		
CO 3				*				*		*		
CO 4	*			*						*		
Cours	e conte	ent and	outcon	nes:		_						
Conter	nt				(Compet	encies					
Unit 1	: Iı	ntroduc	tion to	Embe	dded S	ystems	and N	etworks				
Sensor	and	Transd	ucers,	Types	of	At the e	nd of th	ne topic st	tudent sho	uld be able	e to:	
Sensor	rs, Hu	midity,	Pressu	ure, L	ight,	1. I	dentify	differen	t types of	fsensors	available	
Magne	etics, To	emperat	ure		1	for practical applications (C1)						
					,	2. Describe input – output characteristics of the						
					:	sensors (C2)						



	3. Demonstrate the working of few sensors
	through a small project (C3)
Unit 2	
Sensing Mechanism, Actuating	1. Describe the working of Digital and Analog
Mechanism, Different Sensors,	sensors (C2)
Sampling, Digital and Analog Sensor,	2. Apply the knowledge of the sensors to acquire
Electrical Characteristics of Sensors,	a real time data (C3)
Choosing a sensor for IoT Network	3. Examine the performance of the designed
applications.	network through few solved problems (C4)
Unit 3: Protocols for WPAN, Intro	duction to WPAN standards, Bluetooth
Introduction, Protocol Stack, RF	1. Describe various types of wireless
Classes, Radio Technologies, Service	standards (C2)
Discovery, Device Discovery, Profiles,	2. Identity access management solutions in the
Security (Discovering Bluetooth),	protocol stack (C2)
Hardware, Bluetooth BLE, Bluetooth	3. Discuss Bluetooth software stack (C2)
Devices, BlueZ software stack	
Unit 4: Zigbee	
Frequency, Channels, Topology, Zigbee	1. Explain frequency channel, topology
Protocol Stack, PHY, MAC Layer,	of zigbee network (C2)
Working, Frame Structure, Beacon,	2. Describe the API mode & AT mode
Non-Beacon Communication, Zigbee	of Zigbee communication (C2)
PDU, Zigbee Hardware devices, API	
Mode and AT mode communication	
Unit 5: Near Field Communication	
Passive and Active Devices, NFC cards	1. Explain the concepts of Active and Passive NFC
Interfacing, Read and Write	(C2)
	2. Discuss the read write mechanism of these NFC
	devices (C2)
Unit 6: GPS	
Differential GPS, NMEA protocols,	1. Understanding the working of GPS (C3).
GPS devices, Concepts	2. Understanding protocols used in GPS (C3).
	3. Identifying the devices used in GPS system (C3)



Unit 7: Wireless Sensor N	etworks						
Deployment, Localization, Rou	ting, Time	1. Descr	ibe the workir	ng of Wireless Sensor			
Synchronization, Power Manag	gement	device	devices and networks (C1)				
		2. Desig	2. Design a wireless sensors network an				
		demoi	nstrate the worki	ing (C5)			
Learning strategies, contact h	ours and s	student lear	ning time				
Learning strategy		Contact he	ours	Student learning			
				time (Hrs)			
Lecture	30		60				
Quiz		02		04			
Small Group Discussion (SGD))	02		02			
Self-directed learning (SDL)		-		04			
Problem Based Learning (PBL)	02		04				
Case Based Learning (CBL)		-		-			
Revision	02		-				
Assessment		06		-			
TOTAL		44		74			
Assessment Methods:							
Formative:			Summative	2:			
Internal practical Test			Sessional ex	xamination			
Theory Assignments			End semeste	er examination			
Lab Assignment & Viva			Viva				
Mapping of assessment with	Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4			
Sessional Examination 1	*	*					
Sessional Examination 2			*				
Assignment/Presentation		*	*	*			
End Semester Examination	*	*	*	*			
Feedback Process • H	End-Semest	ter Feedback	ζ	I			



Reference Material	1. M.H. Bao, Micro Mechanical Transducers, "Handbook of Sensors
	and Actuators", Volume 8, Elsevier, 2000.
	2. Ljubisa Ristic, Editor, "Sensor Technology and Devices", Artech
	House, 1994.
	3. Vedat Coskun, Kerem Ok and Busra Ozdenizci, "Near Field
	Communication", Wiley Publications, 2011.
	4. Todor Cooklev, "Wireless communication standards", IEEE Press,
	John Wiley & Sons, 2011.
	5. Houda Labiod, Hossam Afifi, Costantino De Santis, "Wi-Fi,
	Bluetooth, Zigbee and WiMAX", Springer Publications, 2007.
	6. Madhushree Ganguli, "Getting started with Bluetooth", Premier Press,
	ISBN 1931841837, 9781931841832, 2002.
	7. Jörg Eberspächer, Hans-Jörg Vögel, Christian Bettstetter, Christian
	Hartmann, "GSM – Architecture, Protocols and Services" Third Edition,
	Wiley Publications, 2008.
	8. www.trimble.com/gps_tutorial.
	9. Holger Karl and Andreas Willig "Protocols and Architectures for
	Wireless Sensor Networks", John Wiley & Sons, 2005.
	10. Ian F. Akyildiz, "Wireless Sensor Networks", Wiley & Sons, 2010.
	11. Jun Zheng & Abbas Jamalipour, "Wireless Sensor Networks - A
	Networking Perspective", John Wiley & Sons, Inc., Publication, 2008.
	12. Kazem Sohraby, Daniel Minoli & Taieb Znati "Wireless Sensor
	Networks - Technology, Protocols, and Applications", 2007.
	13. F. Zhao and L. Guibas. Morgan Kaufmann, "Wireless Sensor
	Networks: An Information Processing Approach", Jul. 2004.
	14. N. P. Mahalik. Springer Verlag, "Sensor Networks and
	Configuration: Fundamentals, Standards, Platforms, and Applications",
	Nov. 2006.
	15. N. Bulusu and S. Jha, "Wireless Sensor Networks: A Systems
	Perspective", Editors, Artech House, August 2005.



Course Title:Course Code:IOT 605Academic Year:2019-2020No of Credits:3Synopsis:This Course provides	Cou Sem Pren insig	rse Instru ester: H requisites	uctor: First Ye	plication De	-										
Academic Year: 2019-2020 No of Credits: 3	Sem Prei insig	ester: H requisites	First Ye	or Somosta											
No of Credits: 3	Pren insig	equisites		or Somosto											
	insig	-		Xear: 2019-2020Semester: First Year, Semester 2											
Synancia: This Course provides	Ũ		: Bas	ic Program	ming										
Synopsis: This Course provides		ht on													
1. The front-end sect	ion i	1. The front-end section includes working with HTML, CSS3 and Bootstrap t													
design interactive	design interactive and responsive web pages whereas the back-end section														
consists of program	nmir	ıg in PHI	P with	MySQL, X	ML, and	ISON.									
2. Develop a platform	m fri	endly we	eb app	lication or	a website	using B	ootstrap,								
Angular JS, React	JS, a	nd Node	JS.												
Course															
Outcomes On successful complex	tion o	of this co	urse, s	tudents wi	ll be able t	0									
(COs):															
CO 1: Prepare a dynamic we	bpag	e by the	use of	java script											
CO 2: Summarize a well-form	Summarize a well-formed / valid XML document.														
Schedule web applicat	ion c	onnect to	o a DBI	MS to perfe	orm insert,	update an	nd delete								
CO 3: operations.	operations.														
CO 4: Practice converting the	Practice converting the string and parse using JSON objects														
CO 5: Apply Bootstrap, Ang	ular .	JS, React	JS, No	ode JS to c	onstruct m	nodern we	ebsite								
Mapping of COs to POs															
COs PO 1 PO 2 PO 3 PO 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11								
CO 1 * *															
CO 2 * *															
CO 3 * * *															
CO 4 * *															
CO 5 * * *	*														
Course content and outcomes:			•		1										
Content		Compete	encies												
Unit 1: Introduction to Interne	et and	d Web T	echnol	ogy											



Deemed to	de Ona	
Client Server Model, Tier Architecture,	1.	Explain Client Server Model, Tier Architecture
Types of Servers, Web Hosting,	2.	List out the types of Servers
Responsive Design	3.	Describe the importance of Web Hosting and
		Responsive Design
Unit 2: HTML		
Basic tags of HTML, Common Tags,	1.	Construct the Basic web page using tags of HTML
Formatting Tags, Images and Linking,		(C4).
List and Table Structure, Forms,	2.	Compare the difference between semantic and
and control: Text, Radio, Checkbox,		non-semantic tags (C5)
Select, Button, Input, HTML5: HTML	3.	Design web page using Common Tags,
Graphics, HTML Media, HTML		Formatting Tags, Images and Linking, List and
API .		Table Structure. (C5)
	4.	Forms and control Text, Radio, Checkbox, Select,
		Button, Input(C5)
	5.	Explain the importance of HTML Graphics,
		HTML Media, HTML API (C4)
Unit 3: CSS3		
Inline styles, internal style sheets,	1.	Design web pages using Inline styles, internal
linking external style sheets, positioning		style sheets, linking external style sheets(c5)
elements, backgrounds, element	2.	Differentiate between absolute and relative
dimensions, Box Model and text flow,		positioning elements(C4)
Media Types, Building a CSS drop-	3.	Apply backgrounds to web pages (c5).
down menu.		list out the different element dimensions (c1)
	4.	Importance of Box Model and text flow, Media
	•	
		Types (C2)
	5.	Types (C2) Building a CSS drop-down menu(c5)
Unit 4: Javascript	5.	
Unit 4: Javascript Elements of Java Script - Variables,		
		Building a CSS drop-down menu(c5) List out the applications of JavaScript (C1).
Elements of Java Script - Variables,	1.	Building a CSS drop-down menu(c5) List out the applications of JavaScript (C1).
Elements of Java Script - Variables, Data Types, Operators, Control	1.	Building a CSS drop-down menu(c5) List out the applications of JavaScript (C1). Explain the elements of Java Script - Variables,



TRED BY UDeemed to						
Model(DOM) - Document, Form,	. Create	web page to perform repetitive task using				
Event Handling, JQUERY, AJAX	loopin	g statements (C5)				
	. Develo	op web page using Functions				
	Dialog	g - obtaining user input with prompt dialogs.				
	(C5)					
	. Explai	n the importance of Document Object				
	Model	– Document(C3)				
	. Valida	te a Form using pattern matching operators				
	(C3).					
	. Disting	guish between traditional web applications				
	and A.	JAX applications(C4).				
	9. Create web page with AJAX (C5).					
Unit 5: XML vs JSON vs YAM						
Introduction and Features, Use of XML,	. Repres	sentation, YAML, YAML structure (C3)				
XML document, Creating XML, DTD,	. Create	JSON data (C3)				
Reading XML, Introduction to JSON,	. Explai	n the importance of XML.(C3)				
JSON Structure, Object Representation,	. List ou	t the applications of XML,(C1)				
YAML, YAML structure, USE Case	. Constr	ruct XML document and Reading XML				
	(C4)					
Unit 6						
PHP, MYSQL Connection, CRUI	1. Exp	lain the concept of server side scripting				
Operations, Handling JSON, XML data	lang	uage like PHP(C2).				
	2. Able	e to connect database using MYSQL(C5)				
	3. Crea	ate JSON, XML data (C4)				
Unit 7						
BOOTSTRAP, ANGULAR JS, REAC	4. Crea	ate a Responsive web page using Bootstrap,				
JS, NODEJS	Ang	ular JS, React JS and Node JS(C5)				
	5. Dev	elop web page using the framework(C5)				
Learning strategies, contact hours and	tudent le	arning time				
Learning strategy	Contact	hours Student learning				
		time (Hrs)				
Lecture	30	60				



Quiz	Quiz					04		
Small Group Discussi	ion (SGD)		02			02		
Self-directed learning	(SDL)		-			04		
Problem Based Learn	02			04				
Case Based Learning	(CBL)		-			-		
Revision			02			-		
Assessment			06			-		
TOTAL			44			74		
Assessment Methods	5:							
Formative:				Summa	ative:			
Internal practical Test	t			Session	Sessional examination			
Theory Assignments		End semester examination						
Lab Assignment & Viva			Viva					
Mapping of assessme	ent with Co	DS						
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	
Sessional Examinatio	n 1	*	*					
Sessional Examinatio	n 2			*	*			
Assignment/Presentat	ion	*	*	*	*	*	*	
End Semester Examin	nation	*	*	*	*	*	*	
Feedback Process	• En	d-Semes	ter Feedback	-		I		
Reference Material	1. Thomas A. Powell, Fritz Schneider," JavaScript: The Comple					Complete		
	Reference", McGraw-Hill Osborne, Second Edition, 2004.							
	2. Jamsa Krishna, "Introduction to web development using HTML5",						HTML5",	
	2014.							
	3. Danny	Goodma	an, "JavaScrip	t bible", W	/iley, Sev	venth Editio	on, 2010.	
	4. Azat M	ardan, "	Practical Node	e.js: Buildi	ng Real-	World Scala	able Web	
	Apps", Ap	oress Pub	lications, 2014	4.				
	5. Krasim	ir Tsone	v, "Node.js by	Example'	', Packt F	Publications	, 2015	



_	
	6. Luke Welling, Laura Thomson, "PHP and MySQL Web Development
	(Developer's Library)", Addison Wesley Publications, 2008.
	7. Ben Laurie, Peter Laurie, "Apache: The Definitive Guide", 3rd
	Edition, O'Reilly Media,2009.
	8. Brian Totty, David Gourley, Marjorie Sayer, Anshu Aggarwal, Sailu
	Reddy, "HTTP: The Definitive Guide", O'Reilly Media, 2009.
1	



Name of the Program:		Master of Engineering - ME (Internet of Things)
Course Title:		Machine Learning for Big Data
Course Code: BDA-605		Course Instructor:
Academic Year: 2020 - 2021		Semester: First Year, Semester 2
No of Credits: 3		Prerequisites: Programming with Python and Data
Synoncics	This Course provides	Visualization insight on
Synopsis:	This Course provides insight on 1. This course provide the concept of neurons and biological motivatio	
activation functions and threshold units, supervised learning, perceptron network models in Artificial Neural		
	2. This course provide the knowledge about learning from unclassified data	
	using clustering te	
		de the concept of Support Vector Machines for linear and
	non-linear classification.	
	4. This course provid	le the concept of Deep Learning and design of convolutional
	neural network for Deep Learning.	
	5. This course provide the knowledge about the applications and design of	
	Reinforcement Le	arning algorithms.
Course		
Outcomes	On successful completion of this course, students will be able to	
(COs):		
CO 1:	Describe activation functions, weights and threshold units used in artificial neural	
	networks, supervised and unsupervised learning, gradient descent approach, types	
	of perceptron models, overfitting	
CO 2:	Explain the concept of hierarchical clustering and non-hierarchical clustering,	
	support vector machine, deep neural networks and reinforcement learning	
CO 3:	Demonstrate artificial neural network models, clustering models, support vector	
	classifier models, Deep learning models and reinforcement learning models	
CO 4:	Compare and contrast single layer, multilayer and deep neural networks in terms	
	of accuracy in classification	
CO 5:	Design back propagation neural network, K-means and agglomerative clustering,	
	deep neural network, reinforcement learning models and selection of a machine	
	learning algorithm for the given data analysis.	



Mapping of COs to POs												
COs	PO 1	PO 2	<i>PO 3</i>	PO 4	PO 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 1	*											
CO 2		*										
CO 3			*									
CO 4				*								
CO 5				*								
Course	e conte	nt and	outcon	nes:								
Conten						Compet	encies					
Unit 1		Artificia	al Neur	al Net	works	-						
Neuror	ns and	l biolo	gical	motivat	tion,	1. 1	Relate	biological	neurons	s with	artificial	
		unction	-			neur		and the	motivat			
units,	Superv	vised a	and ur	isuperv	ised	development. (C1)						
learnin	g,	Perce	otron	Mo	odel:	2. Distinguish Supervised and unsupervised						
represe	ntation	al limit	ation a	nd grad	lient	learning (C2).						
descen	t traini	ing, Mu	ultilaye	r netw	orks	3. Describe about error reduction techniques in						
and bac	ck prop	agation	, Overf	itting		used	Art	ificial Ne	ural N	letworks	based	
						learning (C2)						
						4. Write the usability of different activation						
						functions for ANN learning system. (C3)						
						5. Describe the architecture						
						of various perceptron networks. (C2)						
Unit 2	: (Clusteri	ing									
Learnii	ng fr	om u	nclassif	fied c	lata,	1. Write the different methods of learning from						
Cluster	ring. Hi	ierarchi	cal Agg	glomera	tive	unclassified data (C3).						
Cluster	ring,	Non	- H	Iierarch	nical	2. I	Explain	l	the	Oj	perations	
Clustering - k-means partitional of various clustering models in									machine			
cluster	clustering, Expectation maximization						ning (C	5)				
(EM)	M) for soft clustering, Semi- 3. Describe the methods used for measur										easuring	
supervi	ised le	earning	with	EM u	sing	dissimilarity between two clusters. (C2)						
labelle	d and u	nlabelle	ed data.									



	4. Apply clustering techniques for data analysis.
	(C3)
Unit 3: Kernel Methods	
Dual Representations, Design of	1. Describe Dual Representations. (C2)
Kernels .	2. Explain the Kernel trick for learning non-linear
	functions (C5)
Unit 4: Support Vector Machines (SMV)
Maximum margin linear separators,	1. Describe about Maximum Margin and
Quadratic programming solution to	Support Vector Machine. (C2)
finding maximum margin separators,	2. Examine the advantages of maximum margin
Kernels for learning non-linear	linear separators technique in SVM (C4)
functions, Varying length pattern	3. Explain the Kernel trick for learning non-
classification using SVM	linear functions (C5)
	4. Show the relation between two forms of
	representation of a hyperplane (C3)
Unit 5: Deep Learning	
Introduction to Deep Learning,	1. Define Deep Learning. (C1)
Introduction to convolutional Neural	2. Describe the applications of deep learning.
Network (CNN), CNN Architecture and	(C2)
layers, Building simple CNN model for	3. Explain the architecture of Deep Neural
classification, Training and Testing the	Network and CNN (C5)
CNN model	4. Design a classifier for the image classification
	system. (C5)
Unit 6: Reinforcement Learning	
Characteristics, N-arm Bandit Problem	, 1. Explain the concept of Multi-Armed Bandit
Calculating the Value Function	, Problem (MABP). (C2)
Associative Learning - Adding States	, 2. Write the functions of Upper Confidence
The Markov Property & Markov Decision	n Bound (UCB) algorithm. (C3)
Process	3. Outline the learning process
	and characteristics of reinforcement learning.
	(C4)



4. Explain about Markov decision process. (C5)

Learning strategies, contact hours and student learning time

Learning strategy	Co	ontact hours		Student learning			
					time (Hrs)		
Lecture			30		60		
Quiz			02		04		
Small Group Discussion ((SGD)		02		02		
Self-directed learning (S	DL)		-		04		
Problem Based Learning	(PBL)		02		04		
Case Based Learning (C	CBL)		-		-		
Revision			02		-		
Assessment			06		-		
TOTAL			44		74		
Assessment Methods:							
Formative:		Summative:					
Internal practical Test			Sessional examination				
Theory Assignments		End semester examination					
Lab Assignment & Viva			Viva				
Mapping of assessment with	Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examination 1	*	*	*		*		
Sessional Examination 2	*	*	*	*	*		
Assignment/Presentation	*	*	*	*			
End Semester Examination	*	* * *		*			
Feedback Process •	End-Semes	ter Feedbacl	K I	I			
			ning", McGr rning" MIT				
2. E. A	lpaydin, "N	fachine Lear	rning", MIT	Press, 201	0.		



3. C. Bishop, "Pattern Recognition and Machine Learning", Springer,
2006.
4. R. Duda, E. Hart, and D. Stork, "Pattern Classification", Wiley
Interscience, 2000.
5. Satish Kumar, "Neural Networks - A Class Room Approach", Second
Edition, Tata McGraw-Hill, 2013.
6. T. Hastie, R. Tibshirani and J. Friedman," The Elements of Statistical
Learning: Data Mining", Inference and Prediction, Springer, 2nd Edition,
2009.
7. Jason Bell, "Machine Learning for Big Data", Wiley Big Data Series,
2016.
8. J. Shawe-Taylor and N. Cristianini, "Kernel Methods for Pattern
Analysis", Cambridge University Press, 2004.
9. S. Haykin, "Neural Networks and Learning Machines", Prentice Hall
of India, 2010.
10. Rama Murthy G, "Multidimensional Neural Networks Unified
Theory", New Age International, 2008.
11. F. Camastra and A. Vinciarelli, "Machine Learning for Audio, Image
and Video Analysis – Theory and Applications", Springer, 2008.



Name of the Program:						Master of Engineering - ME (Internet of Things)						
Course Title: N					Mobi	Mobile Application Development using Android						
Course	Code:	CSE-	605		Cour	Course Instructor:						
Academic Year: 2019-2020 Se						ester: I	First Year	, Semester	2			
No of (Credits:	3				equisites		c knowled	ge of OC	P's conce	epts, Java	
~	-					-	language					
Synop	sis:	This C	ourse p	rovides	s insigh	it on						
		1.	This	course	would	l provi	de funda	mental k	nowledge	e about	android	
		pla	tform.									
		2.	The c	ourse v	vill als	o provid	de skill	sets to de	sign and	develop	android	
		app	olication	ns for r	nobile	devices.						
		3.	This c	course	will p	rovide l	basic kn	owledge	about an	droid ap	plication	
	communication of data which are hosted in remote systems.											
Cours	e											
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, stu	dents will	be able t	0		
(COs):	:											
CO 1:		Explai	n andro	id arch	itecture	e and fra	mework					
CO 2:		Discus	s majoi	buildi	ng bloc	ks of ar	android	application	on			
CO 3:					cations	using	various	UI compo	onents a	nd data 1	handling	
		-	SQLiIte									
CO 4:					opics such as LBS, Mapping, Network connectivity, adapters							
Mappi	ng of (COs to]	POs									
COs	PO 1	<i>PO 2</i>	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*	*										
CO 2	*	*		*								
CO 3		*	*		*							
CO 4	CO 4 * * * * *											
Course	e conte	ent and	outcon	nes:	L	L	1	I	1	1	<u> </u>	
Conter	nt and a second s				(Compete	encies					
Unit 1	:	Introdu	iction									



(Deemed to	be Unn	versity under Section 3 of the UGC Act, 1956)
Introduction to Android and Eclipse	1.	Explain android architecture (C2)
environment, Android application	2.	Discuss major building blocks such as activity,
framework, Unique aspects of		services, broadcast receiver and content provider
mobile application, software		(C2)
engineering issues for mobile	3.	Identify different features in android studio (C1)
application development	4.	Discuss software engineering issues for mobile
		application development (C2)
Unit 2: Android building blocks		
Android manifest file, Dalvik virtual	1.	Explain Android manifest file (C2)
machine, DDMS, ADT, Adb, Android	2.	Discuss DVM, DDMS, android emulator (C2)
emulator, Activities and intents,	3.	Describe android activity (C2)
creating a project, Android activity	4.	Illustrate android activity lifecycle (C2)
lifecycle, starting a new 'Hello World'	5.	Discuss the issues related running and debugging
Android application, Running		applications (C2)
and Debugging applications.		
Unit 3: Android Screen UI Comp	one	ents
Layouts: LinearLayout,	1.	Describe different types of layouts (C2)
AbsoluteLayout, TableLayout,	2.	Distinguish between various types of layout (C2)
RelativeLayout, FrameLayout,	3.	Identify different types of android UI elements
ScrollView, Views: TextView,		required for developing forms (C1)
EditText, and Button views, TimePicker		
and DatePicker views, ListView and the		
Spinner views, Gallery and		
ImageSwitcher views, context sensitive		
menu .		
Unit 4: Data management with SQ	Lit	e
SQLite architecture, creating and using	1.	Describe SQLite architecture (C2)
databases, DBAdapter class, Common	2.	Discuss the use of SQLite database (C2)
SQLite commands, creating triggers,	3.	Discuss the CRUD operations (C2)
logging insert, delete, update using	4.	Apply CRUD operations to develop a simple
SQLite, managing persistent data,		healthcare application (C3)



Development of a simple healthcare				
application				
Unit 5: Advanced topics				
Adapters, background threads,	1. Explain adapter class (C2)			
Notifications, Location based services,	2. Discuss the various components of notification			
Mapping, network connectivity	object in an android application (C2)			
services, telephony services	3. Discuss the use location based service classes			
	(C2)			
	4. Identify the classes required for network			
	applications (C1)			
	5. Define android service (C2)			
	6. Explain life cycle of service (C2)			
	7. Discuss on background threads in android			
	applications (C2)			
Learning strategies, contact hours and	student learning time			
Learning strategy	Contact hours Student learning			
	time (Hrs)			
Lecture	30 60			
Quiz	02 04			
Small Group Discussion (SGD)	02 02			

Small Group Discussion (SGD)	02	02		
Self-directed learning (SDL)	-	04		
Problem Based Learning (PBL)	02	04		
Case Based Learning (CBL)	-	-		
Revision	02	-		
Assessment	06	-		
TOTAL	44	74		
Assessment Methods:				
Formative:	Summative:			
Internal practical Test	Sessional exa	Sessional examination		
Theory Assignments	End semester	examination		
Lab Assignment & Viva	Viva	Viva		



Mapping of assessme	ent with Co	s							
Nature of assessment		CO 1	CO 2	CO 3	CO 4				
Sessional Examinatio	n 1	*	*						
Sessional Examinatio	n 2			*	*				
Assignment/Presentat	tion		*	*	*				
End Semester Examin	nation	*	*	*	*				
Feedback Process	• End	End-Semester Feedback							
Reference Material	Application ISBN-10: (2. Ed H Developme 193435656 3. Rick Developme 059652147 4. Reto (Wrox Pro	n Develo 0321673: Burnette, ent Pla 55, ISBN Rogers ent: Prog 2 , ISBN Meier , grammer	opment in 24 H 352, ISBN-13: "Hello, And tform", Praga and John gramming", O'F V-13: 978-0596 "Professional	ours", Sams Publ 978-0321673350 roid: Introducin amatic, Third 356562, 2011. Lombardo, "4 Reilly Media, Fir 521479, 2009. Android 2 Appl er)", Wrox, Secor	ch Yourself Android lishing, First Edition, o, 2010. Ig Google's Mobile Edition, ISBN-10: Android Application st Edition, ISBN-10: ication Development nd Edition, ISBN-10:				



Name of the Program:						Master of Engineering - ME (Internet of Things)								
						Entrepreneurship								
Course Code: ENP-601						Course Instructor:								
Academic Year: 2020 - 2021					Seme	ster: I	First Ye	ar, Semeste	er 2					
No of (Credits	: 3			Prere	equisites	:							
Synop	sis:	This co	ourse in	troduce	es stude	ents to th	ne theor	ry of entre	preneurshi	p and its p	oractical			
		-						U	ated to th	-				
		process	s, inclu	iding b	ousiness	s mode	l inno	vation, m	onetization	i, small b	ousiness			
		manag	ement	as well	l as str	ategies	that in	nprove pe	rformance	of new b	ousiness			
		ventures. Centered on a mixture of theoretical exploration as well as case studie												
		of real-	world	exampl	es and g	guest lee	ctures, s	students w	ill develop	an unders	tanding			
		of suce	cesses,	opport	unities	and ris	sks of o	entreprene	urship. Th	nis course	has an			
		interdis	sciplina	ary app	roach a	nd is the	erefore	open to st	udents from	m other M	ajors.			
Course	e													
Outco	mes	On suc	cessful	compl	etion of	f this co	ourse, st	udents wi	ll be able t	0:				
(COs)	:													
CO 1:		To imp	art kno	owledge	e on the basics of entrepreneurial skills and competencies to									
01.		provide the participants with necessary inputs for creation of new ventures.												
CO 2:		To fam	iliarize	the par	rticipan	ts with	the con	cept and o	verview of	entrepren	eurship			
CO 2.		with a	view to	enhan	ce entre	epreneu	rial tale	ent						
CO 3:		To app	raise th	e entre	preneu	rial proc	cess sta	rting with	pre-ventur	re stage				
CO 4:		To Cre	ate and	l exploi	t innov	ative bu	isiness	ideas and	market opp	portunities				
GO •		To Bu	ild a m	nind-set	t focusi	ing on	develop	oing nove	l and uniq	ue approa	ches to			
CO 5:		market	opport	unities										
00 (To exp	plore n	new vis	stas of	entrep	reneurs	hip in 21	st century	environr	nent to			
CO 6:		genera	te inno	vative b	ousiness	s ideas t	hrough	case stud	ies.					
Mappi	ing of (COs to 1	POs											
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11			
CO 1	*													
CO 2				*										
CO 3			*											
	I													



	*								
CO 4									
CO 5	*								
CO 6	*								
Course content and outcomes:									
Content	Competencies								
Unit 1: Introduction to Entrepre	urship								
Meaning and Definition of	1. Explain the meaning of Entrepre	eneurship (C1)							
Entrepreneurship-Employment vs	2. Discuss the theories of Entrepre	eneurship (C1)							
Entrepreneurship, Theories of	3. Discuss the approaches to Ent	trepreneurship							
Entrepreneurship, approach to	(C1)								
entrepreneurship, Entrepreneurs VS									
Manager									
Unit 2: Entrepreneurial Traits									
Personality of an entrepreneur, Types of	1. Discuss the Personality traits of entrepreneurs.								
Entrepreneurs	(C2)								
Unit 3: Process of Entrepreneurs	р								
Factors affecting Entrepreneurship	1. Identify the fundamentals and responsibilities								
process	of entrepreneurship (C2)								
	2. Exemplify one's capabilities in relation to the								
	rigors of successful ventures (C3)								
	3. Identify and differentiates the different								
	characteristics and competencies of an								
	entrepreneurs (C2)								
Unit 4: Business Start-up Process									
Idea Generation, Scanning the	1. Explain the Process of Business	start up (C1)							
Environment, Macro and Micro	2. Develop creativity and critica	l thinking in							
analysis	identifying opportunities (C5)								
	3. Apply innovative approaches i	n envisioning							
	ones entrepreneurial career (C3))							
Unit 5: Business Plan writing									
Points to be considered, Model Business	1. Identify different business mode	els (C3)							
plan	2. Describe different parts of a busi	iness plan(C2)							



Unit 6: Case studies									
Indian and Interna	tional	1. Pe	rform	n self-a	ssessme	ent	and	analyse	
Entrepreneurship	entrepreneurial personal traits and								
	competencies (C4)								
		2. Ev	aluat	e oneself	and plai	n co	urses of	action to	
		he	lp	develop	one	's	entrep	eneurial	
		cha	aracte	eristics and	d comp	eten	cies. (C5	j)	
Learning strategies, contact hou	irs and s	student le	arnin	ng time					
Learning strategy		Contact	hour	.s		Sti	udent	learning	
						tin	ne (Hrs)		
Lecture		30				60			
Quiz		02				04			
Small Group Discussion (SGD)		02				02			
Self-directed learning (SDL)		-					04		
Problem Based Learning (PBL)		02					04		
Case Based Learning (CBL)		-					-		
Revision		02							
Assessment		06					-		
TOTAL		44				74			
Assessment Methods:		•				L			
Formative:				Summa	tive:				
Internal practical Test		Sessional exam			ıl exami	nination			
Theory Assignments		End semester e				xamination			
Lab Assignment & Viva				Viva					
Mapping of assessment with Co	s								
Nature of assessment	CO 1	CO 2		CO 3	CO 4		CO 5	CO 6	
Sessional Examination 1	*	*							
Sessional Examination 2				*	*				
Assignment/Presentation							*	*	



End Semester Examin	*		*	*	*	*	*	
Feedback Process	•	End-Semester Feedback						
Reference Material	1.	NVR	Naidu	and T.	Krishna	Rao, "M	lanageme	ent and
		Entrep	reneurs	hip", IK In	ternational	Publishing	g House	Pvt. Ltd
		2008.						
	2.	Mohar	nthy	Sangram	Keshar	i, "Fun	damental	ls of
		Entrep	reneurs	hip", PHI P	ublications	, 2005		
	З.	Butler,	, D. (20	006). Enterp	orise plann	ing and dev	velopmer	nt. USA:
		Elsevie	er Ltd.	Gerber, M.	E. (2008)	Awakening	the entre	epreneur
		within	. NY: H	larper Collin	ns.			



Course Title: Device Drivers Course Code: ESD-604 Course Instructor: Academic Year: 2020 - 2021 Semester: First Year, Semester 2 No of Credits: 3 Prerequisites: Basic C Programming Synopsis: This Course provides insight on 1. Insight into Linux kernel programming. 2. Knowledge about the framework used in building the Linux device driver. 3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course On successful completion of this course, students will be able to (COs): Explain the broad concept of device drivers and build character drivers CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules Handle concurrency, race condition and understand the importance of time while designing a device driver CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * * <	Name	of the P	rogram			Mas	ter of Eng	gineering	g - ME (In	nternet of	f Things)		
Academic Year: 2020 - 2021 Semester: First Year, Semester 2 No of Credits: 3 Prerequisites: Basic C Programming Synopsis: This Course provides insight on 1. Insight into Linux kernel programming. 2. Knowledge about the framework used in building the Linux device driver. 3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course On successful completion of this course, students will be able to (COS): Correlite design of kernel modules and debugging these modules CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules CO 3: Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * *	Course Title:												
No of Credits: 3 Prerequisites: Basic C Programming Synopsis: This Course provides insight on 1. Insight into Linux kernel programming. 2. Knowledge about the framework used in building the Linux device driver. 3. Concept of designing proc and ioctl needed to build a device driver 3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Outcomes On successful completion of this course, students will be able to CO1: Explain the broad concept of device drivers and build character drivers CO2: Describe design of kernel modules and debugging these modules CO3: Handle concurrency, race condition and understand the importance of time while designing a device driver CO4: Allocate dynamic memory and communicating with devices though I/O ports CO5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * <	Course	Code:	ESD-	604		Cou	Course Instructor:						
Synopsis: This Course provides insight on 1. Insight into Linux kernel programming. 2. Knowledge about the framework used in building the Linux device driver. 3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course Outcomes On successful completion of this course, students will be able to CO3: Explain the broad concept of device drivers and build character drivers CO 3: Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POS PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * * * * * * CO 2 * * * * * * * * CO 4 * * * * * * * * CO 5: Demonstrate and d	Acader	nic Yea	ar: 2020) - 2021		Sem	Semester: First Year, Semester 2						
1. Insight into Linux kernel programming. 2. Knowledge about the framework used in building the Linux device driver. 3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course Outcomes On successful completion of this course, students will be able to (COS): CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules CO 3: Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs Explain the able to a state and the importance of time while device are as a state and design up to a state and device are as a state as	No of Credits: 3						equisites:	Basic	C Program	nming			
2. Knowledge about the framework used in building the Linux device driver. 3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course Outcomes On successful completion of this course, students will be able to (COS): CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs Explain the value of the state	Synop	sis:	This C	Course p	orovide	s insigl	ht on						
3. Concept of designing proc and ioctl needed to build a device driver 4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course On successful completion of this course, students will be able to (COs): Course CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * Image: Imag			1. Ins	sight in	o Linu	x kerne	el prograr	nming.					
4. Techniques to debug kernel programs 5. Insight into designing USB drivers. Course Outcomes On successful completion of this course, students will be able to (COs): CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs Vol 100 ports CO 2 * * * * Image: Image			2. Kr	nowledg	ge abou	t the fr	amework	used in	building	the Linu	x device	driver.	
5. Insight into designing USB drivers. Course Outcomes On successful completion of this course, students will be able to (COs): CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules CO 3: Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * Image: CO 3 * * Image: CO 3 <			3. Co	oncept c	of desig	ning p	roc and ic	ctl need	led to buil	d a devie	e driver		
Course On successful completion of this course, students will be able to Course On successful completion of this course, students will be able to COS: Explain the broad concept of device drivers and build character drivers CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules Handle concurrency, race condition and understand the importance of time while designing a device driver Handle concurrency, race condition and understand the importance of time while design of COs to POs CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * - </th <th></th> <th></th> <th>4. Te</th> <th>chnique</th> <th>es to de</th> <th>bug ke</th> <th>ernel prog</th> <th>rams</th> <th></th> <th></th> <th></th> <th></th>			4. Te	chnique	es to de	bug ke	ernel prog	rams					
Outcomes (COS):On successful completion of this course, students will be able to (COS):CO 1:Explain the broad concept of device drivers and build character driversCO 2:Describe design of kernel modules and debugging these modules designing a device driverCO 3:Handle concurrency, race condition and understand the importance of time while designing a device driverCO 4:Allocate dynamic memory and communicating with devices though I/O portsCO 5:Demonstrate and design USB drivers on a kitMapping of COs to POsPO 1PO 4CO 1?PO 3PO 4CO 2??PO 6PO 1PO 2PO 3PO 4CO 2??PO 6PO 1PO 9PO 10PO 10PO 11CO 1?PO 3PO 4PO 5PO 6PO 7PO 8PO 9PO 10PO 11CO 1?PO 3PO 4PO 5PO 6PO 7PO 8PO 9PO 10PO 11CO 1?PO 3PO 3PO 4PO 5PO 4PO 7PO 3PO 9PO 10PO 11CO 1?PO 3PO 4PO 5PO 5PO 6PO 1PO 10PO 10PO 11CO 4??PO 10?PO 10?PO 10PO 10PO 10PO 10PO 10PO 10PO 10P			5. Ins	sight int	o desig	gning U	JSB drive	rs.					
(COs):CO 1:Explain the broad concept of device drivers and build character driversCO 2:Describe design of kernel modules and debugging these modulesHandle concurrency, race condition and understand the importance of time while designing a device driverCO 4:Allocate dynamic memory and communicating with devices though I/O portsCO 5:Demonstrate and design USB drivers on a kitMapping of COs to POsCO 1PO 2PO 4PO 5PO 6PO 7PO 8PO 9PO 10PO 11CO 2**CO 4*PO 6PO 7PO 8PO 9PO 10PO 11CO 1*Image for the set of the	Cours	e											
CO 1: Explain the broad concept of device drivers and build character drivers CO 2: Describe design of kernel modules and debugging these modules Handle concurrency, race condition and understand the importance of time while designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 4: * * * * Image: Communicating with devices though I/O ports CO 5 * * * * Content Improve the point of the po	Outco	mes	On suc	ccessful	compl	etion of	of this cou	rse, stud	lents will	be able t	.0		
Interview of the second secon	(COs)	:											
Handle concurrency, race condition and understand the importance of time while designing a device driverCO 4:Allocate dynamic memory and communicating with devices though I/O portsCO 5:Demonstrate and design USB drivers on a kitMapping of COs to POsCOs $PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11CO 2***********************************$	CO 1:		Explai	n the b	road co	ncept	of device	drivers a	and build	characte	r drivers		
CO 3: designing a device driver CO 4: Allocate dynamic memory and communicating with devices though I/O ports CO 5: Demonstrate and design USB drivers on a kit Mapping of COs to POs Os to POs CO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 2 * * Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Image: Colspan="2">Colspan="2">Image: Colspan="2">Image: Colspan="2" Image: Colspa="2" Image: Colspa="2" Image: Colspan="2"	CO 2:		Describe design of kernel modules and debugging these modules										
designing a device driverCO 4:Allocate dynamic memory and communicating with devices though I/O portsCO 5:Demonstrate and design USB drivers on a kitMapping of COs to POsCOs to POsCOs $PO1$ $PO2$ $PO3$ $PO4$ $PO5$ $PO6$ $PO7$ $PO8$ $PO9$ $PO10$ $PO11$ CO1 **aaaaaaaaCO2 ****aaaaaCO3 ***aaaaaaCO4 ***aaaaaaContent and outcomes:Content and outcomes:CompetenciesUnit 1:Introduction to Device Drivers2. Describe the broad design of device driver (C3)	CO 2		Handl	e concu	rrency,	race c	ondition a	and unde	erstand th	e importa	ance of ti	me while	
Output of the second s	0.0.5:		design	ing a d	evice d	river							
Mapping of COs to POs COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * <t< th=""><th>CO 4:</th><th></th><th>Alloca</th><th>ite dyna</th><th>mic me</th><th>emory</th><th>and comr</th><th>nunicati</th><th>ng with d</th><th>evices th</th><th>ough I/O</th><th>ports</th></t<>	CO 4:		Alloca	ite dyna	mic me	emory	and comr	nunicati	ng with d	evices th	ough I/O	ports	
COs PO I PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 *	CO 5:		Demo	nstrate	and des	sign US	SB drivers	s on a ki	t				
CO 1 *	Mappi	ing of (COs to	POs									
CO 1 *													
CO 2***···	COs	PO 1	PO 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 3 * *	CO 1	*											
CO 4 * CO 5 * Co 5 * Course content and outcomes: Content Content Competencies Unit 1: Introduction to Device Drivers 2. Describe the broad design of device driver (C3)	CO 2	*	*	*									
CO 5 * * Image: Second	CO 3		*	*									
Course content and outcomes: Content Competencies Unit 1: Introduction to Device Drivers 2. Describe the broad design of device driver (C3)	CO 4	*		*									
Content Competencies Unit 1: Introduction to Device Drivers 2. Describe the broad design of device driver (C3)	CO 5	*				*							
Unit 1: Introduction to Device Drivers 2. Describe the broad design of device driver (C3)	Cours	e conte	ent and	outcon	nes:		·		·				
Introduction to Device Drivers2. Describe the broad design of device driver (C3)	Conter	ıt					Compete	ncies					
Unit 2:	Introdu	action t	o Devic	e Drive	ers		2. Desci	ibe the	broad des	ign of de	vice driv	er (C3)	
	Unit 2	:											



Building & Running Modules.	1.	Compile and load modules using a make file (C4)
Unit 3:		
Character Driver.	1.	Explain the structure of a character driver (C3)
Unit 4:		
Debugging Techniques.	1.	Debug modules using prink, proc and kdb (C4)
	2.	Design of loctl used in building device drivers
		(C5)
Unit 5:		
Concurrency and Race Condition	1.	Illustrate the problems associated with concurrent
		device drivers (C3)
	2.	Describe the problems associated with race
		condition while designing a device driver (C3)
Unit 6:		
Advanced Character Driver Operations		1. Execute bottom half through deferred work
		(C4)
Unit 7:		
Time, Delay and Deferred Work		1. Use the concept of delays (C2)
		2. Explain the concept of timers in Linux kernel
		(C2)
Unit 8:		
Allocating Memory		1. Allocate dynamic memory (C3)
		2. Explain the concept of memory barriers (C3)
Unit 9:		
Communicating with Hardware		1. Communicate with the devices through I/O
		ports (C4)
Unit 10:		
Interrupt Handling		1. Illustrate the concept of writing interrupt
		handlers (C4)
Unit 11:		
PCI Drivers, USB Drivers		1. Structure of a USB driver (C4)
		2. Design a USB driver. (C6)
Learning strategies, contact hours an	d stu	ident learning time



	VSPIRED BY LIFT	(Deemed to be U	Iniversity under Section 3	•	-		
Learning strategy			Contact ho	ours		Student learning	
						time (Hrs)	
Lecture			30			60	
Quiz			02			04	
Small Group Discussi	on (SGD)		02			02	
Self-directed learning	-			04			
Problem Based Learn	ing (PBL)		02			04	
Case Based Learning	(CBL)		-			-	
Revision			02			-	
Assessment			06			-	
TOTAL			44			74	
Assessment Methods	5:						
Formative:				Sum	mative:	:	
Internal practical Test	;			Sessi	onal exa	mination	
Theory Assignments				End	semester	examination	
Lab Assignment & V	iva			Viva			
Mapping of assessme	ent with Co	S					
Nature of assessment		CO 1	CO 2	CO	CO 4	CO 5	
				3			
Sessional Examinatio	n 1	*	*				
Sessional Examinatio	n 2			*	*		
Assignment/Presentat	ion		*		*	*	
End Semester Examir	nation	*	*	*	*	*	
Feedback Process	• End	d-Semeste	er Feedback				
Reference Material	1. Alessar	ndro Rub	ini, "Linux D	evice Driv	vers", (N	lutshell Handbook),	
	O'Reilly P	ublishers,	2009.				
	2. John	Madieu,	"Linux Dev	vice Drive	ers Deve	elopment: Develop	
			for embedded				
						lison Wesley, Third	
	Edition, 20			I	,		
	,						



4. Daniel P. Bovet, Marco Cesati, "Understanding the Linux Kernel",
O'Reilly Media, Third Edition, 2008.
5. Wolfgang Mauerer, "Professional Linux Kernel Architecture", Wrox,
2008.
6. Sreekrishnan Venkateswaran, "Essential Linux Device Drivers",
Prentice Hall, 2008.
7. W. Richard Stevens, Stephen A. Rago, "Advanced Programming in
the UNIX Environment", Addison Wesley, Third Edition, 2013.
8. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, "Unix Network
Programming, Vol1: Sockets", Pearson Education India, Third Edition,
2015.



Name of the Program:				Mast	Master of Engineering - ME (Internet of Things)								
Course Title:				IT Pr	IT Project Management								
Course	e Code:	CSE 6	531		Cour	Course Instructor:							
		ar: 2020	- 2021			Semester: First Year, Semester 2							
No of (Credits	: 3			Prere	equisites:	Famili	iarity in develo	oping app	plication u	sing any		
					high	level lang	uage						
Synop	sis:	This C	ourse p	rovides	s insigh	it on							
		1. The	e concep	ot of sof	tware d	ware development process and project management							
		2. Illu	strates t	he diffe	erence b	rence between a lab assignment and group project							
		3. Hel	p the st	udents t	o under	stand the	finer po	oints of Projec	t manage	ement			
		4. Bri	ng awar	eness al	bout the	processes	s, tools a	and technique	s involve	d in the fi	eld of IT		
		pro	ject mai	nageme	nt								
Cours	e												
Outco	mes	On suc	cessful	compl	etion o	f this cou	rse, stu	idents will b	e able to)			
(COs)	:												
CO 1:		Illustrate the importance of project planning.											
CO 2:		Discus	s and	demon	strate v	rate various tools applicable for different phases of the							
CO 2.		softwa	re proje	ect.									
CO 3:		Illustra	te the i	mporta	nce of	ace of Change management.							
Mappi	ing of	COs to]	POs										
								1		1	_		
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11		
CO 1	*	*											
CO 2		*	*										
CO 3	*		*										
Cours	e conte	ent and	outcon	nes:									
Conter	nt				(Competer	ncies						
Unit 1	:	Softwar	e Proj	ect Pla	nning								
Unders	stand t	he Proje	ect Nee	eds, Cı	reate	1. Unde	rstand	the project r	needs, n	ecessity	of plan,		
the Pr	oject	Plan, D	iagnosi	ng Pro	oject	Defin	e the	Project Pla	an, Dia	gnosing	Project		
Planni	ng Prol	olems				Planning Problems (C1)							
Unit 2	:	Estimat	tion										



Elements of a Successful Estimate, Wideband Delphi Estimation, Other Estimation Techniques, Diagnosing	 List the importance of estimation and describe different estimation techniques (C2) Discuss the significance of Reviews and different review techniques (C2)
Estimation Problems.	
Unit 3: Project Schedules	
Building the Project Schedule, 1	. Outline the steps in building project schedule.(C1)
Managing Multiple Projects, Use the 2	. Indicate mechanism of managing multiple
Schedule to Manage Commitments,	projects. (C2)
Diagnosing Scheduling Problems.	
Unit 4: Reviews	
Inspections, Deskchecks, 1	. Discuss the significance of Reviews and different
Walkthroughs, Code Reviews, Pair	review techniques (C2)
Programming, Use Inspections to	
Manage Commitments, Diagnosing	
Review Problems.	
Unit 5: Software Requirements	
Requirements Elicitation, Use Cases, 1	. Introduce to requirement elicitation techniques,
Software Requirements Specification,	design and demonstrate the requirement
Change Control, Introduce Software	documentation by field visits(C2)
Requirements Carefully, Diagnosing	
Software Requirements Problems	
Unit 6 : Design and Programming	
Review the Design, Version Control with	1. Illustrate the key steps in design and
Subversion, Refactoring, Unit Testing, Use	programming phase. Version control and unit
Automation, Be Careful with Existing	testing significance (C3)
Projects, Diagnosing Design and	
Programming Problems	
Unit 7: Software Testing	
Test Plans and Test Cases, Test Execution,	1. Define the test plans, significance of test phase
Defect Tracking and Triage, Test	and the test case characteristics. Introduce
Environment and Performance Testing,	different types testing and significance of type
Smoke Tests, Test Automation,	of testing.(C2)



Testing Effectively, Diagnosing Software Testing ProblemsInterstanding ChangeUnit 8:Understanding ChangeI. Illustrate the necessity of Change management system – developing impact analysis document and its importance (C3).Unit 9:Management and LeadershipTake Responsibility, Do Everything Out in the Open, Manage the Organization, Manage your Team1. Understand the role of management in motivating the team, finer points of managing the team (C2)Unit 10:Managing an Outsourced ProjectPrevent Major Sources of Project Failure, Collaborate with the Vendor1. Describe the differences of managing the outsourced project, typical point of conflicts(C2) 2. Review of the project management process (C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0204Quiz04-Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-Assessment06-	Postmortem Reports, Using Software				
Testing Problems Init 8: Understanding Change Why Change Fails, How to Make Change 1. Illustrate the necessity of Change management system – developing impact analysis document and its importance (C3). Unit 9: Management and Leadership Take Responsibility, Do Everything Out in the Open, Manage the Organization, Manage Your Team 1. Understand the role of management in motivating the team, finer points of managing the team (C2) Unit 10: Managing an Outsourced Project Prevent Major Sources of Project Failure, Interact the project project, typical point of conflicts(C2) 2. Review of the project without process and continuous process improvement. Moving Forward 1. Analyse the projects without process and continuous process improvements initiatives needed for success of the strategy Learning strategies, contact hours and strategy Contact hours Student learning time (Hrs) Learning strategies, contact hours and student learning time (Hrs) 02 04 Small Group Discussion (SGD) 02 02 04 Quiz 02 04 04 Problem Based Learning (PBL) 02 04 02 Strategion 02 - -					
Unit 8: Understanding Change Why Change Fails, How to Make Change 1. Illustrate the necessity of Change management system – developing impact analysis document and its importance (C3). Unit 9: Management and Leadership Take Responsibility, Do Everything Out in the Open, Manage the Organization, Manage Your Team 1. Understand the role of management in motivating the team, finer points of managing the team (C2) Unit 10: Managing an Outsourced Project Prevent Major Sources of Project Failure, C2) 1. Describe the differences of managing the outsourced project, typical point of conflicts(C2) 2. Review of the project management process (C2) Preview of the project management process (C2) Unit 10: Process Improvement 1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4) Learning strategies, contact hours and Stutent learning time (Hrs) Student learning time (Hrs) Lecture 30 60 Quiz 02 04 Small Group Discussion (SGD) 02 02 Self-directed learning (PBL) 02 04 Case Based Learning (CBL) - - Revision 02 - <td></td> <td></td>					
Why Change Fails, How to Make Change 1. Illustrate the necessity of Change management system - developing impact analysis document and its importance (C3). Unit 9: Management and Leadership Take Responsibility, Do Everything Out in the Open, Manage the Organization, Manage Your Team 1. Understand the role of management in motivating the team (C2) Unit 10: Managing an Outsourced Project Prevent Major Sources of Project Failure, Collaborate with the Vendor 1. Describe the differences of managing the outsourced project, typical point of conflicts(C2) 2. Review of the project management process (C2) Unit 10: Process Improvement Life Without a Software Process, Software Process, Software Process Improvement, Moving Forward 1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4) Learning strategies, contact hours and stutent learning time (Hrs) 1. Contact hours Student learning time (Hrs) Lecture 30 60 0 0 0 0 Quiz 02 04 04 04 04 04 04 04 04 02 04 04 04 04 04 04 04 04 04 04 04 04 04 04					
Succeedsystem - developing impact analysis document and its importance (C3).Unit 9:Management and LeadershipTake Responsibility, Do Everything Out in the Open, Manage the Organization, Manage Your Team1. Understand the role of management in motivating the team, finer points of managing the team (C2)Unit 10:Managing an Outsourced ProjectPrevent Major Sources of Project Failure, Management Issues in Outsourced Projects, Collaborate with the Vendor1. Describe the differences of management process (C2)Unit 10:Process Improvement1. Analyse the project swithout process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and student hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0204Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-		1 Illustrate the necessity of Change management			
document and its importance (C3). Unit 19: Management and Leadership Take Responsibility, Do Everything Out in the Open, Manage the Organization, Manage Your Team 1. Understand the role of management in motivating the team, finer points of managing the team (C2) Unit 10: Managing an Outsourced Project Prevent Major Sources of Project Failure, 1. Describe the differences of management point of conflicts(C2) 2. Review of the project, typical point of Collaborate with the Vendor 2. Review of the project without process and continuous process improvement process (C2) Unit 10: Process Improvement 1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4) Learning strategies, contact hours and student learning time (Hrs) Student learning time (Hrs) Lecture 30 60 Quiz 02 04 Small Group Discussion (SGD) 02 04 Stelf-directed learning (PBL) - - Problem Based Learning (CBL) - - Revision 02 - -					
Take Responsibility, Do Everything Out in the Open, Manage the Organization, Manage Your Team1. Understand the role of management in motivating the team, finer points of managing the team (C2)Unit 10:Managing an Outsourced ProjectPrevent Major Sources of Project Failure, Management Issues in Outsourced Projects, Collaborate with the Vendor1. Describe the differences of managing the outsourced project, typical point of conflicts(C2) 2. Review of the project management process (C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and student learning time (<i>Hrs</i>)Student learning time (<i>Hrs</i>)Learning strategies, contact hours and student learning time (<i>Mrs</i>)Out O2O4Student learning time (BDL)0204Case Based Learning (CBL)Revision02-	Saccod				
the Open, Manage the Organization, Manage Your Teammotivating the team, finer points of managing the team (C2)Unit 10:Managing an Outsourced ProjectPrevent Major Sources of Project Failure, Management Issues in Outsourced Projects, Collaborate with the Vendor1. Describe the differences of managing the outsourced project, typical point of conflicts(C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and student learning time (Hrs)Student learning time (Hrs)Lecture3060Quiz0204Self-directed learning (SDL)-04Problem Based Learning (CBL)Problem Based Learning (CBL)02-Revision02-	Unit 9: Management and Leadersh	ір			
Manage Your Teamthe team (C2)Unit 10:Managing an Outsourced ProjectPrevent Major Sources of Project Failure, Management Issues in Outsourced Projects, Collaborate with the Vendor1. Describe the differences of managing the outsourced project, typical point of conflicts(C2)2.Review of the project management process (C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and student learning time (Hrs)Student learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (DL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Take Responsibility, Do Everything Out in	1. Understand the role of management in			
Unit 10: Managing an Outsourced ProjectPrevent Major Sources of Project Failure, Management Issues in Outsourced Projects, Collaborate with the Vendor1. Describe the differences of managing the outsourced project, typical point of conflicts(C2)Collaborate with the Vendor2. Review of the project management process (C2)Unit 10: Process Improvement1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning time (Hrs)5. Student learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (DL)-04Problem Based Learning (CBL)Revision02-Outsourced Project-	the Open, Manage the Organization,	motivating the team, finer points of managing			
Prevent Major Sources of Project Failure, Management Issues in Outsourced Projects, Collaborate with the Vendor1. Describe the differences of managing the outsourced project, typical point of conflicts(C2)Collaborate with the Vendor2. Review of the project management process (C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning timeStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202O204Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Manage Your Team	the team (C2)			
Management Issues in Outsourced Projects, Collaborate with the Vendoroutsourced project, typical point of conflicts(C2) 2. Review of the project management process (C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and student learning time (Hrs)Student learning time (Hrs)Learning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (CBL)Revision02-Outsourced project	Unit 10: Managing an Outsourced	Project			
Collaborate with the Vendorconflicts(C2)2. Review of the project management process (C2)Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning time Learning strategyStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (PBL)0204Problem Based Learning (CBL)Revision02-	Prevent Major Sources of Project Failure,	1. Describe the differences of managing the			
2. Review of the project management process (C2)Unit 10: Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning timeLearning strategyContact hoursLearning strategyStudent learning time (Hrs)Lecture3060Quiz0204Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Management Issues in Outsourced Projects,	outsourced project, typical point of			
(C2)Unit 10: Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning timeImage: Contact hoursLearning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (CBL)Revision02-O2	Collaborate with the Vendor	conflicts(C2)			
Unit 10:Process ImprovementLife Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stuent learning timeImage: Contact hoursLearning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (CBL)Revision02-Outact02-Outact02-		2. Review of the project management process			
Life Without a Software Process, Software Process Improvement, Moving Forward1. Analyse the projects without process and continuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning timeStudent learning time (Hrs)Learning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Self-directed learning (SDL)-04Problem Based Learning (CBL)0204Revision02-Revision02-		(C2)			
Process Improvement, Moving Forwardcontinuous process improvements initiatives needed for success of the project (C4)Learning strategies, contact hours and stutent learning timeStudent learning time (Hrs)Learning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Unit 10: Process Improvement				
Learning strategies, contact hours and stuent learning timeLearning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (CBL)-04Case Based Learning (CBL)Revision02-Outact Based Learning (CBL)Outact Based Learning (CBL)	Life Without a Software Process, Software	1. Analyse the projects without process and			
Learning strategies, contact hours and student learning timeLearning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Process Improvement, Moving Forward	continuous process improvements initiatives			
Learning strategyContact hoursStudent learning time (Hrs)Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-		needed for success of the project (C4)			
Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Learning strategies, contact hours and stu	ident learning time			
Lecture3060Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Learning strategy	Contact hours Student learning			
Quiz0204Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-		time (Hrs)			
Small Group Discussion (SGD)0202Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Lecture	30 60			
Self-directed learning (SDL)-04Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Quiz	02 04			
Problem Based Learning (PBL)0204Case Based Learning (CBL)Revision02-	Small Group Discussion (SGD)	02 02			
Case Based Learning (CBL)Revision02-	Self-directed learning (SDL)	- 04			
Revision 02 -	Problem Based Learning (PBL)	02 04			
	Case Based Learning (CBL)				
Assessment 06 -	Revision	02 -			
	Assessment	06 -			



TOTAL		44		74
Assessment Methods:				
Formative:			Summative:	
Internal practical Test			Sessional exami	ination
Theory Assignments			End semester ex	amination
Lab Assignment & Viva			Viva	
Mapping of assessment with C	os		•	
Nature of assessment	CO 1	СО	2	CO 3
Sessional Examination 1	*	*		
Sessional Examination 2	*			*
Assignment/Presentation	*	*		
End Semester Examination	*	*		*
Feedback Process E	nd-Semester	Feedback		
Reference Material 1. "Appli	ed Software	Project Manag	gement" By Jennife	r Greene, Andrew
Stellm	an (O'Reilly	Publications)	2005.	
2. "The A	Art of Project	Management"	' By Scott Berkun (O'Reilly Publications)
2005.				



	0 (1 T				1.1	6 F			/T		`
						aster of Engineering - ME (Internet of Things)					
					-	ig Data and Data Visualization Lab					
						rse Instr					
							•	r, semeste			
								umming ir			
Synopsis: 1. Students learn to hand						e big dat	a in dis	tributed c	computin	g archited	cture.
	2. Installation and worki					g on Ha	doop an	d ecosys	tem		
		3. Bu	ild mac	chine le	arning	Models					
		4. Pro	ocessing	g of dat	ta strea	m					
		5. Ch	ioose pi	oper da	ata visı	ializatio	n techn	iques			
Course	e										
Outco	mes	On suc	ccessful	l compl	etion c	of this co	ourse, st	udents w	ill be abl	e to	
(COs):	:										
CO 1:	Handle big data using Hadoop and its ecosystems.										
CO 2:	CO 2: Building machine learning algorithm using Spark.										
CO 3:		Data C	Cleaning	g and D	ata Vi	sualizati	on.				
Mappi	ing of (COs to	POs								
l											
COs	PO 1	PO 2	PO 3	<i>PO</i> 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11
COs CO 1	<i>PO 1</i> *	PO 2 *	<i>PO 3</i> *	<i>PO</i> 4	<i>PO 5</i> *	PO 6 *	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11
				<i>PO 4</i>			<i>PO</i> 7	PO 8	<i>PO</i> 9 *	<i>PO 10</i> *	PO 11
CO 1	*	*	*		*	*	<i>PO</i> 7	PO 8			PO 11
CO 1 CO 2 CO 3	* * *	*	*	*	*	*	PO 7				PO 11
CO 1 CO 2 CO 3	* * e conte	* * *	*	*	*	*					PO 11
CO 1 CO 2 CO 3 Course	* * e conte	* * *	*	*	*	*					PO 11
CO 1 CO 2 CO 3 Course Conten Unit 1	<pre>* * * e conte ut : Big</pre>	* * * ent and	outcon	*	*	* * * Compet	encies	*	*		
CO 1 CO 2 CO 3 Course Conten Unit 1	<pre>* * * e conte ut : Big</pre>	Ent and Data 0 Hadoo	outcon	* *	*	* * * Compet 1. Insta	encies	of Hado	*	*	



	4.	Develop script to query t using Hive. (C4)	he data from HDFS			
Unit 2: Machine Learning	1					
Machine Learning in Big Data.	5.	5. Design a model using K-means classifier to				
Stream processing in Big Data.		predict how well products clients (C4).	are accepted by the			
	6.	Develop applications usin in big data (C4).	g Stream processing			
Unit 3: Data Visualization						
Video encoding and processing	1.	Design programs to dyna	mically extract data			
techniques.		from web. (C4)				
	2.	Develop visualization ag	pplication for time			
		series data. (C4)				
	3.	3. Develop visualization application for statistical				
		distributions. (C4)				
	4.	4. Develop visualization application for maps,				
		Hierarchical data and netw	vork data. (C4)			
Learning strategies, contact hours and	stu	dent learning time				
Learning strategy		Contact hours	Student learning			
			time (Hrs)			
Lecture		12	-			
Seminar		-	-			
Quiz		-	-			
Small Group Discussion (SGD)			-			
Self-directed learning (SDL)		-	-			
Problem Based Learning (PBL)		-	-			
Case Based Learning (CBL)		03	-			
Clinic		-	-			
Practical		24	-			
Revision		03	-			



Assessme	ent		06		-
ΤΟΤΑ	L		48		-
Assessment Methods:					
Formative:				Summativ	ve:
Internal practical Test				Sessional	examination
Theory Assignments				End seme	ster examination
Lab Assignment & Viva	ı			Viva	
Mapping of assessmen	t with Co	s			
Nature of assessment		CO 1	CO 2		CO 3
Sessional Examination	1	*	*		
Sessional Examination 2	2		*		*
Assignment/Presentation	n	*	*		*
End Semester Examinat	ion	*	*		*
Laboratory Examination	1	*	*		*
Feedback Process •	Enc	l-Semester F	Feedback	I	
Reference Material 1	. T. Has	stie, R. Tib	shirani and J.	Friedman	, The Elements of
	Statisti	cal Learning	g: Data Mini	ng, Inferer	nce and Prediction.
	Springe	er, 2nd Editio	on, 2009		
2	. Machin	e Learning f	or Big Data, Ja	son Bell, W	/iley Big Data Series
3	. Big Da	ta: Principle	es and best prac	ctices of sc	alable real-time data
	system	s - Nathan M	larz and James	Warren. M	anning Publisher.
4	. Hadoop	o: The Defin	nitive Guide: S	torage and	Analysis at Internet
	Scale –	Tom White	, O'Reilly Publ	lication 4 th	Edition.
5	. Spark:	The Definitiv	ve Guide: Big l	Data Proces	ssing Made Simple –
	Bill Ch	ambers, Mat	tei Zaharia, O'I	Reilly Publi	ication 1 st Edition



Name of the P	rogram			Mast	er of En	gineerin	ng - ME (Internet	of Thing	s)		
Course Title:	8				Embedded Systems Lab							
Course Code:	ESD 60	5L			Course Instructor:							
	Academic Year: 2020 - 2021						r, Semeste	er 2				
No of Credits:					quisites		licroproce		architectu	ıre .		
	-				-		-		bly langu	-		
					ber syste				, ,	U		
Synopsis:	This C	ourse p	rovides	s insigh	•							
	1.	This c	ourse j	provide	s the k	nowledg	ge of AR	M Cort	ex M3 P	rocessor		
	arc	hitectu	re.									
	2.	This co	ourse p	rovides	the kno	owledge	of Micro	controll	er based o	on ARM		
	Pro	cessor	archite	ecture	and its	Registe	ers and]	Instructi	on sets	to write		
	As	Assembly and Embedded C Programming.										
	3.	This c	course	provide	es the c	concept	of Interf	facing a	nd Progr	amming		
	Ser	nsors ar	nd Perip	pherals	to Micr	ocontro	llers.					
	4.	his co	urse pr	ovides	the con	ncept of	Real tir	ne oper	ating sys	tems on		
	Mi	crocont	rollers.									
Course												
Outcomes	On suc	cessful	compl	etion of	f this co	urse, stu	idents wil	ll be abl	e to			
(COs):												
	Illustra	te the f	eatures	of emb	bedded s	systems,	architect	ure of A	RM7, Ins	struction		
CO 1:	set and	develo	pment	tools of	f ARM.							
	Experi	ment th	e arcl	hitectur	al feat	ures o	f LPC1	3/17XX	microcor	ntrollers,		
CO 2:	interfa	cing pe	riphera	l device	es to LP	C2148.						
<u> </u>	Design	a Real	l time I	Embedd	led Syst	ems by	interfaci	ng Senso	ors and A	ctuators		
CO 3:	and po	rting R	eal time	e opera	ting sys	tems.						
Mapping of	COs to 1	POs										
COs PO 1	PO 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	<i>PO</i> 8	PO 9	PO 10	PO 11		
CO 1 *	*	*		*								
CO 2 *	*			*								
CO 3 *	*	*		*								



Course content and outcomes:				
Content	Competencies			
Unit 1: Introduction to LPC13/17xx	Microcontroller			
Introduction to LPC13/17xx	At the end of the topic studen	t should be able to:		
Microcontroller - Hardware, SW.	1. Summarise LPC13/17	xx		
	Microcontroller architectu	re and development		
	tools of ARM. (C2)			
Unit 2: Interfacing LPC13/17xx Micr	ocontroller			
Interfacing With LED, LCD Seven	Experiment interfacing LPC1	3/17xx		
Segment Display, UART, HEX	Microcontroller with I/O devi	ces. (C2)		
Keypad.				
Unit 3:				
Introduction to Free	1. Summarise FreeRTOS	architecture. (C2)		
RTOS, FreeRTOS API Calls, Task	2. Practise different AP	I call in FreeRTOS.		
Creation, Queques, semaphore, mutex,	(C2)			
RTOS application development.	3. Design a Real time E	Embedded system by		
	writing applications on top of Real time			
	operating systems (C5)			
Learning strategies, contact hours and	student learning time			
Learning strategy	Contact hours	Student learning		
		time (Hrs)		
Lecture	12	-		
Seminar	-	-		
Quiz	-	-		
Small Group Discussion (SGD)	-	-		
Self-directed learning (SDL)	-	-		
Problem Based Learning (PBL)	-	-		
Case Based Learning (CBL)	03	-		
Clinic	-	-		
Practical	24	-		



Revision		0	3	-		
Assessment		0	6	-		
TOTAL		4	8	-		
Assessment Methods	5:	i				
Formative:			Summa	tive:		
Internal practical Test	t			Sessiona	l examination	
Theory Assignments			End sem	ester examination		
Lab Assignment & V			Viva			
Mapping of assessme	ent with Co	S				
Nature of assessment	CO 1	CO 2		CO 3		
Sessional Examinatio	n 1	*	*		*	
Assignment			*		*	
Laboratory Examination	ion	*	*		*	
Feedback Process	• End	d-Semester	Feedback	·		
Reference Material	1. Joseph	n Yiu, "Th	e definitive gu	uide to th	e ARM Cortex-M3",	
	Elsevier, 2	nd Edition,	2010.			
	2. Frank	Vahid, To	ny Givargis,	"Embedde	ed System Design: A	
	Unified Ha	rdware/Sof	tware Introduct	ion", Wile	y India, ISBN:81-265-	
	0837-X, 20	007.				
	3. Richa	rd Barry,	"NXP Semico	nductors,	LPC13xx/17xx User	
	Manual", 2	2012.				
	4. NXP Se	emiconducto	ors, "LPCzone]	Examples'	', 2012.	
	5. "FreeR	TOS Refere	nce Manual", F	Real Time	Engineers Ltd., 2016.	



Name of the	Program	n:		Mast	er of Er	gineeri	ng - ME	(Internet	of Thing	s)	
Course Title			Embedded Sensing Systems and Networks Lab								
Course Code	: IOT 60)4L		Cou	Course Instructor:						
Academic Y	ear: 202	20 - 202	21	Sem	ester:	First Y	ear, Sem	ester 2			
No of Credit			Prer	equisite	es:	Basics	of sens	ors, Ba	sics of		
					nunicat	ion					
Synopsis:	This Co 1. charact 2. 3. 4.	Variou eristics Protoc Princij	is type 5. ols for ple of v	s of s Wirele vorking	sensors ss Com s of Glo	municat bal Posi		System	cations a	nd their	
Course Outcomes (COs):		cessful	compl	etion of	f this co	ourse, sti	udents w	ill be abl			
CO 1:	Analyse the input output characteristics of selected sensors										
CO 2:	Design a Data Acquisition System using sensors										
CO 3:	Setup wireless protocol and test										
CO 4:	Design	and ev	aluate	a wirel	ess com	munica	tion netw	ork			
Mapping of	COs to I	POs									
COs PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	<i>PO</i> 8	<i>PO</i> 9	PO 10	PO 11	
CO 1 *		*		*							
CO 2 *				*							
CO 3			*				*		*		
CO 4 *			*	*			*		*		
Course conte	ent and o	outcon	ies:								
Content					Compet	encies					
Unit 1:											
Introduction	to En	nbedde	d Sen	sing	I. Expe	riment c	on variou	s sensors	(C4)		
Systems and	l Netwo	orks: S	ensor		•						
Transducers,	Types	s of	Sens	ore							



	be University under Section 3 of the UGC Act, 1936)
Humidity, Pressure, Light, Magnetics,	
Temperature	
Unit 2:	
Sensing Mechanism, Actuating	1. Construct a Data Acquisition System using
Mechanism, Different Sensors,	sensors and evaluate its performance (C5)
Sampling, Digital and Analog Sensor,	r · · · · · · · · · · · · · · · · · · ·
Electrical Characteristics of Sensors,	
Choosing a sensor for IoT Network	
applications	
Unit 3:	
Protocols for WPAN, Introduction to	1. Demonstrate the working of a Blue tooth
WPAN standards, Bluetooth:	communication (C3)
Introduction, Protocol Stack, RF	
Classes, Radio Technologies, Service	
Discovery, Device Discovery, Profiles,	
Security (Discovering Bluetooth),	
Hardware, Bluetooth BLE, Bluetooth	
Devices, BlueZ software stack	
Unit 4:	
Zigbee: Frequency, Channels,	1. Demonstrate the working of a
Topology, Zigbee Protocol Stack, PHY,	ZigBee communication protocol(C3)
MAC Layer, Working, Frame Structure,	
Beacon, Non-Beacon	
Communication, Zigbee PDU, Zigbee	
Hardware devices, API Mode and AT	
mode communication	
Unit 5:	



	1. Demonstrate the	working o	g of a Near Field		
Active Devices, NFC cards Interfacing,	Communicatio	(C3)			
Read and Write					
Unit 6:					
,	•		ensors network using		
protocols, GPS devices, Concepts	NS2 Network S	Simulator (C5)		
Wireless Sensor					
Networks: Deployment, Localization,					
Routing, Time Synchronization, Power					
Management					
Learning strategies, contact hours and	student learning t	ime			
Learning strategy	Contact hours		Student learning		
			time (Hrs)		
Lecture	12		-		
Seminar	-		-		
Quiz	-		-		
Small Group Discussion (SGD)	-		-		
Self-directed learning (SDL)	-		-		
Problem Based Learning (PBL)	-		-		
Case Based Learning (CBL)	03		-		
Clinic	-		-		
Practical	24		-		
Revision	03		-		
Assessment	06		-		
TOTAL	48		-		
Assessment Methods:					
Formative:		Summati	ve:		
Internal practical Test		Sessional	examination		
Theory Assignments		End semester examination			
Lab Assignment & Viva		Viva			



Mapping of assessme	ent with Co	S		1				
Nature of assessment		CO 1	CO 2	CO 3	CO 4			
Sessional Examinatio	Sessional Examination 1							
Sessional Examinatio	n 2			*	*			
Assignment/Presentat	ion	*	*	*	*			
Laboratory Examinat	ion		*		*			
Feedback Process	• End	d-Semester	r Feedback					
Reference Material	1. M.H. Ba	ao, Micro I	Mechanical Trans	sducers, "Handbo	ook of			
	Sensors and Actuators", Volume 8, Elsevier, 2000.							
	2. Ljubisa Ristic, Editor, "Sensor Technology and							
	Devices", Artech House, 1994.							
	3. Vedat Coskun, Kerem Ok and Busra Ozdenizci, "Near Field							
	Communication", Wiley Publications, 2011.							
	4. Todor Cooklev, "Wireless communication standards", IEEE							
	Press, John Wiley & Sons, 2011.							
	5. Houda Labiod, Hossam Afifi, Costantino De Santis, "Wi-Fi,							
	Bluetooth, Zigbee and WiMAX", Springer Publications, 2007.							
	6. Madhushree Ganguli, "Getting started with Bluetooth", Premier							
	Press, ISBN 1931841837, 9781931841832, 2002.							
	7. Jörg Eberspächer, Hans-Jörg Vögel, Christian Bettstetter, Christian							
	Hartmann, "GSM – Architecture, Protocols and Services" Third							
	Edition, Wiley Publications, 2008.							
	8. www.trimble.com /gps_tutorial.							
	9. Holger Karl and Andreas Willig "Protocols and Architectures							
	for Wirele	ess Sensor	Networks", Joh	n Wiley & Sons, 2	2005.			
	10. Ian F	Akyildiz, '	Wireless Senso	r Networks", Wil	ey & Sons,			
	2010.							



11. Jun Zheng & Abbas Jamalipour, "Wireless Sensor Networks - A
Networking Perspective", John Wiley & Sons, Inc., Publication,
2008.
12. Kazem Sohraby, Daniel Minoli & Taieb Znati "Wireless Sensor
Networks - Technology, Protocols, and Applications", 2007.
13. F. Zhao and L. Guibas. Morgan Kaufmann, "Wireless Sensor
Networks: An Information Processing Approach", Jul. 2004.
14. N. P. Mahalik. Springer Verlag, "Sensor Networks and
Configuration: Fundamentals, Standards, Platforms, and
Applications", Nov. 2006.
15. N. Bulusu and S. Jha, "Wireless Sensor Networks: A Systems
Perspective", Editors, Artech House, August 2005.



Course Title:Responsive Web Application Development LabCourse Code: IOT 605LCourse Instructor:Academic Year: 2020 - 2021Semester: First Year, Semester 2No of Credits: 1Prerequisites: Basic Programming							
Academic Year: 2020 - 2021Semester: First Year, Semester 2							
· · · · · · · · · · · · · · · · · · ·							
No of Credits:1Prerequisites:Basic Programming							
Synopsis: This Course provides insight on							
• The front-end section includes working with HTML, CSS3 and							
Bootstrap to design interactive and responsive web pages whereas t	he						
back-end section consists of programming in PHP with MySQL,							
XML, and JSON.							
• Develop a platform friendly web application or a website using							
Bootstrap, Angular JS, React JS, and Node JS.							
Course							
Outcomes On successful completion of this course, students will be able to	On successful completion of this course, students will be able to						
(COs):							
CO 1: Develop A Dynamic Webpage By The Use Of Java Script.							
CO 2: Write A Well Formed / Valid XML Document.							
CO 3: Connect Web Application to A DBMS To Perform Insert, Update and Dele	ete						
Operations.							
CO 4: Convert the String And Parse Using JSON Objects.							
CO 5: Use Bootstrap, Angular JS, React JS, Node JS To Construct Modern Webs	ite						
COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO	11						
CO 1 *							
CO 2 * *							
CO 3 * * * *							
CO 4 * * ·							
CO 5 * * * *							
Content							
Unit 1:							



(Deemed to be University under Section 3 of the UGC Act, 1956)

Tutus desetters to T to to 1 337.1					
Introduction to Internet and Wel	1. Experiment on various problem, to provide the				
Technology	solution using web development (C4).				
Unit 2:					
HTML	1. Develop a web page using semantic tags (C4).				
	2. Create a web page using form, add validation				
	using patterns(C4).				
Unit 3:					
CSS3	1. Develop different types of layout using css (C4)				
	 Develop responsive web page (C4) Develop web page using drop down menu(C4) 				
Unit 4:					
JavaScript	1. Validate form using JavaScript pattern				
	matching, develop an application using Ajax.				
	(C3)				
Unit 5:					
XML vs JSON vs YAML	1. Create xml, YAML JSOM document able to parse. (C3)				
Unit 6:					
Database connection	1. Analyse and solve various database task using PHP Parse the sting using json (C5)				
Unit 7:					
BOOTSTRAP, ANGULAR JS	, 1. Develop web page using the framework (C5)				
REACT JS, NODEJS					
Learning strategy	Contact hours Student learning time				
Learning strategy					
. .	(Hrs)				
Lecture	- 12 -				
Seminar					
Quiz					
Small Group Discussion (SGD)					
Self-directed learning (SDL)					
Problem Based Learning (PBL)					
	03 -				
Case Based Learning (CBL)	03				



Practical		24 -						
Revision			03		-			
Assessment			06		-			
TOTAL			48		-			
Formative:		native:						
Internal practical Te					onal examin			
Theory Assignments				End se	emester exa	mination		
Lab Assignment & Viva				Viva				
				Sumn	native:			
Nature of assessmen	CO 1	CO 2	CO 3	CO 4	CO 5			
Sessional Examinati	Sessional Examination 1 *							
Sessional Examinati	on 2			*	*	*		
Assignment/Presenta	ation		*	*				
Laboratory Examina	tion	*	*	*		*		
Feedback Process	• Er	nd-Semest	er Feedback					
Reference	1. Thom	nas A. Po	well, Fritz S	Schneider,"	JavaScript:	The Complete		
Material	Reference", McGraw-Hill Osborne, Second Edition, 2004.							
	2. Jamsa Krishna, "Introduction to web development using HTML5",							
	2014.							
	3. Danny Goodman, "JavaScript bible", Wiley, Seventh Edition,							
	2010.							
	4. Azat M	Mardan, "	Practical N	ode.js: Buil	ding Real-	World Scalable		
	Web Apps", Apress Publications, 2014.							
	5. Krasimir Tsonev, "Node.js by Example", Packt Publications, 2015.							
	6. Luke	e Welling	g, Laura 7	Thomson, "	PHP and	MySQL Web		
		-				y Publications,		
	2008.		-	- / ·		-		



", 3rd
al,
009.



Course Title: Course Code: BDA 605L Academic Year: 2020-2021 No of Credits: 1	Cours		ning for B	Big Data I	Lab					
Academic Year: 2020-2021		o Instru		Machine Learning for Big Data Lab						
	Seme	Course Instructor:								
No of Crediter 1					,					
	Prerequisites: Programming with Python and Data Visualization Visualization						ata			
Synopsis: This Course provi	des insight	t on								
Course										
Outcomes On successful con	npletion of	this co	urse, stud	dents wil	l be ab	le to				
(COs):										
CO 1: Demonstrate activ	ation fund	ctions,	weights	and thr	eshold	units in	artificial			
neural networks										
CO 2: Demonstrate Artif	ïcial Neur	al Netw	vork, Clu	stering,	Suppor	t Vector	Machine,			
Deep Neural Netw	ork and R	einforc	ement Le	earning n	nodels					
CO 3: Analyse Artificial	Neural Ne	etwork,	Clusterin	ng, Supp	ort Vec	tor Mach	ine, Deep			
Neural Network a	nd Reinfor	cement	Learning	g models	ł					
Compare and cont	rast single	layer, n	nultilayer	and dee	p neura	l network	ts in terms			
of accuracy in clas	ssification									
CO 5: Design different t	ypes of ar	tificial	neural ne	etwork n	nodels,	clusterin	g models,			
deep neural netwo	rk models	, reinfo	rcement l	learning	models					
Mapping of COs to POs										
COs PO1 PO2 PO3 PO	4 PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11			
CO 1 *										
CO 1 *		<u> </u>								
CO 4 *										
CO 5 *										
Course content and outcomes:										
Content Competencies										
Unit 1: Artificial Neural Ne	etworks									



	1 Demonstrate estivation functions weights						
Neurons and biological motivation.	1. Demonstrate activation functions, weights						
Activation functions and threshold	and threshold units in artificial neural						
units.	networks (C3)						
Supervised and unsupervised learning	2. Demonstrate ANN models (C3)						
Perceptron Model: representational	3. Design of ANN models for classification						
limitation and gradient descent training.	(C5)						
Multilayer networks and back	4. Analyse the performance issues (C4)						
propagation.							
Overfitting.							
Unit 2: Clustering							
Learning from unclassified data.	1. Demonstrate various clustering models in						
Clustering.	machine learning (C3)						
Hierarchical Aglomerative Clustering.	2. Design different types of clusters (C5)						
Non-Hierarchical Clustering - k-means	3. Analyse the performance of clustering						
partitional clustering.	techniques on different data (C4)						
Expectation maximization (EM) for soft	4. Apply clustering techniques for data						
clustering.	analysis. (C3)						
Semi-supervised learning with EM							
using labeled and unlabled data.							
Unit 3 Kernel Methods							
Dual Representations	1. Design of different kernel techniques (C5)						
Design of Kernels							
Unit 4: Support Vector Machines (SM	V)						
Maximum margin linear separators.	1. Demonstrate Maximum margin linear						
Quadractic programming solution to	separators. (C3)						
finding maximum margin separators.	2. Design SVM classifiers (C5)						
Kernels for learning non-linear	3. Analyse the performance of SVM (C4)						
functions.							
Varying length pattern classification							
using SVM							
Unit 5: Deep Learning							
Introduction to Deep Learning	1. Develop Deep Neural Network/ CNN (C5)						



	be University under Section 3 of the UGC Act, 1956)						
Introduction to convolutional Neural	2. Design a classifie	er for the image					
Network (CNN)	classification system. (C5)					
CNN Architecture and layers	3. Compare performance of CNN and ANN for						
Building simple CNN model for	image classification (C4)						
classification							
Training and Testing the CNN model							
Unit 6: Reinforcement Learning							
Characteristics	1. Apply reinforcement	learning model using					
N-arm Bandit Problem	different principles (C3)						
Calculating the Value Function	2. Analyse various rein	nforcement learning					
Associative Learning – Adding States	techniques (C4)						
The Markov Property & Markov Decision	3. Design of reinforcen	nent learning models					
Process	(C5)						
Learning strategies, contact hours and s	student learning time						
Learning strategy	Contact hours	Student learning time					
		(Hrs)					
Lecture	12	-					
Seminar	-	-					
Quiz	-	-					
Small Group Discussion (SGD)	-	-					
Self-directed learning (SDL)	-	-					
Problem Based Learning (PBL)	-	-					
Case Based Learning (CBL)	03	-					
Clinic	-	-					
Practical	24	-					
Revision	03	-					
Assessment	06	-					
TOTAL	48	-					
Assessment Methods:		<u> </u>					
Formative: Summative:							



Internal practical Test - yes Sessional examination Theory Assignments End semester examination - yes Lab Assignment & Viva - yes Viva Mapping of assessment with Cos Nature of assessment CO 1 CO 2 CO₄ CO 5 CO 3 * * Sessional Examination 1 * * Sessional Examination 2 * * * Assignment/Presentation * * * Laboratory examination Feedback Process **End-Semester Feedback** • **Reference Material** 1. Machine Learning, T. Mitchell, McGraw-Hill, 1997 2. Machine Learning, E. Alpaydin, MIT Press, 2010 3. Pattern Recognition and Machine Learning, C. Bishop, Springer, 2006 4. Pattern Classification, R. Duda, E. Hart, and D. Stork, Wiley-Interscience, 2000 5. Neural Networks - A Class Room Approach, Satish Kumar, Second Edition, Tata McGraw-Hill, 2013 6. The Elements of Statistical Learning: Data Mining, Inference and Prediction, T. Hastie, R. Tibshirani and J. Friedman, Springer, 2nd Edition, 2009 7. Machine Learning for Big Data, Jason Bell, Wiley Big Data Series 8. Kernel Methods for Pattern Analysis, J. Shawe-Taylor and N. Cristianini, Cambridge University Press, 2004 9. Neural Networks and Learning Machines, S. Haykin, Prentice Hall of India, 2010 10. Multidimensional Neural Networks Unified Theory, Rama Murthy G 11. F.Camastra and A.Vinciarelli, Machine Learning for Audio, Image and Video Analysis – Theory and Applications, Springer, 2008



Course Code: CSE-605L Course Instructor: Academic Year: 2020 - 2021 Semester: First Year, Semester 2 No of Credits: 1 Prerequisites: Synopsis: This Course provides insight on 1. This course would provide fundamental knowledge about android platform. 2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to (COS): CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: Write android applications using various UI components and data handling using SQLiIte CO 4 * * CO 1 * * CO 2 * * CO 3 * * CO 4 * *	Name of the Program: Ma						Master of Engineering - ME (Internet of Things)						
Academic Vear: 2020 - 2021 Semester: First Year, Semester 2 No of Credits: 1 Prerequisites: Synopsis: This Course provides insight on 1. This course would provide fundamental knowledge about android platform. 2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to (COS): On successful completions using various UI components and data handling using SQLilte CO 4: Experiment advanced topics on android applications Mapping of COs to POs * * *	Course Title:					Mobi	Mobile Application Development using Android Lab						
No of Credits: 1 Prerequisites: Synopsis: This Course provides insight on 1. This course would provide fundamental knowledge about android platform. 2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to (COS): On successful completion of this course, students will be able to CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: using SQLilte CO 4: Experiment advanced topics on android applications Mapping of COs to POs PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * *	Course Code: CSE-605L												
Synopsis: This Course provides insight on 1. This course would provide fundamental knowledge about android platform. 2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course Outcomes On successful completion of this course, students will be able to (COS): CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: Write android applications using various UI components and data handling using SQLilte CO 4: Experiment advanced topics on android applications Mapping of COs to POs PO 1 PO 2 PO 3 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * </th <th colspan="6">Academic Year: 2020 - 2021</th> <th>ster: I</th> <th>First Yea</th> <th>r, Semest</th> <th>er 2</th> <th></th> <th></th>	Academic Year: 2020 - 2021						ster: I	First Yea	r, Semest	er 2			
1. This course would provide fundamental knowledge about android platform. 2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to (COS): On successful completion of this course, students will be able to CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: Write android applications using various UI components and data handling using SQLifte CO 4: Experiment advanced topics on android applications CO2 2 * * * * * * * CO 1 * * CO 1 * * CO 1 * * CO 1 * * CO 2 * * * * CO 4	No of (Credits:	1			Prere	equisites	:					
platform. 2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to CO3: Use of major building blocks in an android application CO3: Write android applications using various UI components and data handling using SQLilte CO4: Experiment advanced topics on android applications CO2 * * * * * * Co3 * * * * Co4 * * * * * * * Co4	Synop	sis:	This C	ourse p	rovides	s insigh	t on						
2. The course will also provide skill sets to design and develop android applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to (COS): On successful completion of this course, students will be able to CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: Write android applications using various UI components and data handling using SQLilte CO 4: Experiment advanced topics on android applications Mapping of COs to POs Image: Colored topic state is a state			1.	This a	course	would	provid	e fundai	nental k	nowledg	e about	android	
applications for mobile devices. 3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to CO1: Use of major building blocks in an android application CO2: Solve different issues associate with design of android applications CO3: Write android applications using various UI components and data handling using SQLilte CO4: Experiment advanced topics on android applications Mapping of COs to POs Cos to POs Co1 * * * Co2 * * * Co4 + * - Co3 + * - Co4 + * - Co4 + * - - Co4 + * - - - Co3 + * * - - - Co4 + * - - - - - Co3 + * + - - - - - Co4 + * - - - - - </th <th></th> <th></th> <th>pla</th> <th>tform.</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>			pla	tform.									
3. This course will provide basic knowledge about android application communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to (COS): On successful completion of this course, students will be able to (COS): On successful completion of this course, students will be able to (COS): On successful completion of this course, students will be able to (COS): Vite android applications (CO 2: Solve different issues associate with design of android applications (CO 3: Write android applications using various UI components and data handling using SQLilte (CO 4: Experiment advanced topics on android applications Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * * <td< th=""><th></th><th></th><th>2.</th><th>The co</th><th>ourse w</th><th>ill also</th><th>provid</th><th>e skill s</th><th>sets to de</th><th>sign and</th><th>develop</th><th>android</th></td<>			2.	The co	ourse w	ill also	provid	e skill s	sets to de	sign and	develop	android	
communication of data which are hosted in remote systems. Course On successful completion of this course, students will be able to CO1: Use of major building blocks in an android application CO2: Solve different issues associate with design of android applications CO3: Write android applications using various UI components and data handling using SQLilte CO4: Experiment advanced topics on android applications Mapping of COs to POs Cos PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 CO1 * * * I <thi< th=""> I I I<</thi<>			app	olication	ns for n	nobile c	levices.						
Course On successful completion of this course, students will be able to CO1: Use of major building blocks in an android application CO2: Solve different issues associate with design of android applications CO3: Write android applications using various UI components and data handling using SQLiIte CO4: Experiment advanced topics on android applications Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO1 * *			3.	This c	ourse v	will pro	ovide ba	asic kno	wledge	about an	droid app	olication	
Outcomes (COs): On successful completion of this course, students will be able to CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: Write android applications using various UI components and data handling using SQLiIte CO 4: Experiment advanced topics on android applications Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * * CO 2 * * * <th></th> <th></th> <th>cor</th> <th>nmunic</th> <th>ation o</th> <th>of data v</th> <th>which a</th> <th>e hoste</th> <th>d in remo</th> <th>ote syster</th> <th>ns.</th> <th></th>			cor	nmunic	ation o	of data v	which a	e hoste	d in remo	ote syster	ns.		
(COs): Image: Second content and outcomes: (COs): Use of major building blocks in an android application (CO 1: Use of major building blocks in an android application (CO 2: Solve different issues associate with design of android applications (CO 3: Write android applications using various UI components and data handling using SQLiIte CO 4: Experiment advanced topics on android applications Mapping of COs to POs Mapping of COs to POs CO 1 * * * CO 2 * * * * Image: Solve different is the second content and outcomes: Content Competencies	Course	e											
CO 1: Use of major building blocks in an android application CO 2: Solve different issues associate with design of android applications CO 3: Write android applications using various UI components and data handling using SQLiIte CO 4: Experiment advanced topics on android applications Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * * CO 2 * * *	Outco	mes	On suc	cessful	compl	etion of	this co	urse, stı	idents wi	ill be abl	e to		
The set of the section	(COs):	:											
CO 3: Write android applications using various UI components and data handling using SQLiIte CO 4: Experiment advanced topics on android applications Mapping of COs to POs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * *	CO 1:		Use of	major l	buildin	g block	s in an a	android	applicati	on			
CO 3: using SQLiIte CO 4: Experiment advanced topics on android applications Mapping of COs to POs COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * Image: Content and outcomes: * Image: Competencies	CO 2:		Solve of	lifferen	t issues	s associ	ate with	n design	of andro	oid applic	cations		
using SQLiIte CO 4: Experiment advanced topics on android applications Mapping of COs to POs Mapping of COs to POs COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * * <th>CO 3.</th> <th></th> <th>Write a</th> <th>android</th> <th>applic</th> <th>ations</th> <th>using v</th> <th>arious 1</th> <th>UI comp</th> <th>onents a</th> <th>nd data l</th> <th>nandling</th>	CO 3.		Write a	android	applic	ations	using v	arious 1	UI comp	onents a	nd data l	nandling	
Mapping of COs to POs COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * * <	005		using S	SQLiIte									
COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 CO 1 * *	CO 4:		Experi	ment ac	lvanceo	d topics	on and	roid app	olications	5			
CO 1 * * ·	Mappi	ing of (COs to 1	POs									
CO 1 * * ·													
CO 2 * * * *	COs	<i>PO</i> 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 2 Image: Comparison of the second secon	CO 1	*		*									
CO 4 * * *	CO 2	*	*	*	*	*							
Course content and outcomes: Content Content Competencies	CO 3			*		*							
Content Competencies	CO 4		* *										
· ·	Course content and outcomes:												
Unit 1: Part - 1: Installation of Android Studio	Conten	ıt				(Compete	encies					
	Unit 1	: Par	t - 1:	Installa	ation of	f Andro	oid Stu	dio					



TRED BY > (Deemea to	be University under Section 5 of the UGC Act, 1956)
Installation of Android Studio,	1. Identify different features in android studio
environment setting, Project creation,	(C1)
building a project, running a sample	2. Explain Android manifest file (C2)
project	3. Discuss DVM, DDMS, android emulator (C2)
	4. Discuss the issues related running and
	debugging applications (C2)
Unit 2: Introduction to Android Scree	en UI Components
Implementation of android applications	1. Practice by creating android applications using
using various android UI components	different types of layouts (C3)
and layouts	2. Develop android applications using different
	types of views such as Listview, spinner, time
	picker and date picker (C3)
	3. Illustrate the use of Gallery
	and ImageSwitcher views (C2)
Unit 3: Introduction to Data Manage	ement with SQLite
Develop android applications for data	1. Implement android applications for content
handling	provider (C3)
	2. Apply shared preferences concept to android
	UI screen (C3)
	3. Apply CRUD operations to develop a simple
	healthcare application (C3)
Unit 4: Advanced topics	
Adapters, background threads,	1. Practice to generate notification object in an
Notifications, Location based services,	android application (C3)
Mapping, network connectivity	2. Apply Location based services in android
services, telephony services	applications (C3)
	3. Demonstrate android service life cycle in an
	android application (C3)
	4. Understand the use of background threads in
	android applications (C3)
Learning strategies, contact hours and	student learning time
1	



(Deemed to be University under Section 3 of the UGC Act, 1956)

Learning strategy		Contact hou	urs	Student learning	
				time (Hrs)	
Lecture		12		-	
Seminar		-		-	
Quiz		-		-	
Small Group Discussion (SGD))	-		-	
Self-directed learning (SDL)		-		-	
Problem Based Learning (PBI	L)	-		-	
Case Based Learning (CBL)		03		-	
Clinic		-		-	
Practical		24		-	
Revision		03		-	
Assessment		06		-	
TOTAL		48		-	
Assessment Methods:					
Formative:			ative:		
Internal practical Test			Session	nal examination	
Theory Assignments			End semester exar		
Lab Assignment & Viva			Viva		
Mapping of assessment with	Cos				
Nature of assessment	CO 1	CO 2	CO 3	CO 4	
Sessional Examination 1	*	*			
Sessional Examination 2		*	*	*	
Assignment/Presentation	*	*		*	
Laboratory Examination	*	*	*	*	
Feedback Process •	End-Semes	ter Feedback	<u> </u>		



Reference Material	5. "Sams Teach Yourself Android Application Development in					
	24 Hours", Lauren Darcey and Shane Conder, ISBN-10:					
	0321673352 ISBN-13: 978-0321673350 Edition: 1					
	6. "Android: Introducing Google's Mobile Development					
	Platform", Ed Burnette, ISBN10: 1934356565 ISBN-13: 978-					
	1934356562 Edition: Third Edition					
	7. "Android Application Development: Programming", Rick					
	Rogers and John Lombardo, ISBN10: 0596521472 ISBN-13: 978-					
	0596521479 Edition: 1					
	8. "Professional Android 2 Application Development"					
	(Wrox Programmer to Programmer) , Reto Meier , ISBN-10:					
	0470565527 ISBN-13: 978-0470565520 Edition: 2					



Name of the Program:						Master of Engineering - ME (Internet of Things)						
Course	Title:					Entrepreneurship Lab						
Course Code: ENP-601L					Cour	Course Instructor:						
Academic Year: 2020 - 2021				Seme	ster: F	irst Yea	r, Semeste	er 2				
No of C	redits:	1			Prere	equisites	:					
Synops	is:	This C	ourse p	rovides	s insigh	t on						
								-	-	eneurship		
		practic	al imp	lement	ation.	It focu	ises on	differei	nt stage	s related	to the	
		entrepr	reneuria	al proce	ess, inc	luding	busines	s model	innovati	on, mone	etization,	
		small t	ousines	s manag	gement	as well	as strat	tegies that	t improv	ve perform	nance of	
		new bu	siness	venture	s. Cant	ered on	a mixtu	re of theo	oretical e	xploratio	n as well	
		as case	studies	of real	-world	examp	es and g	guest lect	ures, stu	dents will	develop	
		an und	lerstand	ling of	succes	ses, op	portunit	ties and	risks of	entreprer	neurship.	
		This co	ourse ha	as an in	terdisci	iplinary	approa	ch and is	therefor	e open to	students	
		from o	ther Ma	ajors.								
Course	:											
Outcom	nes	On suc	cessful	compl	etion of	f this co	urse, st	udents w	ill be abl	e to		
(COs):												
CO 1:		Unders	stand th	e conce	ept of e	ntrepre	neurship)				
CO 2:		To app	raise th	e entre	preneu	rial proc	ess star	ting with	pre-ven	ture stage	through	
		group of	discuss	ion								
		To Bui	ild a m	ind-set	focusii	ng on d	evelopii	ng novel	and unic	que appro	oaches to	
CO 3:		market	opport	unities	by con	sidering	g case st	tudies an	d unders	tand the c	complete	
		flow of	f entrep	reneurs	ship							
Mappi	ng of (COs to 1	POs									
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*					*		*				
CO 2						*						
CO 3								*		*		
Course content and outcomes:												



Content	Competencies				
Unit 1: Introduction to Entrepreneu	rship				
Meaning and Definition of	1. Discuss the theories of Entrepreneurship				
Entrepreneurship-Employment vs	(C1)				
Entrepreneurship, Theories of	2. Discuss the approaches to Entrepreneurship				
Entrepreneurship, approach to	(C1)				
entrepreneurship, Entrepreneurs VS					
Manager					
Unit 2: Process of Entrepreneurship	<u> </u>				
Factors affecting Entrepreneurship	1. Exemplify one's capabilities in relation to				
process	the rigors of successful ventures (C3)				
	2. Identify and differentiates the different				
	characteristics and competencies of an				
	entrepreneurs (C2)				
Unit 3: Business Plan writing					
Points to be considered, Model Business	1. Identify different business models (C3)				
	1. Identify different business models (C5)				
plan	Describe different parts of a business plan(C2)				
plan					
plan Unit 4: Case studies	Describe different parts of a business plan(C2)				
plan Unit 4: Case studies Indian and International	Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse				
plan Unit 4: Case studies Indian and International	Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse entrepreneurial personal traits and				
plan Unit 4: Case studies Indian and International	Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse entrepreneurial personal traits and competencies (C4)				
plan Unit 4: Case studies Indian and International	 Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse entrepreneurial personal traits and competencies (C4) 2. Evaluate oneself and plan courses of action 				
plan Unit 4: Case studies Indian and International	 Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse entrepreneurial personal traits and competencies (C4) 2. Evaluate oneself and plan courses of action to help develop one's entrepreneurial characteristics and competencies. (C5) 				
plan Unit 4: Case studies Indian and International Entrepreneurship	 Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse entrepreneurial personal traits and competencies (C4) 2. Evaluate oneself and plan courses of action to help develop one's entrepreneurial characteristics and competencies. (C5) 				
plan Unit 4: Case studies Indian and International Entrepreneurship Learning strategies, contact hours and	 Describe different parts of a business plan(C2) 1. Perform self-assessment and analyse entrepreneurial personal traits and competencies (C4) 2. Evaluate oneself and plan courses of action to help develop one's entrepreneurial characteristics and competencies. (C5) student learning time 				



Seminar		-		-		
Quiz			-		-	
Small Group Discussion (SC	GD)		-		-	
Self-directed learning (SDL))		-		-	
Problem Based Learning (PE	BL)		-		-	
Case Based Learning (CBL)			03		-	
Clinic			-		-	
Practical			24		-	
Revision			03		-	
Assessment			06		-	
TOTAL			48		-	
Assessment Methods:						
Formative:				Summ	ative:	
Internal practical Test			Sessional examinat		nal examination	
Theory Assignments				End set	mester examination	
Lab Assignment & Viva				Viva		
Mapping of assessment wit	h Co	S		·		
Nature of assessment		CO 1	CO 2 C		CO 3	
Sessional Examination 1		*	*			
Sessional Examination 2					*	
Assignment/Presentation			*		*	
Laboratory Examination		*	*		*	
Feedback Process • End-Semester Feedback						
Reference Material 1.	NV	R Naidu	ı and T. Kr	rishna Ra	o, "Management and	
	Entrepreneurship", IK International Publishing House Pvt. Ltd					
	200	08.				
2.	Mo	hanthy	Sangram	Keshari,	"Fundamentals of	
	Ent	repreneur	rship", PHI Pub	lications, 2	2005	



<i>3.</i> Butler, D. (2006). Enterprise planning and development. USA:
Elsevier Ltd. Gerber, M.E. (2008) Awakening the entrepreneur
within. NY: Harper Collins.



Name of the Program:						Master of Engineering - ME (Internet of Things)							
Course Title:						Device Drivers Lab							
Course	e Code:	ESD-60	04L		Cour	Course Instructor:							
Acade	mic Yea	ar: 2020) - 2021		Seme	ester:	First Yea	r, Semest	er 2				
	Credits	1			Prere	equisites	3:						
Synop	sis:	This C	ourse p	orovides	s insigh	t on							
		1. Ins	sight int	o Linu	x kerne	l progra	umming.						
		2. Kr	lowledg	ge abou	t the fra	amewor	k used i	n buildin	g the Lii	nux devic	e driver.		
		3. Co	ncept o	f desig	ning pr	oc and i	ioctl nee	eded to be	uild a de	vice drive	er		
		4. Techniques to debug kernel programs											
		5. Insight into designing USB drivers											
Cours	e												
Outco	mes	On suc	ccessful	compl	etion of	f this co	ourse, stu	udents wi	ill be abl	e to			
(COs)	:												
GO 4		Under	stand b	asic Li	nux ke	rnel pro	ogramm	ing with	an intro	duction t	o kernel		
CO 1:		modul	es										
~ ~ ~		Under	stand th	ne conc	ept of f	file oper	ration w	ith imple	ementatio	on of ope	n, close,		
CO 2:		read, v	vrite sys	stem ca	ulls								
CO 3:		Impler	nent pro	oc entri	ies								
CO 4:		Impler	nentatio	on of ic	octls								
CO 5:		Use to	ols to d	ebug th	ne kerne	el modu	les						
Mapp	ing of (COs to	POs										
						-	-		-				
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11		
CO 1	*	*			*								
CO 2		*			*								
CO 3	*		*										
CO 4		*	*										
CO 5	*		* *										
Cours	Course content and outcomes:												



	be University under Section 3 of the UGC Act, 1956)
Content	Competencies
Unit 1:	
Introduction to Device Drivers	Describe the broad design of device driver (C3)
Unit 2:	
Building & Running Modules.	Compile and load modules using a make file (C4)
Unit 3:	
Character Driver.	Explain the structure of a character driver (C3)
Unit 4:	
Debugging Techniques.	1. Debug modules using prink, proc and kdb (C4)
	2. Design of loctl used in building device drivers
	(C5)
Unit 5:	
Concurrency and Race Condition	1. Illustrate the problems associated with
	concurrent device drivers (C3)
	2. Describe the problems associated with race
	condition while designing a device driver (C3)
Unit 6:	
Advanced Character Driver Operations	Execute bottom half through deferred work (C4)
Unit 7:	
Communicating with Hardware	Communicate with the devices through I/O ports
	(C4)
Unit 8:	1
Interrupt Handling	Illustrate the concept of writing interrupt handlers
T. G	(C4)
Unit 9:	1



(Deemed to be University under Section 3 of the UGC Act, 1956)

PCI Drivers, USB Drivers

- 1. Structure of a USB driver (C4)
- 2. Design a USB driver. (C6)

Learning strategies, contact hours and student learning time

Learning strategy		Contact hou	urs	Studer	Student learning		
				time (.	time (Hrs)		
Lecture		12		-	-		
Seminar		-		-			
Quiz		-		-	-		
Small Group Discussion (SG	D)	-		-	-		
Self-directed learning (SDL)		-		-	-		
Problem Based Learning (PB	L)	-		-	-		
Case Based Learning (CBL)		03		-	-		
Clinic		-		-	-		
Practical		24		-	-		
Revision		03		-	-		
Assessment	06		-	-			
TOTAL		48		-	-		
Assessment Methods:							
Formative:			Sum	mative:			
Internal practical Test			Sess	ional examir	nation		
Theory Assignments		End	End semester examination				
Lab Assignment & Viva			Viva				
Mapping of assessment with	n Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examination 1	*	*					
Sessional Examination 2			*	*			
		*		*	*		
Assignment/Presentation		1	1	1			



Reference Material	1. Alessandro Rubini, "Linux Device Drivers", (Nutshell Handbook),
	O'Reilly Publishers, 2009.
	2. John Madieu, "Linux Device Drivers Development: Develop
	customized drivers for embedded Linux", Packt Publishing, 2017.
	3. Robert Love, "Linux Kernel Development", Addison Wesley,
	Third Edition, 2010.
	4. Daniel P. Bovet, Marco Cesati, "Understanding the Linux
	Kernel", O'Reilly Media, Third Edition, 2008.
	5. Wolfgang Mauerer, "Professional Linux Kernel Architecture",
	Wrox, 2008.
	6. Sreekrishnan Venkateswaran, "Essential Linux Device Drivers",
	Prentice Hall, 2008.
	7. W. Richard Stevens, Stephen A. Rago, "Advanced Programming
	in the UNIX Environment", Addison Wesley, Third Edition, 2013.
	8. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, "Unix
	Network Programming, Vol1: Sockets", Pearson Education India,
	Third Edition, 2015.



Name of the P	rogram:			Mast	er of En	gineeri	ng - ME (Internet	of Thing	s)	
Course Title:				-	T Project Management Lab						
Course Code:	CSE-631L			Cour	se Instr	uctor:					
Academic Yea	ar: 2020 - 2021 Semester: First Year, Semester 2										
No of Credits:	1			Prere	equisites	: Fami	liarity in	develo	ping ap	plication	
				-		gh level	language	e			
Synopsis:	This Cou	irse pi	rovides	insigh	t on						
	1. T	he co	ncept o	of softw	are dev	elopmer	nt process	and pro	ject mana	agement	
	2. Il	llustra	ites the	differe	ence bet	ween a	lab assigr	nment ar	nd group	project	
	3. H	Ielp	the st	udents	to ur	nderstar	nd the f	finer po	oints of	Project	
	mana	igeme	ent								
	4. Bring awareness about the processes, tools and techniques involved i										
	the field of IT project management.										
Course											
Outcomes	On successful completion of this course, students will be able to										
(COs):											
CO 1:	Practice the project development through project planning.										
CO 2:	Understand the finer points of Project management.										
CO 3:	Bring awareness about the processes, tools and techniques involved in the field of IT project management.								the field		
Mapping of C	COs to PO	Os									
COs PO 1	PO 2 1	PO 3	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 1	3	ĸ	*								
CO 2				*				*			
CO 3	k	k		*							
Course conte	nt and ou	itcom	les:								
Content				(Compete	encies					
Unit 1:	Software	Proje	ect Pla	nning							



Understand the Project Needs, Create	1. Discussion on tools needed for project
the Project Plan, Diagnosing Project	management (C3)
Planning Problems.	
Unit 2: Estimation	
Elements of a Successful Estimate,	1. Download and demonstrate the tools
Wideband Delphi Estimation, Other	typically used for UML design. (C3)
Estimation Techniques, Diagnosing	
Estimation Problems.	
Unit 3: Project Schedules	
Building the Project Schedule,	1. Design the application through the UML
Managing Multiple Projects, Use the	tool practiced (C4)
Schedule to Manage	2. Develop the team with different roles
Commitments, Diagnosing Scheduling	assigned to each member - namely project
Problems.	manager, developer, tester and assign
	appropriate tasks (C4)
Unit 4: Reviews	
Inspections, Deskchecks,	1. Develop basic set of programs and to
Walkthroughs, Code Reviews, Pair	illustrate the unit tests (C2)
Programming, Use Inspections to	
Manage Commitments, Diagnosing	
Review Problems.	
Unit 5: Software Requirements	
Requirements Elicitation, Use Cases,	1. Field visit to develop and practice the
Software Requirements Specification,	requirement elicitation (C3)
Change Control, Introduce Software	
Requirements Carefully, Diagnosing	
Software Requirements Problems	
Unit 6: Design and Programming	
Review the Design, Version Control	1. Illustrate the key steps in design and
with Subversion, Refactoring, Unit	programming phase. Version control and unit
Testing, Use Automation, Be Careful	testing significance (C3)



rT	2 Deview of verieus ortafacta concreted by
with Existing Projects, Diagnosing	2. Review of various artefacts generated by
Design and Programming Problems	project and revise the project management
	methodology to the team (C5)
Unit 7: Software Testing	
Test Plans and Test Cases, Test	1. Inter team testing set up based on
Execution, Defect Tracking and Triage,	requirement document(C5)
Test Environment and Performance	
Testing, Smoke Tests, Test	
Automation, Postmortem Reports,	
Using Software Testing Effectively,	
Diagnosing Software Testing Problems	
Unit 8: Understanding Change	
Why Change Fails, How to Make	1. Illustrate the necessity of Change
Change Succeed	management system – SVN hands on (C3).
Unit 9: Management and Leader	rship
Take Responsibility, Do Everything Out	1. Discussion on the topic with the help of
in the Open, Manage the Organization,	case study (C3)
Manage Your Team	
Unit 10: Managing an Outsourc	ed Project
Prevent Major Sources of Project	
	2 Discussion on the tartic with the help of
Failure, Management Issues in	2. Discussion on the topic with the help of $2 = 2 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +$
Outsourced Projects, Collaborate with	case study (C3)
the Vendor	
Unit 11: Process Improvement	
Life Without a Software Process,	1. Post-mortem report generation of
Software Process Improvement,	respective project by each team – review of the
Moving Forward	report and suggest areas of improvement (C4)
Learning strategies, contact hours and s	student learning time



Learning strategy		Contact hours	7	Student learning time (Hrs)		
Lecture		12		-		
Seminar		-		-		
Quiz		-		-		
Small Group Discussion (SGD)		-		-		
Self-directed learning (SDL)		-		-		
Problem Based Learning (PBL)		-		-		
Case Based Learning (CBL)		03		-		
Clinic		-		-		
Practical		24		-		
Revision		03		-		
Assessment		06		-		
TOTAL		48		-		
Assessment Methods: Formative:			Summa			
Internal practical Test			Session	al examination		
Theory Assignments			End sen	nester examination		
Lab Assignment & Viva			Viva			
Mapping of assessment with C	os					
Nature of assessment	CO 1	CO 2		CO 3		
Sessional Examination 1	*	*				
Sessional Examination 2				*		
Assignment/Presentation	*					
Laboratory Examination	*	*		*		
		ter feedback ter Feedback				



Reference Material	1. "Applied Software Project Management" By Jennifer
	Greene, Andrew Stellman (O'Reilly Publications) 2005.
	2. "The Art of Project Management" By Scott Berkun (O'Reilly
	Publications) 2005.



Academic Year: 2020 - 2021 Semester: No of Credits: 4 Prerequisibasics Synopsis: Students are expected to select area of their specialization that visoftware or both in a semester Course On successful completion of this Outcomes On successful completion of the projectives of the projective of the	Instructor: r: First Year, Semester 2 isites: Any programming language and circuit t a problem in the area of their interest and the would require an implementation in hardware / his course, students will be able to oject work and provide an adequate background										
Academic Year:2020 - 2021Semester:No of Credits:4Prerequis basicsSynopsis:Students are expected to select area of their specialization that visoftware or both in a semesterCourse Outcomes (COs):On successful completion of this with a detailed literature surveyCO 1:Apply the objectives of the project with a detailed literature surveyCO 2:Breakdown the project into sub to be reproduced by an independ block diagramCO 4:Evaluate the results	r: First Year, Semester 2 isites: Any programming language and circuit t a problem in the area of their interest and the would require an implementation in hardware / his course, students will be able to oject work and provide an adequate background										
No of Credits:4Prerequise basicsSynopsis:Students are expected to select area of their specialization that we software or both in a semesterCourse Outcomes (COs):On successful completion of this (COs):CO 1:Apply the objectives of the project with a detailed literature surveyCO 2:Breakdown the project into sub to be reproduced by an independent block diagramCO 4:Evaluate the results	isites: Any programming language and circuit t a problem in the area of their interest and the would require an implementation in hardware / his course, students will be able to										
basicsSynopsis:Students are expected to select area of their specialization that v software or both in a semesterCourse Outcomes (COs):On successful completion of this (COs):CO 1:Apply the objectives of the project with a detailed literature surveyCO 2:Breakdown the project into sub- to be reproduced by an independence block diagramCO 4:Evaluate the results	t a problem in the area of their interest and the would require an implementation in hardware / his course, students will be able to										
CourseOn successful completion of thisOutcomesOn successful completion of this(COs):Apply the objectives of the projectives of the projective of the	would require an implementation in hardware /										
CourseOutcomesOn successful completion of this(COs):Apply the objectives of the projectives of the projectives of the projective surveyCO 1:Apply the objectives of the projective surveyCO 2:Breakdown the project into sub- to be reproduced by an independenceCO 3:Compose hardware/software des block diagramCO 4:Evaluate the results	his course, students will be able to bject work and provide an adequate background										
CourseOn successful completion of thisOutcomesOn successful completion of this(COs):Apply the objectives of the projectives of the project into subtractive surveyCO 1:Apply the objectives of the project into subtractive surveyCO 2:Breakdown the project into subtractive be reproduced by an independent of the project into subtractive surveyCO 3:Compose hardware/software destructionsCO 4:Evaluate the results	ject work and provide an adequate background										
Outcomes (COs):On successful completion of this (COs):CO 1:Apply the objectives of the project with a detailed literature surveyCO 2:Breakdown the project into sub 	ject work and provide an adequate background										
(COs):Apply the objectives of the projectives of the projectives of the projectives of the project with a detailed literature surveyCO 1:Apply the objectives of the projectives of the projective of	ject work and provide an adequate background										
CO 1:Apply the objectives of the projectives with a detailed literature surveyCO 2:Breakdown the project into sub- to be reproduced by an independenceCO 3:Compose hardware/software des block diagramCO 4:Evaluate the results											
CO 1:with a detailed literature surveyCO 2:Breakdown the project into sub to be reproduced by an independCO 3:Compose hardware/software des block diagramCO 4:Evaluate the results											
CO 2:Breakdown the project into sub to be reproduced by an independ Compose hardware/software des block diagramCO 4:Evaluate the results	У										
CO 2:Image: Construction of the construct											
to be reproduced by an independenceCO 3:Compose hardware/software destructionCO 4:Evaluate the results	Breakdown the project into sub blocks with sufficient details to allow the work										
CO 3:Iblock diagramCO 4:Evaluate the results	an independent researcher										
block diagramCO 4:Evaluate the results	Compose hardware/software design, algorithms, flowchart, methodology, and										
	block diagram										
CO 5: Summarize the work carried out											
	at										
Mapping of COs to POs											
	06 P07 P08 P09 P010 P011										
CO 1 *											
CO 2 *	*										
CO 3	* *										
CO 4 *	*										
CO5:	*										
Course content and outcomes:											
Content Com	npetencies										
Phase 1											



At the end of the topic student should be able to:				
8. Identify the problem/specification (C1)				
9. Discuss the project (C2)				
10. Prepare the outline (C3)				
11. Describe the status of the project (C2)				
12. Prepare a mid-term project presentation report (C3)				
13. Prepare and present mid-term project presentation slides (C3, C5)				
14. Develop project implementation in				
hardware/software or both in chosen platform				
(C5)				
6. Prepare the progress report (C3)				
7. Prepare the final project presentation report				
(C3)				
8. Prepare and present final project presentation				
slides (C3, C5)				
• Madifier and Develop invalues detion in				
9. Modify and Develop implementation in				
9. Modify and Develop implementation in hardware/software or both in chosen platform				
hardware/software or both in chosen platform				
hardware/software or both in chosen platform (C3, C5)				
hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results				
 hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results (C6) 				
hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results (C6) student learning time				
hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results (C6) student learning time Contact hours Student learning				
hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results (C6) student learning time Contact hours Student learning time (Hrs)				
hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results (C6) student learning time Contact hours Student learning time (Hrs)				
hardware/software or both in chosen platform (C3, C5) 10. Justify the methods used and obtained results (C6) student learning time Contact hours Student learning time (Hrs) 				

-

-

Problem Based Learning (PBL)



Case Based Learning (C	CBL)		-			-		
Clinic			-			-		
Practical		-			-			
Revision		-		-				
Assessment			-					
TOTAL			51			09		
Assessment Methods:								
Formative:					Summative:			
Project Problem Selecti	on				Mid-Term	Presentation		
Synopsys review				Second status review				
First status review			Demo & Final Presentation					
Mapping of assessmen	t with Cos							
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5		
Mid Presentation		*	*					
Presentation		*	*	*	*	*		
Feedback Process	End-	Semes	ster Feedb	back				
Reference Material H	Particular to	the ch	losen pro	ject				



Name of the Program:Master of Engineering - ME (Internet of ThingsCourse Title:Seminar - 2Course Code:IOT 698Course Instructor:Academic Year:2020 - 2021Semester:No of Credits:1Prerequisites:Communication SkillSynopsis:6.To select, search and learn technical literature.7.To Identify a current and relevant research topic.8.To prepare a topic and deliver a presentation.9.To develop the skill to write a technical report.10.Develop ability to work in groups to review and modify technical ofCourseOn successful completion of this course, students will be able to(COs):Show competence in identifying relevant information, defining and expression.	content.						
Academic Year: 2020 - 2021 Semester: First Year, Semester2 No of Credits: 1 Prerequisites: Communication Skill Synopsis: 6. To select, search and learn technical literature. 7. To Identify a current and relevant research topic. 8. To prepare a topic and deliver a presentation. 9. To develop the skill to write a technical report. 10. Develop ability to work in groups to review and modify technical of Course Outcomes On successful completion of this course, students will be able to (COs): Show competence in identifying relevant information, defining and explanation.							
No of Credits: 1 Prerequisites: Communication Skill Synopsis: 6. To select, search and learn technical literature. 7. To Identify a current and relevant research topic. 8. To prepare a topic and deliver a presentation. 9. To develop the skill to write a technical report. 10. Develop ability to work in groups to review and modify technical of Outcomes On successful completion of this course, students will be able to (COs): Show competence in identifying relevant information, defining and explored and explor							
Synopsis:6. To select, search and learn technical literature.7. To Identify a current and relevant research topic.8. To prepare a topic and deliver a presentation.9. To develop the skill to write a technical report.10. Develop ability to work in groups to review and modify technical ofCourseOutcomes(COs):Show competence in identifying relevant information, defining and explanation							
 7. To Identify a current and relevant research topic. 8. To prepare a topic and deliver a presentation. 9. To develop the skill to write a technical report. 10. Develop ability to work in groups to review and modify technical of Course Outcomes On successful completion of this course, students will be able to (COs): Show competence in identifying relevant information, defining and explanation 							
 8. To prepare a topic and deliver a presentation. 9. To develop the skill to write a technical report. 10. Develop ability to work in groups to review and modify technical of Course Outcomes On successful completion of this course, students will be able to (COs): Show competence in identifying relevant information, defining and explanation 							
9. To develop the skill to write a technical report. 10. Develop ability to work in groups to review and modify technical of Course Outcomes On successful completion of this course, students will be able to (COs): Show competence in identifying relevant information, defining and explanation							
CourseOutcomesOn successful completion of this course, students will be able to(COs):Show competence in identifying relevant information, defining and explanation							
Course On successful completion of this course, students will be able to (COs): Show competence in identifying relevant information, defining and explanation							
Outcomes (COs):On successful completion of this course, students will be able toCO 1:Show competence in identifying relevant information, defining and explanation	plaining						
(COs): Show competence in identifying relevant information, defining and explanation CO 1: Show competence in identifying relevant information, defining and explanation	plaining						
CO 1: Show competence in identifying relevant information, defining and exp	plaining						
CO 1:	plaining						
topics under discussion.							
Show competence in working with a methodology, structuring their or	al work,						
CO 2: and synthesizing information.							
Use appropriate registers and vocabulary, and will demonstrate com	mand of						
CO 3: voice modulation, voice projection, and pacing.							
Demonstrate that they have paid close attention to what others say	and can						
CO 4: respond constructively.							
Develop persuasive speech, present information in a compell							
CO 5: structured, and logical sequence, respond respectfully to opposing idea	is, show						
depth of knowledge of complex subjects, and develop their abili							
synthesize, evaluate and reflect on information.							
Mapping of COs to POs							
COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 P PO 9 PO 10	PO 11						
8							
CO 1 * *	*						
CO 2 * * * *	*						
CO 3 * * *	*						



CO 4	*							*	*			*	
CO5:	*							*	*			*	
Learni	ng stra	ategies,	contac	t hou	rs and s	student]	learning	time					
Learnin	ng strat	egy				Contact hours					Student learning		
										tin	ne (Hrs)		
Lecture	2					-				-			
Semina	r					-					-		
Quiz						-				-			
Small Group Discussion (SGD)						14				-			
Self-di	elf-directed learning (SDL)					-				-			
Probler	n Base	d Learn	ing (PE	BL)		-				-			
Case B	Case Based Learning (CBL)				-				-				
Clinic				-				-					
Practical					-				-				
Revision				-				-					
Assessment					-				-				
TOTA	L					14				-			
Assess	ment N	/lethod	s:							•			
Forma	tive:							Sı	ımm	ativ	ve:		
Semina	ır Topi	c Select	ion										
Synops	ys revi	ew											
PPT Re	eview												
Mappi	ng of a	issessm	ent wit	h Cos	5								
Nature	of asse	essment			CO 1	CO	2 CO 3	C C	O 4		CO 5		
Present	ation				*	*	*	*			*		
Feedba	ack Pro	ocess	•	End	-Semest	er Feedl	back	I			1		
Refere	nce M	aterial	Partic	ular t	o the cho	osen Ser	ninar						



Name of the Program:	Master of Engineering - ME (Internet of Things)											
Course Title:	Project Work											
Course Code: IOT 799	Course l	Instru	ctor:									
Academic Year: 2020 - 2021	Semeste	er: Se	econd Year	, Semes	ster 3, 4							
No of Credits: 25	Prerequisites: SDLC, Communication Skills, technical skills.											
Synopsis: The project work aim	as to challenge analytical, creative ability and to allow											
students to synthesize	e, apply	the e	xpertise a	nd ins	ight lea	rned in t	the core					
discipline.												
Students build self-o	Students build self-confidence, demonstrate independence, and developrofessionalism on successfully completion of the project.											
professionalism on suc												
Course												
Outcomes On successful complex	tion of th	nis cou	irse, stude	nts wil	l be able	e to						
(COs):												
CO 1:	n working environment and processes that in place at the											
relevant Industries.												
CO 2: To familiarize the cha	llenges as relevant professionals.											
CO 3: Review the literature a	and develop solutions for real time onboard projects.											
CO 4: Write technical report	and deliver presentation.											
CO 5: Apply engineering and	management principles to achieve project goal.											
Mapping of COs to POs												
COs PO 1 PO 2 PO 3 PO 4	PO 5 P	06	<i>PO</i> 7	<i>PO</i> 8	PO 9	PO 10	PO 11					
CO 1	*	:	*	*	*	*	*					
CO 2	*											
CO 3 * * * *	*											
CO 4 * * * *												
CO5:	*		*	*	*	*	*					
Course content and outcomes:	·						•					
Content	Con	mpete	ncies									
Phase 1:												



TRED BY V (Deemed to b								
Problem identification, synopsis	At the end of the topic student should be able to:							
submission, status submission, mid	1. Identify the problem/specification (C1)							
evaluation.	2. Discuss the project (C2)							
	3. Prepare the outline (C3)							
	4. Prepare a mid-term project presentation report							
	(C3)							
	5. Prepare and present mid-term project							
	presentation slides (C3, C5)							
	6. Develop project implementation in							
	hardware/software or both in chosen platform							
	(C5)							
Phase 2								
Status submission, final evaluation.	1. Prepare the progress report (C3)							
	2. Prepare the final project presentation report							
	(C3)							
	3. Prepare and present final project presentation							
	slides (C3, C5)							
	4. Modify and Develop implementation in							
	hardware/software or both in chosen platform							
	(C3, C5)							
	5. Justify the methods used and obtained results							
	(C6)							
Learning strategies, contact hours and	student learning time							
Learning strategy	Contact hours Student learning							
	time (Hrs)							
Lecture								
Seminar								
Quiz								
Small Group Discussion (SGD)								
Self-directed learning (SDL)								
Problem Based Learning (PBL)								
Case Based Learning (CBL)								



Clinic		-			-		
Practical					-		
Revision	-			-			
Assessment	-			-			
TOTAL		-		-			
Assessment Methods:							
Formative:				Summativ	ve:		
Project Problem Selection				Mid-Term	n Presentation		
Synopsys review				Second sta	atus review		
First status review				Demo & I	Final Presentation		
Mapping of assessment with	Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Mid Presentation	*	*					
Presentation	*	*	*	*			
Feedback Process • H	End-Semes	ster Feedl	back	1	1		
Reference Material Particula	ar to the cl	nosen pro	ject				

PROGRAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAP





	Course													
Sl.No.	Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CSE 601	Data Structures and Algorithms	3	*	*		*		*					
2		Operating Systems for IoT	3	*	*	*		*						
3		IoT Networks and Protocols	3	*	*	*	*							
4	IOT 603	IoT Security	3	*	*	*	*	*						
5		Fundamentals of Machine Learning	3	*	*	*	*							
6		Cloud Application Development with JAVA	3	*	*	*		*						
7		Digital Signal Processing	3	*	*	*	*	*						
8		IoT Application Development	3	*	*	*	*	*						
9		Data Structures and Algorithms Lab	1		*	*		*			*			
10	IOT 601L	Operating Systems for IoT Lab	1	*	*	*		*						
11	IOT 602L	IoT Networks and Protocols Lab	1	*				*	*					
12	IOT 603L	IoT Security Lab	1	*		*	*	*					*	
10		Fundamentals of Machine Learning Lab	1	*	*	*	*							
11	CDC-603L	Cloud Application Development with JAVA Lab	1	*		*		*						
12	ESD-603 L	Digital Signal Processing Lab	1	*	*		*	*						
13	IOT-606L	IoT Application Development Lab	1	*			*	*						
11	IOT 695	Mini Project - 1	4				*	*	*	*	*	*	*	*
12	IOT 697	Seminar - 1	1	*							*	*		*
13	BDA 614	Big Data and Data Visualization	3	*	*	*	*			*				
14	ESD 605	Embedded Systems	3	*	*	*		*						



15	IOT 604	Embedded Sensing Systems and Networks	3	*		*	*	*			*		*	
16	IOT 605	Responsive Web Application Development	3	*	*	*	*	*						
17	BDA-605	Machine Learning for Big Data	3	*	*	*	*	*						
18	CSE-605	Mobile Application Development using Android	3	*	*	*	*	*						
19	ENP-601	Entrepreneurship	3	*		*	*		*		*		*	
20	ESD-604	Device Drivers	3	*	*	*		*						
21	CSE-631	IT Project Management	3	*	*	*								
22	BDA 614L	Big Data and Data Visualization Lab	1	*	*	*	*	*	*		*	*	*	
23	ESD 605L	Embedded Systems Lab	1	*	*	*		*						
24	IOT 604L	Embedded Sensing Systems and Networks Lab	1	*		*	*	*			*		*	
25	IOT 605L	Responsive Web Application Development Lab	1	*		*	*	*						
26	BDA-605L	Machine Learning for Big Data lab	1	*	*	*	*							
27	CSE-605L	Mobile Application Development using Android lab	1	*	*	*	*	*						
28	ENP-601L	Entrepreneurship lab	1	*					*		*		*	
29	ESD-604L	Device Drivers lab	1	*	*	*		*						
30	CSE-631L	IT Project Management lab	1			*	*	*				*		
31	IOT 696	Mini Project - 2	4				*	*	*	*	*	*	*	*



32	IOT 698	Seminar - 2	1	*							*	*		*
33	IOT 799	Project Work	25	*	*	*	*	*	*	*	*	*	*	*