

Manipal School of Information Sciences

Manipal Academy of Higher Education, Manipal

Outcome Based Education (OBE) Framework

Two Year full time Postgraduate Program

Master of Engineering - ME (Blockchain Technology)



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NATURE AND EXTENT OF THE PROGRAM

Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic principle of this platform is that it allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. Public blockchain platforms allow us to guarantee these properties with overwhelming probabilities even when untrusted users are participants of distributed applications with ability to transact on the platform. Even though, blockchain technology has become popularly known because of its use in the implementation of Cryptocurrencies such as BitCoin, Ethereum, etc., the technology itself holds much more promise in various areas such as time stamping, logging of critical events in a system, recording of transactions, trustworthy e-governance etc. Many researchers are working on many such use cases such as decentralized public key infrastructure, self-sovereign identity management, registry maintenance, health record management, decentralized authentication, decentralized DNS, etc. Also, corporations such as IBM and Microsoft are developing their own applications in diverse fields such as the Internet of Things (IoT), etc., even enabling blockchain platforms on the cloud.

Considering the need to disseminate the emerging concepts for engineering graduates, a program on blockchain technology is offered, so they can fit industry ready and take also take research in the area of Blockchain Technology.

Master of Engineering - ME (Blockchain Technology) postgraduate degree would welcome engineering graduates from any electrical discipline with 50% mark in qualifying exam. Students after successfully completing the program will get career opportunities as an Blockchain Architect, Blockchain application Developer, Blockchain and Blockchain Stack developer.



PROGRAM EDUCATION OBJECTICE (PEO)

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

Master of Engineering - ME (Blockchain Technology) program are as follows.

PEO No	Education Objective
PEO 1	Engineers will possess good fundamentals, computing, and problem-solving ability,
	and solve the real time problems in the areas of Blockchain Technology.
PEO 2	Engineers who are innovative, bring out novel ideas in addressing the research issues
	and challenges and pursue their interest in research /Higher Education
PEO 3	Engineers who have leadership qualities and inclination, become entrepreneurs



GRADUATE ATTRIBUTES

S No.	Attribute	Description				
		Acquire in-depth knowledge of specific discipline or professional				
	Scholarshin of	area, including wider and global perspective, with an ability to				
1		discriminate, evaluate, analyse and synthesise existing and new				
	Knowledge	knowledge, and integration of the same for enhancement of				
		knowledge.				
		Analyse complex engineering problems critically, apply				
2	Critical Thinking	independent judgement for synthesising information to make				
2	Critical Thinking	intellectual and/or creative advances for conducting research in a				
		wider theoretical, practical and policy context.				
		Think laterally and originally, conceptualise and solve				
		engineering problems, evaluate a wide range of potential				
3	Problem Solving	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.				
		Extract information pertinent to unfamiliar problems through				
	Research Skill	literature survey and experiments, apply appropriate research				
		methodologies, techniques and tools, design, conduct				
4		experiments, analyse and interpret data, demonstrate higher order				
4		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.				
		Create, select, learn and apply appropriate techniques, resources,				
5	Usage of modern	and modern engineering and IT tools, including prediction and				
5	tools	modelling, to complex engineering activities with an				
		understanding of the limitations.				
		Possess knowledge and understanding of group dynamics,				
	Collaborative and	recognise opportunities and contribute positively to				
6	Multidisciplinary	collaborative-multidisciplinary scientific research, demonstrate a				
	work	capacity for self-management and teamwork, 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.						
		themserves as well as others.						
		Demonstrate knowledge and understanding of engineering and						
	Project	management principles and apply the same to one's own work,						
7	Management and	as a member and leader in a team, manage projects efficiently in						
	Finance	respective disciplines and multidisciplinary environments after						
		consideration of economical and financial factors.						
-		Communicate with the engineering community, and with society						
		at large, regarding complex engineering activities confidently						
0		and effectively, such as, being able to comprehend and write						
o	Communication	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						
0		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						
	Ethical Practices	of conduct, ethics of research and scholarship, consideration of						
10	and Social	the impact of research outcomes on professional practices and an						
	Responsibility	understanding of responsibility to contribute to the community						
		for sustainable development of society.						
	.	Observe and examine critically the outcomes of one's actions and						
11	Independent and	make corrective measures subsequently, and learn from mistakes						
•••	Reflective Learning	without depending on external feedback						
		without depending on external reedback.						



QUALIFICATIONS DESCRIPTORS

- 1. Demonstrate
 - (i) A systematic, extensive, coherent knowledge and understanding of an academic field of study, as a whole, its applications, and links to related disciplinary areas/subjects of study; including a critical understanding of the established theories, concepts, number of advanced and emerging issues in the field of Blockchain Technology.
 - (ii) Procedural knowledge that creates different types of professionals related to the Blockchain Technology, including research and development, teaching, government and public service.
 - (iii) Professional skills in the domain of blockchain technology with the knowledge of developing applications deployment, and testing using the modern tools and programming languages.
- 2. Demonstrate comprehensive knowledge on cryptocurrencies, blockchain applications, network security, cryptographic algorithms, web application development, data structures and operating systems.
- 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 Blockchain 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 (Blockchain Technology), Students will be able to:

PO No	Attribute	Competency						
DO 1	Scholarship of	Acquire knowledge to build applications for blockchain						
POI	Knowledge	technology domain of Blockchain Technology.						
PO 2	Critical Thinking	Identify, formulate, analyze, and solve real-life problems with						
102		Blockchain Technology.						
		Identify. formulate, review research aspects and analyse issue						
DO 3	Problem Solving	in the domain of Blockchain Ecosystem using various aspects						
103		like Blockchain Application Development, Blockchain Testing						
		and Automation, Blockchain Deployment.						
		To identify problems related to blockchain and able to provide						
PO 4	Kesearch Skill	design solutions from literature study.						
PO 5	Usage of modern	Create, select, and apply appropriate techniques, resources, for						
100	tools	building and deploying Blockchain applications and tools.						
	Collaborative	To identify much have a sub-hands with measure have in the field						
DO 6	and	of healthcore hanking coversment coming and many more						
PUO	Multidisciplinary	or nearmoare, banking, government, gaming and many more						
	work	and provide solutions using blockchain technology.						
	Project	Demonstrate knowledge and understanding of Blockchain						
PO 7	Management and	Technology and apply to architect and develop blockchain						
107	Finance	applications, principles as a member and leader in a team, to						
		manage projects and in multidisciplinary environments.						
PO 8		Communicate effectively with the engineering community and						
	Communication	with society at large, such as, being able to comprehend and						
		write effective reports and design documentation, make						
		effective presentations, and give and receive clear instructions.						



PO 9	Life-long Learning	Ability to develop professional skills to prepare them for immediate employment and for lifelong learning in advanced areas of Blockchain and its applications.
PO 10	Ethical Practices and Social Responsibility	Apply ethical principles and commit to professional ethics and responsibilities and norms of the Blockchain Technology and security practices.
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 (Blockchain Technology)

Semester: 1

Semester: 2

Subject Code	Subject Title	L	Т	Р	С	Subject Code	ubject Code Subject Title		Т	Р	С
CSE 601	Data Structures and Algorithms	3	-	-	3	CDC 607	CDC 607 DevOps for Cloud		-	-	3
BCH 601	Blockchain Application Development	3	-	-	3	BCH 602	2H 602 Network Security and Analysis		-	-	3
BCH 603	Blockchain Technology	3	-	-	3	BCH 604	BCH 604 Advanced Blockchain Application Development		-	-	3
BCH 605	Cryptocurrency and Smart Contracts	3	-	-	3	BCH 606	Blockchain Verification and Testing	3	-	-	3
	Elective - 1	3	-	-	3		Elective - 2	3	-	-	3
CSE 601L	Data Structures and Algorithms Lab	-	-	3	1	CDC 607L	DevOps for Cloud Lab	-	-	3	1
BCH 601L	Blockchain Application Development Lab	-	-	3	1	BCH 602L	Network Security and Analysis Lab	-	-	3	1
BCH 603L	Blockchain Technology Lab	-	-	3	1	BCH 604L Advanced Blockchain Application Development Lab		-	-	3	1
BCH 605L	Cryptocurrency and Smart Contracts Lab	-	-	3	1	BCH 606L	Blockchain Verification and Testing Lab	-	-	3	1
	Elective - 1 Lab	-	-	3	1		Elective - 2 Lab	-	-	3	1
BCH 695	Mini Project - 1	-	-	4	-	IOT 696	Mini Project - 2	-	-	-	4
BCH 697	Seminar - 1	-	-	1	-	IOT 698	Seminar - 2	-	-	-	1
Total		15	-	15	25	Total		15	-	15	25

SECOND YEAR (FINAL YEAR): ME (Blockchain Technology)

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



List of Electives(Theory)

	Elective - 1	Elective - 2		
Code	Subject	Code	Subject	
BCH-615	Distributed Computing and Databases	BCH-616	Cloud Computing	
BDA-623	Architecture of Big Data Systems	BCH-617	Machine Learning	
CSE-604	Database Programming in Java	ENP-601	Entrepreneurship	

List of Electives(Lab)

	Elective - 1	Elective - 2			
Code	Subject	Code	Subject		
DCU 6151	Distributed Computing and Databases Lab	BCH-	Cloud Computing Lab		
DCH-015L	Distributed Computing and Databases Lab	616L	Cloud Computing Lab		
BDA-	Architecture of Pig Data Systems Lab	BCH-	Mashina Lasming Lah		
623L	Architecture of Big Data Systems Lab	617L	Machine Learning Lab		
CSE-604L	Database Programming in Java Lab	ENP-601L	Entrepreneurship Lab		



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

Name o	f the Pr	ogram:			Mas	Master of Engineering - ME (Blockchain Technology)						
Course	Title:				Data	Data Structures and Algorithms						
Course	Code:	CSE 601			Cou	Course Instructor:						
Academic Year: 2020 - 2021					Sem	ester:	First Y	ear, Sen	nester 1			
No of Credits: 3						requisite	s: Basi	c Progra	amming	– prefera	bly C	
Synops	is:	This C	ourse pr	ovides i	nsight	on						
		1. Th	is course	introdu	ices st	udents to	o elem	entary c	lata stru	ctures a	nd design	
		of	of algorithms.									
		2. Students learn how to design optimal algorithms with respect to time a									time and	
		space										
		3. Students learn how to implement link list, stack, queues, searching an									ching and	
		sor	ting tech	niques,	sets, t	rees and	l graph	s.				
		4. Stu	dents le	arn the	desig	n of div	vide a	nd cond	quer tec	chnique,	dynamic	
		pro	grammi	ng, gree	edy tec	hnique a	and bad	ck track	ting.			
Course	<u>!</u>											
Outcom	nes	On suc	cessful c	complet	ion of	this cou	rse, stu	idents v	will be a	ble to		
(COs):												
CO	1:	Specify	y and an	alyse al	gorith	ms.						
со	2:	Learn a structu	and desi§ re.	gn prog	rams f	or imple	ementa	tion of [linear a	nd non li	near data	
CO	3:	Learn	and desig	gn prog	rams f	or sortin	g and	searchi	ng.			
CO	1.	Illustra	te app	lication	of	divide	and	conque	er tech	inique,	dynamic	
	4.	progra	mming, g	greedy (technio	que and	back tı	acking				
Mappi	ng of C	Os to P	Os									
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	*	* *										
Course	Course content and outcomes:											
Content						Compe	tencies	5				



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



Unit 5: Operations on Sets	
Introduction to Sets, A Linked- List	1. Develop data structures for sets (C6)
implementation of Set, The Dictionary, The	2. Design a linked list-based
Hash Table Data Structure	implementation of sets (C6)
	3. Design a Dictionary (C6)
	4. Design Data structure for hash table
	(C6)
Unit 6: Trees	
Basic Terminology, Implementation of	1. Examine the concepts of trees. (C3)
Trees, Binary Trees, Binary Search Trees	2. Design and implement general trees
	(C6)
	3. Design and implement binary trees
	(C6)
	4. Design and implement binary search
	trees (C6)
Unit 7: Graphs	
Basic definitions, Representation of Graphs,	1. Define graphs (c6)
Minimum Cost Spanning Tree, Single Source	2. Design data structure for graphs (c6)
Shortest Paths,	3. Formulate an algorithm to solve
All-Pairs Shortest Path	minimum cost spanning tree(c6)
	4. Formulate an algorithm to solve
	Single source shortest path (c6)
	5. Formulate an algorithm to solve All-
	pair shortest path(c6)
Unit 8: Algorithm Design Techniques	
Divide-and-Conquer Algorithms, Dynamic	1. Design of divide and conquer
Programming, Greedy Algorithms,	algorithms (C6)
Backtracking	2. Solve max min, Strassen's matrix
	multiplication, multiplication of
	long integers problem. (C6)
	3. Design of dynamic programming
	techniques (C6)



		4. Solve	matrix chain	order problem	
		(C6)			
		5. Design of greedy algorithms(C6)			
		6. Solve	Knap-sack, j	ob scheduling	
		with d	eadlines and o	optimal storage	
		on tape	es problems. (C	C6)	
		7. Design	of Back track	ting algorithms	
		(C6)			
Learning strategies, contact hours	and stude	ent learning tir	ne		
Learning strategy		Contact hours	Student learn	ing 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 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	
Sessional Examination 1	*	*			



Sessional Examination	12		*	*	*		
Assignment/Presentati	on	*	*	*	*		
End Semester Examina	ation	*	*	*	*		
Feedback Process	End-Semester Feedback						
Reference Material	1. "Introduction to Algorithms" Thomas H. Cormen, Charles E.						
	Leiserson, Ronald L. Rivest.						
	2. "Data St	2. "Data Structures& Algorithms" Aho, Hopcroft and Ulmann					
	3. "Data st	3. "Data structures and algorithm analysis in C" Mark Allen Weiss					
	4. "Comput	ter Algorith	ms" : Ellis	s Horowitz,	Sartaj Sahni,		
	Sanguthe	evar Rajaseka	ran				



Name of the Program:			Mast	Master of Engineering - ME (Blockchain Technology)							
Course	e Title	:			Block	Blockchain Application Development					
Course Code: BCH 601				Cour	Course Instructor:						
Academic Year: 2020 - 2021				Seme	ester:	First Ye	ear, Seme	ster 1			
No of	Credit	s: 3			Prer	equisite	es: -				
Synop	This Course provides insight on This Course provides insight						insight o	n depth			
		practic	al knov	wledge	in Blo	ockchain	techno	logy. The	e basic	understar	iding of
	programming required for building blockchain application using Node.js. This							.js. This			
		course	allows	studen	ts to ha	ve a fur	ndament	al knowle	edge on	HTML, C	CSS and
		JavaSc	ript for	develo	ping bl	lockchai	in or any	v web app	olication	s.	
Course	e										
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, stu	dents wil	ll be able	e to	
(COs):	:										
CO	1:	List and understand the blockchain applications									
CO	2:	To identify the programming languages used for blockchain development									
		Plan and prepare the fundamentals of programming required for blockchain						ckchain			
co	3:	development.									
CO	4:	Solve t	o write	applic	ation in	genera	l or spec	ific to bl	ockchair	ı	
CO	5:	Model	and Co	onstruct	the blo	ockchair	n applica	ation			
Mappi	ing 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							*				
CO 4			*	*							
Course content and outcomes:											
Conten	ıt				(Compete	encies				
Unit 1	:										
Introdu	ction t	o applic	ations	– Туре	es of	1 7	Co evolo	in the cou	ncent of	web and	ications
Applications–ApplicationvsI.Io explain the concept of web applications(C2)											



Implementation – Functional vs Non- functional – Programming languages in Blockchain – Blockchain Platforms Introduction to Web Applications – Web Servers – HTML vs HTML 5 – HTML FORMS – CSS – CSS3	2.	To identify the block application developme To illustrate application CSS (C3)	chain platforms for nt (C1) ons using HTML and
Unit 2:			
JavaScript – JQUERY – AJAX	1.	To explain the construct (C2) To illustrate application jQuery and AJAX (C3)	cts of JAVASCRIPT ons with JavaScript ,
Unit 3:			
Node.js – Constructs of Node.js – Classes – Objects - Creating blockchain with node.js	1. 2. 3.	To explain the constru- To explain the concept (C2) To illustrate applicatio	cts in Node.js (C2) s of OOPS in node.js ns with node.js (C3)
Unit 4:			
Introduction to Databases – Database Tools – Databases in Blockchain - ER diagrams - Normalization – SQL – NOSQL	1. 2. 3.	To explain the cord databases (C2) To describe the conce (C2) To illustrate the work SQL tools (C3)	ncepts involved in opts of ER diagrams ing of SQL and NO
Learning strategies, contact hours and	studen	t learning time	
Learning strategy		Contact hours	Student learning time (Hrs)
Lecture		30	60
Seminar		-	-
Quiz		02	04



Small Group Discuss	ion (SGD)		02	2		02	
Self-directed learning (SDL) -						04	
Problem Based Learning (PBL) 02						04	
Case Based Learning	(CBL)		-			-	
Clinic			-			-	
Revision			02	2		-	
Assessment			06	5		-	
TOTAL			44	ł		74	
Assessment Methods	s:						
Formative:				S	Summativ	ve:	
Internal practical Test	t			S	Sessional e	examination	
Theory Assignments				I	End semes	ter examination	
Lab Assignment & Viva	Lab Assignment & Viva			V	Viva		
Mapping of assessm	ent with Co	S		•			
Nature of assessment		CO 1	CO 2		CO 3	CO 4	
Sessional Examination	on 1	*	*				
Sessional Examination	on 2				*	*	
Assignment/Presentat	tion	*	*		*	*	
End Semester Examin	nation	*	*		*	*	
Laboratory examinati	on	*	*		*	*	
Feedback Process	End-Semes	ster Feedbac	k				
Reference Material	1. Learn	Blockchain	Programm	ing	with Java	Script: Build your	
	very	own Block	chain and	de	centraliz	ed network with	
	JavaSo	cript and No	o de.js , Eric T	Frauł	o, Packt Pi	ublishing, 2018.	
	2. HTML	5 Black	Book (Co	vers	CSS3,	JavaScript, XML,	
	ХНТМ	IL, AJAX	, PHP, jQ	Quer	y), DT	Editorial Services,	
	Dreamtech Press, Second edition, 2016.						
	3. HTML & CSS: The Complete Reference, Thomas Powell,						
	McGra	w Hill Educ	ation, Fifth E	Editio	on, 2017.		
	4. Begin	ning Node.j	s, Basarat Al	li Sy	ed, Apress	s, 2014.	



5.	Node.Js Web Development, David Herron, Ingram short title;
	3rd Revised edition, 2016.
6.	Mastering Node.js, Sandro Pasquali, Kevin Faaborg, Packt
	Publishing Limited; 2nd Revised edition, 2017
7.	Full-Stack JavaScript Development: Develop, Test and
	Deploy with MongoDB, Express, Angular and Node on AWS,
	Eric Bush, Red Sky, 2016.
8.	Blockchain Applications: A Hands-On Approach, Arshdeep
	Bahga, Vijay Madisetti, VPT, 1 edition, 2018.



Name of the Program:			Mast	Master of Engineering - ME (Blockchain Technology)							
Course	e Title:	:			Bloc	Blockchain Technology					
Course	e Code	: BCH	603		Cour	Course Instructor:					
Acade	mic Ye	ear: 202	20 - 202	21	Seme	ester:	First Y	ear, Sem	ester 1		
No of	Credit	s: 3			Prer	equisit	es: Bas	ic Netwo	ork Conce	epts	
Synop	sis:	This C	Course	provide	es insig	ght on	underst	anding tl	he worki	ng of bl	ockchain
		techno	logy ar	nd how	block	chain p	latform	works. '	The cour	se discus	s on the
		nuance	s invo	lved in	block	chain to	echnolo	gy and i	its imple	mentatio	n on the
		blockc	hain pla	atform.							
Course	e										
Outco	mes	On suc	cessful	compl	etion of	f this co	ourse, st	udents w	ill be abl	e to	
(COs):	:										
CO	1:	Ou	tline th	e chara	cteristi	cs of th	e block	chain ecc	osystem.		
CO	2:	Develop the blockchain ecosystem using Ethereum.									
CO	3:	Evaluate the application based on Ethereum.									
CO	4:	Exa	amine t	he deve	elopme	nt proce	ess usin	g Hyperl	edger.		
CO	5:	De	monstr	ate the	blockcl	hain app	olication	n develop	oment pro	ocess.	
Mappi	ing of (COs to]	POs								
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 1	*	*		*							
CO 2	*				*						
CO 3	*	*	*		*						
CO 4	*	*									
CO 5	*		*		*						
Course content and outcomes:											
Conten	ıt				(Compet	encies				
Unit 1	:										
Introdu	iction t	o Block	chain -	Potenti	al of []	At the e	nd of th	e topic s	tudent sh	ould be a	ble to:
Blockchain – Defining Blockchain –											



Ownership - Understanding Ledger -	1 . To describe the potential of blockchain and its
$Ledger Structure \ - \ Concepts of$	architecture. (C2)
Ownership – Centralized vs	2. To describe the relation between blockchain
Decentralized - Components of a	and smart contracts. (C2)
Blockchain -Characteristics of	3 . To describe the consensus and CAP theorem.
Blockchain - The growth of blockchain	(C2)
technology - Distributed systems - The	
history of blockchain and Bitcoin -	
Types of blockchain – Consensus - CAP $% \mathcal{C}^{(n)}$	
theorem and blockchain -	
Decentralization using blockchain	
Methods of decentralization- Routes to	
decentralization - Blockchain and full	
ecosystem decentralization- Smart	
contracts- Decentralized Organizations.	
Unit 2:	
Ethereum and working with Smart	1. To describe the working of the smart contracts
	(C2)
Contracts : Understand Ethereum	
Contracts:UnderstandEthereum,DefineSmartContracts,Identify	2. To illustrate the concepts involved in Ethereum
Contracts:UnderstandEthereum,DefineSmartContracts,IdentifyCryptocurrencyusedin	2. To illustrate the concepts involved in Ethereum and its development (C2)
Contracts:UnderstandEthereum,DefineSmartContracts,IdentifyCryptocurrencyusedinEthereum,DescribeTransactionsin	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using
Contracts:UnderstandEthereum,DefineSmartContracts,IdentifyCryptocurrencyusedinEthereum,DescribeTransactionsinEthereum,DefineConsensus	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts :UnderstandEthereum,DefineSmartContracts,IdentifyCryptocurrencyusedinEthereum,DescribeTransactionsinEthereum,DefineConsensusMechanisminEthereum,List	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts:UnderstandEthereum,DefineSmartContracts,IdentifyCryptocurrencyusedinEthereum,DescribeTransactionsinEthereum,DefineConsensusMechanisminEthereum,ListDevelopmentTechnologies,Identify	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts : Understand Ethereum ,Define Smart Contracts,Identify Cryptocurrency used in Ethereum,Describe Transactions in Ethereum,Define Consensus Mechanism in Ethereum,List Development Technologies,Identify Ethereum Clients, Define Platform	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts : Understand Ethereum ,Define Smart Contracts,Identify Cryptocurrency used in Ethereum,Describe Transactions in Ethereum,Define Consensus Mechanism in Ethereum,List Development Technologies,Identify Ethereum Clients, Define Platform Functions,Understand Solidity,	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts:UnderstandEthereum,DefineSmartContracts,IdentifyCryptocurrencyusedinEthereum,DescribeTransactionsinEthereum,DefineConsensusMechanisminEthereum,ListDevelopmentTechnologies,IdentifyEthereumClients,DefineFunctions,UnderstandSolidity,DescribeSolidityOperatorsAndSolidityOperators	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts : Understand Ethereum ,Define Smart Contracts,Identify Cryptocurrency used in Ethereum,Describe Transactions in Ethereum,Define Consensus Mechanism in Ethereum,List Development Technologies,Identify Ethereum Clients, Define Platform Functions,Understand Solidity, Describe Solidity Operators and Functions,Setting up Metamask,How to	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts : Understand Ethereum ,Define Smart Contracts,Identify Cryptocurrency used in Ethereum,Describe Transactions in Ethereum,Define Consensus Mechanism in Ethereum,List Development Technologies,Identify Ethereum Clients, Define Platform Functions,Understand Solidity, Describe Solidity Operators and Functions,Setting up Metamask,How to interface with ethereum network,First	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)
Contracts : Understand Ethereum ,Define Smart Contracts,Identify Cryptocurrency used in Ethereum,Describe Transactions in Ethereum,Define Consensus Mechanism in Ethereum,List Development Technologies,Identify Ethereum Clients, Define Platform Functions,Understand Solidity, Describe Solidity Operators and Functions, Setting up Metamask,How to interface with ethereum network,First smart contract,Ethereum accounts and	 To illustrate the concepts involved in Ethereum and its development (C2) To describe the creation of applications using solidity. (C2)



contract Declaring a function	
contract, Declaring a function,	
Deploying and redeploying of a	
contract,Comparing Wei & Ether,What	
is a gas transaction,Remix testing.	
Unit 3:	
Hyperledger : Define Hyperledger	1. To explain the concepts of Hyperledger (C2)
Blockchain, Understand Hyperledger	2. To identify different components in
Consensus Algorithm ,Explain	Hyperledger (C2)
Hyperledger Iroha ,Identify	3. To illustrate the examples of Hyperledger (C3)
Hyperledger Components ,Describe	
Setting up Channels Policies	
,Chaincodes List Hyperledger ,	
Explorer Components ,Define	
Hyperledger Composer, Fabric Under	
the Hood (Concepts &	
Terminology),Ledger	
Implementation, Dev Environment	
Walkthrough: Peer & CouchDB	
setup,Ledger Implementation,Peers	
Nodes : Anchors and Endorsers, Anchor	
Peers & Endorsing Peers, Clients Node:	
Endorsement Policies, Client Peer &	
Endorsing Policies Orderer	
Nodes, Membership Service Provider &	
Certification Authority,Dev	
Environment Walkthrough: Orderer and	
CA Server, Chaincode Development.	
Unit 4:	
Creating private Blockchain with	1. To define and describe the multichain
Multichain : Define Multichain ,	blockchain (C2)



Describe MultiChain Streams , Create	2. To explain the mining in multichain process
& deploy private blockchain ,Explain	(C3)
Connecting to a Blockchain ,Identify	3. To illustrate the deployment of multichain
Multichain Interactive Mode ,List	blockchain and its applications (C2)
Native assets ,Define Transaction	
Metadata ,Explain Streams Explain	
Mining ,Bitcoin to private	
blockchain, Aim of multichain, Hand-	
shake process,Multi-chain use	
cases,Multichain	
permission,Multichain	
assets, multichain streams, Basics of	
retrieving from streams,Consensus	
model,Multichain	
flexibility, Deployment options, Speed	
and scalability of multichain	

Learning strategies, contact hours and student learning 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:	Summative:	Summative:						
Internal practical Test	Sessional examination							
Theory Assignments					End semester e	End semester examination		
Lab Assignment & Viva					Viva			
Mapping of assessme	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	*	*	*	*	*		
End Semester Examin	nation	*	*	*	*	*		
Laboratory examinati	on	*	*	*	*	*		
Feedback Process	End-Seme	ster Feed	dback		1			
Defense Meterial	1 Disala)	N I T		J		
Kelerence Material	1. BIOCKO	Donial I	Draschar	A mon-1	st Edition 2017	auction in 25		
	2 Bogint	Daniel I	lockchoir	$\mathbf{A} \mathbf{P} \mathbf{C} \mathbf{S} \mathbf{S}, \mathbf{I}$	ginner's Cuid	o to Building		
	2. Degini Blocko	hain Sc	olutions	Rikramad	itva Singhal Ga	utam Dhameia		
	Privans	su Sekha	ar Panda.	Apress: 1	st ed. Edition 20)18		
	3. Maste	ring Blo	ockchain	. Imran B	ashir. Ingram sh	ort title. Second		
	Editior	n, 2018.		,	, 8	- · · · · · · · · · · · · · · · · · · ·		
	4. Hands	-On B	lockchai	n with	Hyperledger,	Petr Novotny		
	Venkat	traman	Ramakris	shna Niti	n Gaur Anthony	y O'Dowd Luc		
	Desros	iers, Ing	gram shor	t title, 201	8.			
	5. Solidit	y Prog	ramming	g Essentia	als, Ritesh Mod	i, Ingram short		
	title, 20	018						
	6. Block	Chain f	rom Co	ncept to	Execution, Deb	oajani Mohanty,		
	BPB; 2	2nd revis	sed and u	pdated ed	ition, 2018.			
	7. Master	ring Bl	lockchaiı	n Progra	mming with S	Solidity: Write		
	produ	ction-re	ady sma	rt contra	acts for Ethere	um blockchain		
	with S	olidity,	Jitendra (Chittoda, I	Packt Publishing	Limited, 2019.		



8.	Hands-On Blockchain with Hyperledger, Petr Novotny
	Venkatraman Ramakrishna Nitin Gaur Anthony O'Dowd Luc
	Desrosiers, Ingram short title, 2018
9.	Blockchain for Dummies , Tiana Laurence, 2 nd edition – 2019.
10	. Hands-On Smart Contract Development with Solidity and
	Ethereum: From Fundamentals to Deployment, David Hoover,
	Kevin Solorio, Randall Kanna, Shroff/O'Reilly; First edition, 2019.
11	. Blockchain By Example: A developer's guide to creating
	decentralized applications using Bitcoin, Ethereum, and
	Hyperledger, Bellaj Badr , Richard Horrocks, Xun (Brian) Wu ,
	Packt Publishing Limited, 2018.
12	. Introducing Ethereum and Solidity: Foundations of
	Cryptocurrency and Blockchain Programming for Beginners,
	Chris Dannen, APRESS, 1 edition, 2017.
13	. Ethereum: Blockchains, Digital Assets, Smart Contracts,
	Decentralized Autonomous Organizations, Henning Diedrich,
	CreateSpace Independent Publishing Platform; 1 st edition, 2016.



Name of the Program:			Mast	Master of Engineering - ME (Blockchain Technology)									
Course	e Title				Cryp	Cryptocurrency and Smart Contracts							
Course	e Code	BCH	605		Cour	Course Instructor:							
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 1							
No of	Credit	s: 3			Prer	equisite	es: Cr	yptograpl	ny Basi	ics, Net	working		
~					Basic	s, Prog	rammin	g aspects					
Synop	sis:	This C	ourse p	rovides	sinsigh	t on							
			Discus	ss the in	npleme	ntation	of cryp	tocurrenc	cies.				
		Understand main blockchain concepts like Proof-of-Work, mining,											
		peer-to-peer connections, etc.											
			Build	their ov	vn bloc	kchain	and cry	ptocurren	icy.				
			Design	n, test, s	and dep	loy sec	ure Sma	art Contra	acts				
Course	e												
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, st	udents wi	ill be abl	e to			
(COs):	:												
CO 1:		To out	line the	details	crypto	graphy	and its	basic alg	orithms.				
CO 2:		To ide	ntify an	d desig	gn and p	orogram	smart o	contracts.					
CO 3:		Illustra	te user	-define	d opera	tions of	arbitra	ry compl	exity.				
CO 4:		Design	Code	Deploy	and Ex	ecute a	Smart	Contract.					
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 content and outcomes:													
Conter	ıt				(Compet	encies						
Unit 1	: Int	roductio	on										
Introdu	ction	to Sec	curity:	Need	for	At the o	nd of th	e topic st	udent ch	ould be a	ble to:		
Security	y, CIA t	riad, Sei	rvices -	Mechar	isms	ns							
and Attacks, Classic Encryption Techniques													



 Substitution cipher - Transposition cipher, Characteristic of Cryptographic Systems- Modern Encryption Techniques, symmetric key, asymmetric key, PKI and Key Management, block cipher, stream cipher, Hashing Unit 2: 	 To identify the encryption and decryption techniques (C1) To infer key management and Hashing technique in cryptography. (C3)
Introduction to Bitcoin - Background on Digital Payment - Bitcoin Protocol specification - Security Transactions in Bitcoin - Applications/Extensions of Bitcoin	 To explain the working of the bitcoin (C2) To illustrate security transactions, happen in bitcoin. (C3)
Unit 3: Identify Bitcoin & How to Get Bitcoins ,Identify Bitcoin Wallets ,Identify Wallet , Define Selling Bitcoins , Compare Bitcoin Blockchain , Transaction & Transaction Script , Describe Various Transaction Forms in Bitcoin,Define Scripts in Bitcoin ,List Nodes in Bitcoin Network.	 To identify bitcoin and examine the procedure of selling and purchasing bitcoins. (C1) To describe the various Transactions (C2) To write scripts for Bitcoin (C3)
Unit 4: Understand Economics of Bitcoin , Define Bitcoin , Mining Describe , Fabrication of a Block Header ,Define Mining Identify ,Successful Mining List ,Difficulties in Solo Mining ,Understand Mining ,By pool of Miners,Mining and consensus ,Autonomous verification of mining,Independent verification of mining,Checklist for verification of mining,Combining transactions into blocks,Combination of verified transactions,Combining transactions into blocks,Portrayal of difficulty,Condition of difficulty,Creation of block header,Main chain and Orphan	 To describe and discuss on the miners and mining process (C2) To test the mining process (C4) To describe the types of miners. (C2)



block,Creation of new block,Independent						
validation of new block,The race for						
bitcoin mining and hash race,Difficulty						
rising with the hashing power of the						
miners, Solo mining and difficulty of solo						
mining, Benefits of pooled mining, Types of						
mining pools.						
Unit 5:						
Introduction to Smart Contracts - History -	 To describe and create smart contracts (C1) Define smart contacts with Ethereum (C1) 					
Definition - Advantages of Smart Contracts						
- Ricardian contracts - Creating Smart						
Contracts with Ethereum Ecosystem	3. Discuss the advantage and disadvantages of					
	smart contacts(C2)					
Learning strategies, contact hours and	student learning time					
Learning strategy	Contact hours	Student learning				
		time (Hrs)				
Lecture	30	60				
Seminar	-	-				
Quiz	02	04				

02

-

02

-

-

02

06

44

Summative:

Viva

Sessional examination

End semester examination

02

04

04

-

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-

74

Small Group Discussion (SGD)

Problem Based Learning (PBL)

Self-directed learning (SDL)

Case Based Learning (CBL)

Assessment Methods:

Internal practical Test

Theory Assignments

Lab Assignment & Viva

Clinic

Revision

TOTAL

Assessment

Formative:



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	natic	on	*	*	*	*				
Laboratory examinati	on			*		*				
Feedback Process	En	d-Seme	ster Feedbac	k	1					
Reference Material	1.	Crypto	ography and	d Network S	Security - Pr	inciples and Practice,				
		Stallin	gs William,	Pearson Ed	ucation; Seve	enth edition, 2017				
	2.	Crypto	ography An	d Network	Security, Fo	orouzan, McGraw Hill				
		Educat	ion, 2015							
	3.	 Cryptography and Network Security, Atul Kahate, McGraw Hill Education; Third edition, 2017. 								
	4.	The A	ge of Crypt	cocurrency:	How Bitcoi	n and Digital Money				
		Are Cl	hallenging t	lenging the Global Economic, Paul Vigna, Michael J.						
		Casey,	St. Martin's	Press, 2015						
	5.	Master	ring Ethere	um: Buildi	ng Smart C	ontracts and DApps,				
		Andre	as M. Anto	nopoulos, E	Dr. Gavin Wo	ood, , Shroff/O'Reilly;				
		First ec	irst edition, 2018							
	6.	Master	ring Bitcoi	n: Progra	mming the	Open Blockchain,				
		Andrea	as M. Antone	opoulos, Shr	off/O'Reilly;	Second edition, 2017.				
	7.	Progra	amming Bit	coin: Leari	n How to P	rogram Bitcoin from				
	Scratch, Jimmy Song, O'Reilly Media, 1 edition 2019.									
	8.	Blocko	chain for Bu	siness with	Hyper-ledge	e r Fabric , Nakul Shah,				
		BPB P	3PB Publications; 1 st edition, 2019.							
	9.	Hands	ands-On Cybersecurity with Blockchain, Rajneesh Gupta,							
		Packt I	Publishing; 1	st edition, 2	2018.					



1	0. Ethereum Smart Contract Development: Build blockchain-
	based decentralized applications using solidity, Mayukh
	Mukhopadhyay, Packt Publishing Limited, 2018.
1	11. Building Blockchain Projects, Narayan Prusty, Packt Publishing
	Limited, 2017.
1	2. Hands-On Bitcoin Programming with Python: Build powerful
	online payment centric applications with Python, Harish Garg,
	Packt Publishing Limited, 2018.
1	13. Bitcoin and Cryptocurrency Technologies – A Comprehensive
	Introduction Hardcover, Arvind Narayanan, Joseph Bonneau,
	Edward Felten, Andrew Miller , Steven Goldfeder, Princeton
	University Press, 2016.
1	4. Fundamentals of Smart Contract Security, Richard Ma, Jan
	Gorzny, Edward Zulkoski, Momentum Press, 2019.



Name of the Program:				Mast	Master of Engineering - ME (Blockchain Technology)									
Course	e Title:				Distr	Distributed Computing and Databases								
Course	e Code	: BCH-	615		Cou	Course Instructor:								
Acade	mic Ye	ear: 202	20 - 202	21	Seme	ester:	First Y	ear, Seme	ester 1					
No of	s: 3			Prer	equisite	es:	Introduct	tory C	ourse	n IoT,				
					Netw	orking	Basics,	, Program	nming as	spects, C)perating			
					syste	m, Linu	IX							
Synop	sis:	This C	ourse p	rovides	s insigh	t on								
		The co	urse al	lows st	udents	to have	e a good	l understa	inding of	n how di	stributed			
		system	allows	resour	ce sha	ring, in	cluding	software	by syst	ems con	nected to			
		the net	work.	The cou	urse als	so discu	sses on	the distri	buted da	atabases	and how			
		they he	elp in st	oring d	ata. Th	e relate	d tools a	and progr	amming	using C/	JAVA is			
		discuss	sed on t	he prac	ctical as	spects o	f the dis	sturbed co	mputing	ζ.				
				-		_								
Course	e													
Outco	mes	On suc	cessful	compl	etion of	f this co	ourse, st	udents wi	ll be abl	e to				
(COs):	:													
CO 1:		To ide	ntify an	d intro	duce co	oncepts	related	to distribu	uted com	puting s	ystems.			
CO 2:		Identif	y the in	troduct	tory dis	tributed	l databa	se concep	ots and it	s structu	res.			
CO 3:		Descril	be term	s relate	ed to dis	stribute	d object	database	design a	and mana	igement.			
CO 1		Produc	e the	transac	tion m	anagen	nent and	d query	processi	ng techn	iques in			
CO 4:		DDBM	IS.											
CO 5:		Relate	the im	ortanc	e and a	pplicati	on of er	nerging d	atabase	technolo	øv.			
Mann	ma of					PP					57.			
wiappi			rUs											
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	*	* * * .												
Course	e conte	nt and	outcon	nes:										
Conten	ıt				(Compet	encies							
Unit 1	:													



Distributed Systems – Examples - Resource Sharing and the Web- Challenges – Distributed System Models – Architectural, Fundamental - Interprocess Communication - API for Internet protocols – Message-Oriented Communication – Unicasting - Multicasting and Broadcasting - Client- Server communication – Group Communication.	 To outline the characterization of the distributed systems (C1) To describe the architecture of the distribute systems(C2) To explain the interprocess communications (C5) To explain the client-server architecture (C5)
Distributed Operating Systems: Issues in Distributed Operating System – Remote Invocation - Communication between distributed objects - Remote procedure calls -Threads in Distributed Systems – Clock Synchronization – Election Algorithms – Distributed Mutual Exclusion – Distributed Transactions – Distributed Deadlock – Agreement Protocols.	 To outline the characteristics of operating systems. (C1) To examine the threads in distributed systems(C5) To explain the exclusion, deadlock in distributed systems (C5)
Unit 3:	
Distributed File Systems: Introduction - File service architecture - File System- Enhancements and further developments - Name Services: Introduction - Name Services and the Domain Name System - Directory Services - Time and Global States -	 To review the distributed file systems (C2) To explain the domain name system and services (C5) To examine the time and clocks involved In Distributed systems. (C5)



Synchronizing physical clocks - Logical	
time and logical clocks - Distributed	
debugging - Coordination and	
Agreement-Introduction - Distributed	
$mutual \ exclusion - Elections \ - \ Multicast$	
communication-Consensus and related	
problems	
Unit 4:	
Distributed Shared Memory:	1. To explain the shared memory concepts in
Introduction - Design and	distributed computing. (C2)
implementation issues - Sequential	2. To describe the consistent models (C2)
consistency and Ivy case study - Release	3. To explain the fault tolerance and its types.
consistency and Munin case study -	(C5)
Other consistency models - Introduction	
to Fault Tolerance - Distributed Commit	
$Protocols-Byzantine\ Fault\ Tolerance-$	
Impossibilities in Fault Tolerance.	
Unit 5:	
Introduction to Databases -Structured	1. To explain the type of databases (C2)
vs Unstructured vs SemiStructured data	2. To describe the entity relationships (C2)
- RDBMS $-$ Entity Relationships $-$ SQL	3. To examine the graph databases and its tools
- NOSQL - Distributed Databases -	(C4)
Graph Databases – Tools	
Unit 6:	
Security In Databases: Security	1. To Describe the security issues in database
requirements of database systems -	systems. (C2)
Reliability and Integrity in databases -	2. To describe the security issues in Databases
Redundancy – Recovery –	(C2)
Concurrency/ Consistency – Monitors –	3. To Describe the process of SQL injection. (C3)
Sensitive Data – Types of disclosures –	



Inference-Finding and Confirming SQL								
injection								
Learning strategies, contact hours and student learning time								
Learning strategy			Contact hours				Student learning	
							time (Hrs)	
Lecture			3	30	60			
Seminar					-		-	
Quiz				C)2		04	
Small Group Discussi	on (SGD)			0)2		02	
Self-directed learning	(SDL)				-		04	
Problem Based Learn	ing (PBL)			C)2		04	
Case Based Learning	(CBL)				-		-	
Clinic					-		-	
Revision				C)2	-		
Assessment		06				-		
TOTAL				4	4	74		
Assessment Methods	:							
Formative:						Summa	ative:	
Internal practical Test			Sessional				al examination	
Theory Assignments						nester examination		
Lab Assignment & Viva								
Mapping of assessme	ent with Cos	S						
Nature of assessment		CO 1	L	CO 2		CO 3	CO 4	
Sessional Examination	n 1	*		*				
Sessional Examination	n 2					*		
Assignment/Presentat			* *		*	*		
End Semester Examin	*		*	*		*		
Laboratory examination *				*		*	*	
Feedback Process	End-Semes	ster Feed	dback	K				


Reference Material	1.	SQL injection Attacks and defense , Justin Clarke, Syngress, 2 nd						
		edition,2012						
	2.	Distributed Systems Concepts and Design, George Coulouris,						
		Jean Dollimore, Tim Kindberg, Gordon Blair, Pearson, 5 th edition, 2011.						
	3.	Distributed Systems Principles and Paradigms,						
		A.S.Tanenbaum, M.Van Steen, PHI, 2012.						
	4.	Distributed Computing: Fundamentals, Simulations and						
		Advanced Topics, Hagit Attiya and Jennifer Welch, Wiley, 2004.						
	5.	Distributed Computing Principles and Applications, M.L.Liu,						
		Pearson Addison Wesley, 2004.						
	6.	Graph Databases: New Opportunities for Connected Data, Ian						
		Robinson, Jim Webber, Emil Eifrem, Shroff/O'Reilly, 2nd Edition,						
		2016.						
	7.	Graph Algorithms: Practical Examples in Apache Spark &						
		Neo4j, Mark Needham, Amy E. Hodler, Shroff/O'Reilly; First						
		edition, May 2019.						



Name of the Program:					Mast	Master of Engineering - ME (Blockchain Technology)							
Course Title:				Arch	Architecture of Big Data Systems								
Course Code: BDA 623						Course Instructor:							
Academic Year: 2020 - 2021					Seme	ester:	First Y	ear, Seme	ester 1				
No of Credits: 3				Prer	equisite	es: -							
Synop	sis:	This C	ourse p	orovides	s insigh	t on							
1. Students learn the				e conc	ept of b	oig data	characte	ristics, t	atch and	lambda			
		arc	hitectu	re.									
		2. Thi	is cours	se intro	duces s	tudents	to basic	es file syst	tems in I	Big Data			
		3. Thi	is cour	se helj	ps the	student	to un	derstand	the con	cepts of	Hadoop		
		fra	meworl	k, Sparl	k frame	work aı	nd their	internals.					
		4. Thi	is cours	se help	s the st	udents	to learn	n Map-rec	luce pro	grammin	g, Spark		
		pro	gramm	ing.									
		5. Stu	idents l	earn the	e differ	ent laye	rs with	use cases	demons	trations.			
Cours	e												
Outco	mes	On suc	cessful	compl	etion of	this co	urse, st	udents wi	ll be able	e to			
(COs)	:												
CO	1:	Exami	ne the t	ype of	data in	big data	ì.						
CO	2:	To des	ign app	olication	ns based	d with H	ładoop	framewoi	·k.				
CO	3:	To des	ign app	olication	ns based	d with s	park are	chitecture	•				
CO	4.	To buil	ld appli	cations	based of	on the B	ig Data	Architect	ure platf	orms and	analyse		
	7.	the res	ults bas	sed on t	he outc	ome of	the app	lications	used.				
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	*	*	*		*	*	*			*			
Course	Course content and outcomes:												



Content	Competencies
Unit 1: Classifying Big Data Chara	cteristics
Analysis type - real time or batched for	1. Identify different types of Data (C1)
later analysis.	2. Identify processing methodology (C1)
Processing methodology - predictive,	
analytical, ad-hoc query, and reporting.	
Data frequency and size	
On demand, as with social media	
data	
Continuous feed, real-time -	
weather data, transactional data	
Time series - time-based data	
Data type - transactional, historical,	
master data and metadata.	
Content formats - structured,	
unstructured, semi-structured	
Data sources - Web and social media,	
humans, machines, transaction data and	
biometric data.	

Unit 2: Big Data processing - the Lambda architecture

Vertical partitioning.

Append-only, immutable data	1. Understand Lambda architecture to handle				
Batch layer Serving layer Speed layer Case study: Druid - A Real-time Analytical Data Store	 Big Data (C2). Understand different layers in Lambda Architecture (C2). 				
Unit 3 Batch layer, Serving layer and S	Speed layer				
Choosing a storage solution for the batch layer: Distributed file systems,	 Develop applications to store data in HDFS (C4). 				



ManReduce: a paradigm for Big Data	2	Develop applications	for batch processing			
mapreduce. a paradigin for big Data	2.					
computing.		using Map Reduce tech	nnique (C4).			
Performance metrics for the serving	3. Understand the need of serving layer					
laver	4.	Design application	to store data for			
		processing in serving l	ayer (C4).			
Requirements for a serving layer	5	Understand the need of	Speed layer for data			
database	5.	C_{1}	speed hayer for data			
Computing real time views Storing real time views Challenges of incremental computation Asynchronous versus synchronous updates		processing (C2).				
Unit 4: Spark: Alternatives to MapH	Reduc	e				
Spark Architecture						
Spark Session	1.	Understand Spark A	rchitecture for data			
DataFrame		processing (C2).				
Transformations and Actions	2. Design applications using DataFrames a					
Spark SQL		RDDs (C4).				
Resilient Distributed Datasets						
(RDDs)						
Unit 5: Stream Processing using Spa	rk					
Advantages and challenges of stream	1.	Understand different	stream processing			
processing		techniques (C2).				
Streaming APIs	2	Design applications for	r handling real time			
Sucanning AT IS	۷.	data using Structured S	Streaming (C4)			
Structured Stream Processing		autu abing prioration of	(C 1).			
Unit 6: Machine Learning using Spa	ark					
High level M-Lib concepts	1.	Understand different li	braries and packages			
M-Lib in Action		for machine learning in	$s_{\text{park}}(C2)$			
	~		тэрагк (С <i>2)</i> .			
	2.	Design machine learnin Spark (C4).	ng model using			
Learning strategies, contact hours and s	tuden	t learning time				
Learning strategy	Cont	act hours	Student learning			
			time (Hrs)			



	30		60	
	-		-	
Quiz				
Small Group Discussion (SGD)				
	-		04	
	02		04	
	-		-	
	-		-	
	02		-	
	06		-	
	44		74	
	Sur	Summative:		
	Ses	sional examinati	on	
	Enc	l semester exami	nation	
	Viv	a		
CO 1	CO 2	CO 3	CO 3	
*	*			
	*	*		
			*	
*	*	*	*	
*	*	*	*	
End-Semester Feedback				
1 Pig Date: Principles and hast practices of scalable real time date				
1. Dig Data: Principles and best practices of scalable real-time data systems - Nathan Marz and James Warren Manning Publisher				
systems - Nathan Marz and James Warren. Manning Publisher.				
- Nathan Marz a : The Definitive	Guide: Storas	ze and Analysis	at Internet	
	CO 1 CO 1 * * * * * * * * *	- 02 02 - 02 - 02 - 02 - 02 - 02 06 44 - 06 - 44 - 06 - 44 - 06 - 44 - 06 - 44 - 07 - 5es - End Viv - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - * * </td <td>- 02 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 044 - 5essional examinati - End semester exami Viva Viva - CO 1 CO 2 CO 3 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * <t< td=""></t<></td>	- 02 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 044 - 5essional examinati - End semester exami Viva Viva - CO 1 CO 2 CO 3 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * <t< td=""></t<>	



3	. Spark:	The Def	initive C	Buide: Big Dat	a Process	ing Made Simple –	
	Bill Cl	Bill Chambers, Matei Zaharia, O'Reilly Publication 1 st Edition.					
4	. <u>http://s</u>	http://static.druid.io/docs/druid.pdf,					
	<u>http://c</u>	http://druid.io/docs/0.8.0/design/design.html					
5	. Big da	Big data architecture and patterns - IBM developerWorks.					
	http://v	www.ibm	.com/de	veloperworks	/library/bc	l-archpatterns1/	
6	i. Big	Data	and	Analytics	-IBM	developerWorks.	
	http://v	www.ibm	n.com/de	veloperworks	/analytics/	/	
7	. <u>http://l</u>	http://lambda-architecture.net/					
8	. Apach	Apache HBase - <u>http://hbase.apache.org/</u>					
9	. Apach	Apache Spark Streaming - https://spark.apache.org/streaming/					
1	0. Summ	ingbird		MapReduce		library -	
	https://	github.co	om/twitt	er/summingbi	rd		



Name	e of th	Ithe Program: Master of Engineering - ME (Blockchain Technology)										
Cours	se Titl	e:			Dat	Database Programming in Java						
Cours	se Coo	le: CSE	2-604		Cou	Course Instructor:						
Acad	emic Y	(ear: 2	- 2020 -	2021	Sen	<u>iester:</u>	First `	Year, Sei	mester .	1		
No of	Cred	i ts: 3			Pre	requisit	es: Ba	asic prog	rammi	ng know	ledge	
Synoj	psis:	1.	To	provid	e fu	ndament	al kno	owledge	of va	arious o	bject o	riented
			nrog	rammi	ng co	ncents a	nd data	base cor	cents			
				·		neepts u		1.				
		2.	To d	esign a	and d	evelop c	latabas	e applica	itions u	sing java	a progra	mming
			langı	lage.								
Cours	se	On su	ccessfi	ıl com	pletic	on of this	s course	e, studen	ts will	be able to	C	
Outco	omes	es										
(COs):											
CO 1:	:	Explain major principles of object oriented programming concepts										
CO 2:		Discuss the different elements of java programming language										
CO 3:	:	Design databases using the conceptual model										
CO 4:	:	Develop a java application for various database requirements										
Mapp	ping of	f COs t	o POs									
Cos	PO	<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	PO 12
	1											
CO 1	*	*										
CO 2	*	*	*		*							
CO 3		*		*								
CO 4			*		*							
Cours	se con	tent an	d outo	comes:								
Conte	ent					Compet	encies				No of I	Hours
Unit 1	1: In	troduc	tion									
Objec	t Orie	ntation	(00)	Conce	pts	• Illust	roto wi	th on ove	mpla th	a maior	nringinl	aa ayah
	• Illustrate with an example the major principles such						es such					
						as c	lasses,	objects	, enca	psulation	n, inhei	ritance,
	polymorphism (C2)											
							1 	1 4				
						 Distil 	nguisn	betw	een	procedu	ire o	riented
						prog	rammir	ng and	object	oriented	progra	mming
						(C2)						



Unit 2: Introduction to Java	
Data types, Operators, Control Statements.	 Discuss features of java programming language (C2) Discuss the term platform independence specific to java programming language (C2) Explain various data types, operators and control statements (C2)
Unit 3: Classes in java	
Class fundamentals, Constructs, Garbage collection, Inner Classes	 Define class structure in java programming language (C1) Discuss various components of class structure which includes concepts constructors, variables, methods using java (C2) Explain the mechanism garbage collection (C2) Illustrate the use of inner classes (C2)
Unit 4: Inheritance	
Introduction to Java Inheritance, Multilevel inheritance, Abstract, final classes	 Define different types of inheritance (C1) Explain abstract classes (C2) Discuss final classes (C2) Apply abstract classes and final classes in applications (C3)
Unit 5: Packages, Interfaces	
Package, access control, Interfaces.	 Illustrate the use of packages in an application (C2) List various access control mechanism (C1) Define java interfaces (C1) Apply interfaces in applications. (C3)
Unit 6: I/O API's	



Reader,WriterAPIs,FileManagementUnit 7:Exception HandlingUsing exception handling, Creatinguser defined exceptions.	 List the types of steam classes available (C1) Write java program to read data from different types of files (C3) Discuss file management in java (C2) Discuss the types of exception handle (C2) Explain user define exception class (C2)
Unit 8: Java Applets, Applicati Java Applets, life cycle, methods, java Application	 ons Define java applets (C1) Discuss life cycle of java applets (C2) Distinguish between java applets and java applications (C2)
Unit 9: Introduction to Swing Swing components, Event handling, layout managers	 Distinguish between AWT components and swing components (C2) Define features of swing components (C1) Apply different swing components, layout managers in java applications (C3) Discuss event delegation model (C2)
Unit 10: Introduction to Database Primary goal of RDBMS, Purpose of Database System, Characteristics of the Database Approach, Actors on the Scene, Workers behind the scene, Advantages of Using a DBMS, Views of Data	 concepts Define Relational database management (C1) Discuss the purpose of database system (C2) Explain characteristics of the database approach (C2) List actors on the scene and workers behind the scene (C1) Discuss advantages of using DBMS (C2)



Unit 10: SQL					
Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Derived Relations, Views, Modification of the Database, Joined Relations, Data-Definition Language	 Explain basic structure of SQL statement (C2) Discuss set operations (C2) Explain different types of aggregate functions (C2) Explain Views, nested queries, joined relations (C2) Discuss data definition language (C2) 				
Unit 10: Introduction to JDBC					
JDBC Architecture, Connecting to an ODBC Data Source, JDBC Connection, JDBC Implementation, Resultset Processing, Prepared statement, Other JDBC Classes, Moving the cursor in scrollable Result Sets, Making updates to Updatable Result Sets.	 Explain JDBC architecture (C2) Explain JDBC connection and its implementation (C2) Explain different types of jdbc classes which are required for database applications (C2) 				

Learning strategy	Contact hours	Student learning time			
		(Hrs)			
Lecture	30	60			
Seminar	-	-			
Quiz	02	04			
	02	02			
Small Group Discussion (SGD)	02	02			
Solf directed learning (SDL)		04			
Self-directed learning (SDL)	-	04			
Problem Based Learning (PBL)	02	04			
Case Based Learning (CBL)	-	-			
-					
Clinic	-	-			
D ::	02				
Revision	02	-			
Assessment	06				
	00	-			



TOTAL			4	4	74			
Assessment Metho	ods:							
Formative:				Summ	ative:			
Theory Assignment	t			Sessio	Sessional Examination			
Lab Assignment				Univer	rsity End Semester			
				Exami	nation			
Lab Test				Viva				
Viva								
Mapping of assess	ment with	Cos						
Nature of assessme	nt	CO 1	CO 2	CO 3	CO 4			
Sessional Examinat	tion 1	*	*					
Sessional Examinat	tion 2			*				
Assignment/Present	tation		*	*	*			
End Semester Exam	nination	*	*	*	*			
Feedback	End-Seme	ester Feedl	back					
Process								
Reference	1. Patrick	k Naughton	n and Herb	ert Schildt	– "JAVA 2 – The Complete			
Material	Refere	ence", Tata	a McGraw I	Hill.				
	2. George	e Reese -	"Database	Program	ning with JDBC and Java",			
	O'Reilly							
	3. "Datab	base system	n Concepts	s",Author:	Abraham Silberschatz (Bell			
	Labor	atories), H	Ienry F. Ko	orth(Bell L	aboratories) and S. Sudarshan			
	(Indian Institute of Technology, Bombay, Publishers: The McGraw							
	Hill C	ompanies,	Inc.					
	4. "Fund	amentals o	of Database	systems".	Author: Elmasri and Navath			



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

Name of the Program:					Master of Engineering - ME (Blockchain Technology)						
Course Title:			Data S	Data Structures and Algorithms Lab							
Course Code: CSE 601L				Cours	Course Instructor:						
Academic Ye	ar: 2020	- 2021		Seme	ster: F	irst Year	, Semester	r 1			
No of Credits	: 1			Prere	equisites	C Prog	gramming				
Synopsis:	This C	ourse p	rovide	s insigh	t on						
	1.	This c	course	introdu	ces stu	dents to	o elemen	tary dat	a structu	res and	
	des	ign of	algorith	nms.							
	2.	Studer	nts lear	n how t	to desig	n optim	al algorit	hms wit	h respect	to time	
	and	l space									
	3.	Studer	nts lear	n how to	o imple	ment lin	k list, sta	ck, queu	es, search	ing and	
	sor	ting tec	chnique	es, sets,	trees ar	nd graph	ıs.				
	4.	Studer	nts lear	n the d	esign o	f divide	and con	quer tec	hnique, c	lynamic	
	pro	gramm	ing, gr	eedy te	chnique	e and ba	ck trackir	ıg			
Course											
Outcomes	On suc	cessful	compl	etion of	f this co	ourse, st	udents wi	ll be abl	e to		
(COs):											
CO 1:	Specify	Specify and analyse algorithms									
CO 2.	Learn	and des	sign pro	ograms	for imp	plement	ation of l	inear an	d non lin	ear data	
02:	structu	re.									
CO 3:	Learn a	and des	ign pro	ograms	for sort	ing and	searching	<u>.</u>			
CO 4:	Illustra	ite ap	plicatio	on of	divide	e and	conque	r techi	nique, c	lynamic	
CU 4:	program	mming	, greed	y techn	ique and	d back t	racking.				
CO 5:	Learn	to orga	nise the	e code f	or scala	bility a	nd mainta	inability	/.		
Mapping of	COs to]	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	<i>PO</i> 9	PO 10	PO 11	
CO 1	*										
CO 2	*	*		*			*				
CO 3	*	*		*			*				
CO 4	*	*		*			*				
CO 5	*	*		*			*				
	1	1			1	1	1	1			



Course content and outcomes:	
Content	Competencies
Unit 1: Elementary data structures	
Implementation of Lists, Stacks,	1. Illustrate and Implement singly linked list.
Queues	(C3)
	2. Illustrate and Implement doubly linked
	list. (C3)
	3. Illustrate and Implement array-based
	stack. (C3)
	4. Illustrate and Implement pointer-based
	stack. (C3)
	5. Illustrate and Implement array-based
	queues. (C3)
	6. Illustrate and Implement pointer-based
	queues.(C3)
Unit 2: Sorting & Searching Technique	ues
Quick sort, Heap sort, Merge sort,	1. Illustrate and implement programs for
Binary search, linear search, Fibonacci	insertion sort, bubble sort and selection sort. (C3)
search	2. Illustrate and implement programs for
	quick sort. (C3)
	3. Illustrate and implement programs for
	heap sort. (C3)
	4. Illustrate and implement programs for
	merge sort. (C3)
	5. Illustrate and implement programs for
	binary, linear and Fibonacci search. (C3)
Unit 3: Trees	
Basic Terminology, Implementation of	1. Experiment the working of binary
Trees, Binary Trees, Binary Search	trees. (C4)
Trees	2. Experiment the working of binary search
	trees. (C4)



	3. Experiment the worki	ng of Tree traversal
	technique. (C4)	
Unit 4: Graphs		
Basic definitions, Representation of	1. Illustrate with a gra	ph using adjacency
Graphs, Minimum Cost Spanning Tree,	matrix and adjacency list tech	iniques. (C3)
Single Source Shortest Paths, All-Pairs	2. Illustrate the implem	nent minimum cost
Shortest Path	spanning tree. (C3)	
	3. Illustrate the Single	source shortest path
	problem. (C3)	
	4. Illustrate the All-	pair shortest path
	problem. (C3)	
Unit 5: Algorithm Design Techniques		
Divide-and-Conquer Algorithms,	1. Illustrate max min problem	n. (C3)
Dynamic Programming, Greedy	2. Illustrate Strassen's m	atrix multiplication
Algorithms, Backtracking	problem. (C3)	
	3. Illustrate matrix chain orde	er problem. (C3)
	4. Illustrate knap-sack, job s	cheduling with dead
	line and optima storage on tag	os problems. (C3)
	5. Illustrate n queens ar	nd graph colouring
	problems. (C3)	
Learning strategies, contact hours and	l 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					-				
Assessment		0	6		-				
TOTAL			4	8			-		
Assessment Methods:									
Formative:					Summa	ative:			
Internal practical Tes	t				Session	al examinat	ion		
Theory Assignments					End ser	nester exam	ination		
Lab Assignment & Viva					Viva				
Mapping of assessm	ent with Co	S							
Nature of assessment		CO 1	CO 2		CO 3	CO 4	CO 5		
Sessional Examination	*	*							
Sessional Examination	on 2		*		*	*			
Assignment/Presentar	tion	*	*		*	*	*		
Laboratory Examinat	ion	*	* *		*	*	*		
Feedback Process	End-Semes	ster Feedb	ack						
Reference	1. "Introdu	uction to A	Algorithms" 7	Гho	mas H. (Cormen, Ch	arles		
Material	E. Leiserso	on, Ronald	l L. Rivest.						
	2. "Data Structures& Algorithms" Aho, Hopcroft and Ulmann								
	3. "Data structures and algorithm analysis in C" Mark Allen								
	Weiss								
	4. "Compu	uter Algor	ithms" : Ellis						
	Horowitz,	SartajSahı	ni, Sangutheva	arR	ajasekar	an			



Name o	Name of the Program: Mas					Master of Engineering - ME (Blockchain Technology)					
Course	Title:				Block	Blockchain Application Development LAB					
Course	Code:	BCH 6	01L		Cour	Course Instructor:					
Acaden	nic Yea	c Year: 2020 - 2021 Semester: First Year, Semester 1									
No of C	credits:	3			Prer	equisites	:				
Synop	sis:	This Course provides insight on depth practical knowledge in Blockchain									
		technology. The basic understanding of programming required for building									
		blockchain application using Node.js. This course allows students to have a									
		fundan	nental	knowle	edge o	n HTM	L, CSS	and Ja	vaScript	for dev	veloping
		blockcl	hain or	any we	eb appl	ications.					
Course	e										
Outco	nes	On suc	cessful	compl	etion o	f this co	urse, stu	idents wi	ll be able	e to	
(COs):											
CO	1:	To buil	d and c	levelop	the wo	eb based	blockcl	hain appl	ications.		
CO	2:	To ider	ntify the	e progr	ammin	g langua	ages use	d for bloo	ckchain	developm	ient.
CO	3:	To illu	strate a	nd dem	onstra	te proble	ems requ	ired for l	blockcha	in develo	pment.
CO	4:	To writ	te appli	cation	in gene	eral or sp	pecific to	o blockch	nain.		
CO	5:	To Mo	del and	Const	ruct the	e blockcl	hain app	lication.			
Mappi	ng of (COs to l	POs								
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 1	*	*		*	*						
CO 2	*		*		*						
CO 3	*	*	*		*						
CO 4	*			*	*						
Course	Course content and outcomes:										
Conten	nt -				(Compete	encies				
Unit 1	:										
Introdu	ction t	o applic	ations	– Туре	es of	1. 1	To demo	nstrate th	ne Install	ation of 1	required
Applic	ations	_	Applic	ation	vs	p	latform	and its st	tudy. (C	l)	1 · · ·



Implementation – Functional vs Non-					
functional – Programming languages in					
Blockchain – Blockchain Platforms					
Introduction to Web Applications -					
Web Servers - HTML vs HTML 5 -					
HTML FORMS – CSS – CSS3					
Unit 2:					
JavaScript – JQUERY – AJAX	 To demonstrate/illust JAVASCRIPT (C2) To demonstrate JavaScript , jQuery and 	rate constructs of applications with d AJAX (C3)			
Unit 3:					
Node.js – Constructs of Node.js –	1. To illustrate the constr	ucts in Node.js (C2)			
Classes – Objects - Creating blockchain	2. To illustrate the concepts of OOPS in				
with node.js	node.js (C2)	-			
	3. To illustrate applicatio	ns with node.js (C3)			
Unit 4:					
Introduction to Databases – Database	1. To illustrate the co	ncepts involved in			
Tools – Databases in Blockchain - ER	databases (C2)				
diagrams - Normalization - SQL -	2. To illustrate the conce	epts of ER diagrams			
NOSQL	(C2)				
	3. To illustrate the work	ing of SQL and NO			
	SQL tools (C3)				
Learning strategies, contact hours and s	student learning time				
Learning strategy	Contact hours	Student learning			
		time (Hrs)			
Lecture	12	-			
Seminar	-	-			
Quiz	-	-			



Small Group Discuss	ion (SGD)		-		-		
Self-directed learning	(SDL)		-		-		
Problem Based Learn	ing (PBL)		-		-		
Case Based Learning	(CBL)		03		-		
Clinic			-		-		
Practical			24	-	-		
Revision			03		-		
Assessment			06		-		
TOTAL			48		-		
Assessment Methods	5:						
Formative:				Summativ	ve:		
Internal practical Test	t		Sessional examination				
Theory Assignments			End semester 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	on	*	*	*	*		
Feedback Process	End-Semes	ster Feedbac	k				
Reference Material	1. Learn	Blockchain	Programm	ing with Java	aScript: Build your		
	very	own Block	chain and	decentraliz	ed network with		
	JavaScript and Node.js, Eric Traub, Packt Publishing, 2018.						
	2. HTML	5 Black	Book (Cov	vers CSS3,	JavaScript, XML,		
	XHTM	IL, AJAX,	, PHP, jQ	uery), DT	Editorial Services,		
	Dream	tech Press, S	econd editio	n,2016.			



3.	HTML & CSS: The Complete Reference, Thomas Powell,
	McGraw Hill Education, Fifth Edition, 2017.
4.	Beginning Node.js, Basarat Ali Syed, Apress, 2014.
5.	Node.Js Web Development, David Herron, Ingram short title;
	3rd Revised edition, 2016.
6.	Mastering Node.js, Sandro Pasquali, Kevin Faaborg, Packt
	Publishing Limited; 2nd Revised edition, 2017
7.	Full-Stack JavaScript Development: Develop, Test and
	Deploy with MongoDB, Express, Angular and Node on AWS,
	Eric Bush, Red Sky, 2016.
8.	Blockchain Applications: A Hands-On Approach, Arshdeep
	Bahga, Vijay Madisetti, VPT, 1 edition, 2018.



Name of the Program: Ma					Mas	Master of Engineering - ME (Blockchain Technology)						
Course Title: Blo				Blo	Blockchain Technology Lab							
Course Code: BCH 603L Co					Cou	Course Instructor:						
Acade	mic Y	ear: 202	20 - 20	21	Sen	nester: Fi	rst Yea	r, Seme	ster 1			
No of	Credit	s: 3			Pre	requisites:	Basic	Networ	k Conce	epts		
Synop	sis:	This C	ourse	provide	s ins	ight on une	derstanc	ling the	e workii	ng of blo	ockchain	
	technology and how blockchain platform works. The course discuss on the										s on the	
		nuance	s invo	lved in	bloc	kchain tech	nology	and its	s implei	nentatior	n on the	
		blockcl	hain pl	atform.								
Course	e											
Outco	mes	On suc	cessful	comple	etion	of this cour	se, stud	lents wi	ll be abl	e to		
(COs):	:			1								
CO 1:		Develo	p the b	lockcha	ain ec	cosystem us	ing Eth	ereum.				
CO 2:		Evalua	te the a	pplicat	ion b	ased on Eth	ereum.					
CO 3:		Examine the development process using Hyperledger.										
CO 4:		Demon	strate	the bloc	kcha	in applicati	on deve	lopmen	t proces	s.		
Mappi	ing of	COs to	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	*		*		*							
CO 2	*	*	*		*							
CO 3	*	*			*							
CO 4	*	*			*							
Course	Course content and outcomes:											
Conter	ıt					Competen	cies					
Unit 1	:											
Introdu	iction	to Block	kchain	- Poten	tial	At the end	of the t	opic stu	ident sh	ould be a	ble to:	
of Bloc	ckchair	n – Defii	ning Bl	ockchai	in –	1. Identif	y th	e re	quired	progr	amming	
Owner	ship –	Unders	tanding	g Ledge	er –	- environment and operating systems. (C1)						
Ledger	Stru	icture	– Co	ncepts	of							
Owner	Ownership – Centralized vs											



Decentralized - Components of a	2. Relate examples and constructs of the chosen
Blockchain -Characteristics of	programming languages (python/solidity).
Blockchain - The growth of	(C1)
blockchain technology - Distributed	
systems - The history of blockchain	
and Bitcoin - Types of blockchain -	
Consensus - CAP theorem and	
blockchain - Decentralization using	
blockchain Methods of	
decentralization- Routes to	
decentralization - Blockchain and full	
ecosystem decentralization- Smart	
contracts- Decentralized	
Organizations.	
Unit 2:	
Ethereum and working with Smart	1. To describe the architecture of Ethereum. (C1)
Contracts : Understand Ethereum	2. To illustrate and build blockchain examples
,Define Smart Contracts,Identify	with Ethereum platform. (C3)
Cryptocurrency used in	
Ethereum, Describe Transactions in	
Ethereum,Define Consensus	
Mechanism in Ethereum,List	
Development Technologies,Identify	
Ethereum Clients, Define Platform	
Functions, Understand Solidity,	
Describe Solidity Operators and	
Functions, Setting up Metamask, How	
to interface with ethereum	
network,First smart contract,Ethereum	
accounts and how to receive ether,	
Structuring a contract, Declaring a	



function, Deploying and redeploying	
of a contract,Comparing Wei &	
Ether, What is a gas transaction, Remix	
testing.	
Unit 3:	
Hyperledger : Define Hyperledger	1. To identify different components in
Blockchain , Understand Hyperledger	Hyperledger (C2)
Consensus Algorithm ,Explain	2. To illustrate the examples of Hyperledger (C3)
Hyperledger Iroha ,Identify	
Hyperledger Components ,Describe	
Setting up Channels Policies	
,Chaincodes List Hyperledger ,	
Explorer Components ,Define	
Hyperledger Composer, Fabric Under	
the Hood (Concepts &	
Terminology),Ledger	
Implementation,Dev Environment	
Walkthrough: Peer & CouchDB	
setup,Ledger Implementation,Peers	
Nodes : Anchors and Endorsers,	
Anchor Peers & Endorsing	
Peers, Clients Node: Endorsement	
Policies, Client Peer & Endorsing	
Policies Orderer Nodes, Membership	
Service Provider & Certification	
Authority,Dev Environment	
Walkthrough: Orderer and CA	
Server, Chaincode Development.	
Unit 4:	



	5 00 074							
Creating private Blockchain with	1.	To define and describe the multichain						
Multichain : Define Multichain ,		blockchain (C2)						
Describe MultiChain Streams , Create	2.	2. To explain the mining in multichain process						
& deploy private blockchain ,Explain		(C3)						
Connecting to a Blockchain ,Identify	3.	To illustrate the deployment of multichain						
Multichain Interactive Mode ,List		blockchain and its applications (C2)						
Native assets ,Define Transaction								
Metadata ,Explain Streams Explain								
Mining ,Bitcoin to private								
blockchain, Aim of multichain, Hand-								
shake process,Multi-chain use								
cases,Multichain								
permission,Multichain								
assets, multichain streams, Basics of								
retrieving from streams, Consensus								
model,Multichain								
flexibility, Deployment options, Speed								
and scalability of multichain								

Learning strategies,	contact hours and	d 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 Method	s:								
Formative:					Summat	ive:			
Internal practical Test					Sessional	l examination			
Theory Assignments				End seme	ester examination				
Lab Assignment & Viva				Viva					
Mapping of assessm	ent	with Co	OS						
Nature of assessment CO 1				CO 2	CO 3	CO 4			
Sessional Examination 1 *			*	*	*				
Sessional Examination 2					*	*			
Assignment/Presentation *				*	*	*			
End Semester Examination *				*	*	*			
Laboratory examinat	ion		*	*	*	*			
Feedback Process	En	d-Seme	ster Fee	dback					
Reference	1.	Block	chain E	Basics: A	Non-Technic	al Introduction in 25			
Material		Steps,	Daniel I	Drescher, A	Apress; 1 st Edi	tion, 2017.			
	2.	Beginı	ning Bl	lockchain:	A Beginner	r's Guide to Building			
		Blocke	chain So	olutions, Bi	ikramaditya Si	nghal, Gautam Dhameja ,			
		Priyan	su Sekha	ar Panda, A	press; 1st ed.]	Edition, 2018.			
	3.	Maste	ring Blo	ockchain, I	mran Bashir, I	ngram short title, Second			
		Edition	n, 2018.						
	4.	Hands-On Blockchain with Hyperledger, Petr Novotny							
		Venka	Venkatraman Ramakrishna Nitin Gaur Anthony O'Dowd Luc						
		Desros	iers, Ing	gram short (title, 2018.				
	5.	Solidit	y Prog	ramming 1	Essentials, Ri	tesh Modi, Ingram short			
		title, 2	018						



6.	BlockChain from Concept to Execution, Debajani Mohanty,
	BPB; 2nd revised and updated edition, 2018.
7.	Mastering Blockchain Programming with Solidity: Write
	production-ready smart contracts for Ethereum blockchain
	with Solidity, Jitendra Chittoda, Packt Publishing Limited, 2019.
8.	Hands-On Blockchain with Hyperledger, Petr Novotny
	Venkatraman Ramakrishna Nitin Gaur Anthony O'Dowd Luc
	Desrosiers, Ingram short title, 2018
9.	Blockchain for Dummies , Tiana Laurence, 2 nd edition – 2019.
10	. Hands-On Smart Contract Development with Solidity and
	Ethereum: From Fundamentals to Deployment, David Hoover,
	Kevin Solorio, Randall Kanna, Shroff/O'Reilly; First edition,
	2019.
11	. Blockchain By Example: A developer's guide to creating
	decentralized applications using Bitcoin, Ethereum, and
	Hyperledger, Bellaj Badr, Richard Horrocks, Xun (Brian) Wu,
	Packt Publishing Limited, 2018.
12	. Introducing Ethereum and Solidity: Foundations of
	Cryptocurrency and Blockchain Programming for Beginners,
	Chris Dannen, APRESS, 1 edition, 2017.
13	. Ethereum: Blockchains, Digital Assets, Smart Contracts,
	Decentralized Autonomous Organizations, Henning Diedrich,
	CreateSpace Independent Publishing Platform; 1 st edition, 2016.
1	



Name of the	Program:	Master of Engineering - ME (Blockchain Technology)					
Course Title	:	Cryptocurrency and Smart Contracts Lab					
Course Code	e: BCH 605L	Course Instructor:					
Academic Y	ear: 2020 - 2021	Semester: First Year, Semester 1					
No of Credit	s: 3	Prerequisites: Cryptography Basics, Networking					
		Basics, Programming aspects					
Synopsis:	This Course provides	insight on					
	Create a NodeJS application with real-time WebSocket connection						
	Build an API with NodeJS and Express						
	Design, test, and deploy secure Smart Contracts						
Course							
Outcomes	On successful comple	tion of this course, students will be able to					
(COs):							
CO 1:	To understand how block chain system works						
CO 2:	To design and deploy smart contracts						
CO 3: Integrate ideas from block chain technology into their own projects							
Mapping 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			*		*						

Course content and outcomes:

Content	Competencies				
Unit 1: Introduction					
Cryptography and Hashing	At the end of the topic student should be able to:				
	Use open source tools to generate hashes for content. (C3)				
Unit 2:					
Block Chain	Identify various popular blockchain applications. Create a list of those applications. (C3)				



Unit 3:						
Bitcoin	Build a transaction and then hash it. Generate public and private keys. Digitally sign a transaction. (C3)					
	Explore the bitcoin on blockchain.info for block generation. (C6)					
Unit 4:						
Smart Contracts	Create Smart Cont	racts throug	sh open source tools			
Learning strategies, contact hours and	student learning t	ime				
Learning strategy	Contact h	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:		Summativ	ve:			
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				
Sessional Examinatio	n 1	11 * *							
Sessional Examinatio	on 2			*					
Assignment/Presentat	tion		*	*	*				
End Semester Examin	nation	*	*	*	*				
Laboratory examinati	on		*		*				
Feedback Process	End-Semes	ster Feedbac	k						
Reference Material	1. Crypto	ography and	d Network S	Security - P	rinciples and Practice,				
	Stallin	Stallings William, Pearson Education; Seventh edition, 201							
	2. Crypto	ography An	d Network	Security, F	Forouzan, McGraw Hill				
	Education, 2015								
	3. Crypto	ography an	d Network	Security,	Atul Kahate, McGraw				
	Hill Ed	ucation; Th	ird edition, 2	2017.					
	4. The Ag	ge of Crypt	cocurrency:	How Bitco	in and Digital Money				
	Are Cl	nallenging t	he Global H	Economic ,	Paul Vigna , Michael J.				
	Casey,	St. Martin's	Press, 2015						
	5. Master	ring Ethere	um: Buildi	ng Smart (Contracts and DApps,				
	Andre	as M. Anto	nopoulos, I	Dr. Gavin W	vood, , Shroff/O'Reilly;				
	First ec	lition, 2018							
	6. Master	ring Bitcoi	n: Progra	mming th	e Open Blockchain,				
	Andrea	s M. Antone	opoulos, Shr	off/O'Reilly	; Second edition, 2017.				
	7. Progra	mming Bit	g Bitcoin: Learn How to Program Bitcoin from						
	Scrate	h , Jimmy So	ong, O'Reilly	y Media, 1 e	dition 2019.				
	8. Blockc	hain for Bu	siness with	Hyper-ledg	e r Fabric , Nakul Shah,				
	BPB Publications; 1 st edition, 2019.								
	9. Hands	-On Cyber	security wi	th Blockch	ain, Rajneesh Gupta,				
	Packt Publishing; 1 st edition, 2018.								
	10. Ethere	um Smart	Contract]	Developme	nt: Build blockchain-				
	based	decentrali	zed applic	ations usi	ng solidity, Mayukh				
	Mukho	padhyay, Pa	ckt Publishi	ing Limited,	2018.				



-	
	11. Building Blockchain Projects, Narayan Prusty, Packt Publishing
	Limited, 2017.
	12. Hands-On Bitcoin Programming with Python: Build powerful
	online payment centric applications with Python, Harish Garg,
	Packt Publishing Limited, 2018.
	13. Bitcoin and Cryptocurrency Technologies – A Comprehensive
	Introduction Hardcover, Arvind Narayanan, Joseph Bonneau,
	Edward Felten, Andrew Miller , Steven Goldfeder, Princeton
	University Press, 2016.
	14. Fundamentals of Smart Contract Security, Richard Ma, Jan
	Gorzny, Edward Zulkoski, Momentum Press, 2019.



Name	of the	Program	m:		Mas	Master of Engineering - ME (Blockchain Technology)							
Course	Course Title: Dis					Distributed Computing and Databases Lab							
Course	ourse Code: BCH-615L Co						Course Instructor:						
Acade	cademic Year: 2020 - 2021 Se						First Y	ear, Seme	ester 1				
No of (Credits	s: 3			Pre	requisite	es:	Introduc	tory C	ourse i	n IoT,		
					Net	working	Basics,	Program	nming as	spects, O	perating		
	-				syst	em, Linu	Х						
Synop	sis:	This C	ourse p	provides	s insig	ht on							
Course	e												
Outco	mes	On suc	cessful	compl	etion	of this co	urse, st	udents wi	ill be abl	e to			
(COs):	:												
CO	1:	To ide	ntify ar	nd intro	duce o	concepts	related	to distrib	uted com	puting sy	stems.		
CO	2:	Identif	y the ir	ntroduct	ory d	istributed	databa	se concep	ots and it	s structur	es.		
CO	3:	Descri	be term	s relate	d to d	istributed	l object	database	design a	and mana	gement.		
		Produce the transaction management and query processing te							ng techn	iques in			
co	4:	DDBMS.											
CC	95	Relate	the im	portanc	e and	applicati	on of er	nerging d	latabase	technolog	gy.		
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	*	*	*		*								
CO5	*	*	*	*	*								
Course	e conte	nt and	outcon	nes:		1		1	-	1			
Conten	nt and a second s					Compete	encies						
Unit 1	:												
Introdu	iction	– Ch	aracter	ization	of	At the e	nd of th	e topic st	udent sh	ould be a	ble to:		
Distributed Systems – Examples -					es -								
Resour	ce Sl	naring	and	the V	Veb-	1. To i	dentify	the program	ramming $(C1)$	g environi	ment for		
Challer	nges	– Dis	stribute	d Sys	stem	Dist	iouteu	Computin	ig (C1)				
Models	s – Arc	hitectu	ral, Fui	ndamen	tal -								



Interprocess Communication - API for Internet protocols – Message-Oriented Communication – Unicasting - Multicasting and Broadcasting - Client- Server communication – Group Communication.	 To illustrate small examples with the understanding of constructs required for Interposes communications(C3)
Unit 2:	
Distributed Operating Systems: Issues in Distributed Operating System – Remote Invocation - Communication between distributed objects - Remote procedure calls -Threads in Distributed Systems – Clock Synchronization – Election Algorithms – Distributed	 To illustrate and solve problems through the concept of Remote procedure calls and threads (C3) To illustrate problems with algorithms related to distributed computing. (C3)

Election	Algorithms	—	Distributed
Mutual	Exclusion	_	Distributed
Transactio	ons – Distrib	outed	Deadlock -
Agreemer	nt Protocols.		

Unit 3:

Distributed File Systems: Introduction -	1. To illustrate examples for handling files, clock
File service architecture - File System-	and time in distributed systems.(C3)
Enhancements and further	
developments - Name Services:	
Introduction - Name Services and the	
Domain Name System - Directory	
Services - Time and Global States -	
Clocks, events and process states	
Synchronizing physical clocks - Logical	
time and logical clocks - Distributed	
debugging - Coordination and	
Agreement-Introduction - Distributed	
mutual exclusion – Elections - Multicast	



communication-Consensus and related	
problems	
Unit 4:	
DistributedSharedMemory:Introduction-Designandimplementationissues-Sequentialconsistency and Vurincasestudy -Cother consistency and Munincasestudy -Other consistency-Distributedto Fault Tolerance - Distributed CommitProtocols - Byzantine Fault Tolerance -Impossibilities in Fault Tolerance.	1. To illustrate and build programs for shared memory concepts.(C3)
Unit 5:	
Introduction to Databases –Structured vs Unstructured vs SemiStructured data – RDBMS – Entity Relationships – SQL – NOSQL – Distributed Databases – Graph Databases – Tools	 To identify the databases for SQL and NOSQL(C1) To illustrate application based on SQL and NOSQL.(C3)
Unit 6:	
Security In Databases: Security requirements of database systems – Reliability and Integrity in databases – Redundancy – Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures – Inference-Finding and Confirming SQL injection	 To illustrate the security issues in databases. (C3) To illustrate the steps involved in sql injection and discuss the pros and cons. (C3)
Learning strategies, contact hours and	student learning time



Learning strategy		Contac	Student learning				
					time (Hrs)		
Lecture			1	2	-		
Seminar			-		-		
Quiz			-		-		
Small Group Discussi	on (SGD)		-		-		
Self-directed learning	(SDL)		-		-		
Problem Based Learn	ing (PBL)		-		-		
Case Based Learning	(CBL)		0	3	-		
Clinic			-		-		
Practical			2	4	-		
Revision			0	3	-		
Assessment			0	6	-		
TOTAL			4	8	-		
Assessment Methods	5:						
Formative: Summative:							
Internal practical Test	Į			Session	Sessional examination		
Theory Assignments			End semester examination				
Lab Assignment & Viva							
Mapping of assessme	ent with Cos	5					
Nature of assessment		CO 1	CO 2	CO 3	CO 4		
Sessional Examinatio	n 1	*	*				
Sessional Examinatio	n 2			*			
Assignment/Presentat		*	*	*			
End Semester Examin	*	*	*	*			
Laboratory examination *			*	*	*		
Feedback Process End-Semester Feedback							
Keference Material	1. SQL in	jection A	ttacks and d	etense, Just	in Clarke, Syngress, 2 nd		
	edition,2012						



2.	Distributed Systems Concepts and Design, George Coulouris,
	Jean Dollimore, Tim Kindberg, Gordon Blair, Pearson, 5 th edition,
	2011.
3.	Distributed Systems Principles and Paradigms,
	A.S.Tanenbaum, M.Van Steen, PHI, 2012.
4.	Distributed Computing: Fundamentals, Simulations and
	Advanced Topics, Hagit Attiya and Jennifer Welch, Wiley, 2004.
5.	Distributed Computing Principles and Applications, M.L.Liu,
	Pearson Addison Wesley, 2004.
6.	Graph Databases: New Opportunities for Connected Data, Ian
	Robinson, Jim Webber, Emil Eifrem, Shroff/O'Reilly, 2nd Edition,
	2016.
7.	Graph Algorithms: Practical Examples in Apache Spark &
	Neo4j, Mark Needham, Amy E. Hodler, Shroff/O'Reilly; First
	edition, May 2019.



Name	of the	Program	m:		Mas	ster of Er	gineeri	ng - ME (Blockch	ain Tech	nology)
Course Title: A			Arcl	Architecture of Big Data Systems Lab							
Course Code: BDA 623L Co				Cou	ourse Instructor:						
Academic Year: 2020 - 2021 Sen				Sem	nester:	First ye	ear, First s	semester			
No of	Credit	s: 1			Pre	requisite	es: Prog	ramming	in Pytho	on or Java	L
Synop	sis:	1. Th	is cour	se help	os the	student	to uno	lerstand	the cond	cepts of	Hadoop
		framework, Spark framework and their internals.									
		2. Th	is cours	se help	s the s	students	to learn	Map-red	luce pro	grammin	g, Spark
		programming.									
		3. Th	is cours	e helps	the st	udents to	build n	nachine le	arning n	nodel usii	ng Spark
		fra	meworl	к.							
Course	e										
Outco	mes	On suc	cessful	compl	etion o	of this co	urse, stu	udents wi	ll be abl	e to	
(COs):	:										
CO 1:		Install and develop applications using Hadoop and its ecosystems									
CO 2:		Build applications using Spark frame work									
CO 3:		Build I	Machin	e Learn	ing m	odels us	ing Spa	`k			
Mapping of COs to POs											
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 1	*	*	*		*	*			*	*	
CO 2	*	*	*		*	*			*	*	
CO 3	*	*	*		*	*			*	*	
Course content and outcomes:											
Content					Compete	encies					
Unit 1: Hadoop ecosystem											
Installation and configuring Hadoop					1. Configure HDFS and YARN (C2)						
ecosystem					2. Data handling using Sqoop, Hive, PIG(C2)						
						3. Implementing MapReduce applications					
						(C2)					



Unit 2: Spark Framework						
Spark tool chain – RDD, DataFrame,	RDD, DataFrame, 1. Develop applications using Spark					
SQL and Streaming	DataFrame	and SQL (C	C4).			
	2. Design real	time applic	ations using Spark			
	Streaming	(C4).				
		· · ·				
Unit 3: Machine Learning using Span	·k					
MLIB	1. Build mach	ine learning	models using			
	Spark(C5)		6			
T		•				
Learning strategies, contact hours and	student learning t	ime				
Learning strategy	Contact he	Contact hours				
x	12		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:	1					
Formative:	Summative:					
Internal practical Test	Sessional examination					
Theory Assignments	End semester examination					
Lab Assignment & Viva	Viva					


Mapping of assessme	ent	with Co	8	L				
Nature of assessment			CO 1	CO 2	CO 3			
Sessional Examinatio	n 1		*					
Sessional Examinatio	n 2			*	*			
Assignment/Presentation			*	*	*			
End Semester Examination			*	*	*			
Laboratory Examinat	ion		*	*	*			
Feedback Process	•	Enc	l-Semester H	Feedback				
Reference Material	1.	Big Da	ta: Principle	es and best practices o	f scalable real-time data			
		systems	s - Nathan M	Iarz and James Warrer	n. Manning Publisher.			
	2.	Hadoop	: The Defin	nitive Guide: Storage	and Analysis at Internet			
	Scale – Tom White, O'Reilly Publication 4 th Edition.							
	3.	Spark:	The Definiti	ive Guide: Big Data Pr	ocessing Made Simple –			
		Bill Ch	ambers, Ma	tei Zaharia, O'Reilly P	Publication 1 st Edition.			



Name of the	e Program:		Ma	Aaster of Engineering - ME (Blockchain Technology)						
Course Titl	e:		Dat	atabase Programming in Java Lab						
Course Cod	le: CSE-6041	L	Co	ourse Instructor:						
Academic Y	(ear: 2020 -	2021	Sen	nester:	First	<u>Year, Se</u>	mester.	1		
No of Credi	i ts: 3		Pre	erequisi	tes: B	asic Prog	grammi	ng know	ledge	
Synopsis:	1. To	provide	e fu	ndamen	tal kno	owledge	of va	arious c	bject c	oriented
	prog	grammiı	ng co	ncepts a	and data	abase con	ncepts.			
	2. To	design a	nd d	evelop o	latabas	e applica	ations u	sing jav	a progra	umming
	lang	guage.								
Course	On success	ful com	pletio	on of thi	s cours	e, studer	ts will	be able t	0	
Outcomes										
(COs):										
CO 1:	Apply obje	ct orient	ted p	rogramn	ning co	ncepts in	n a java	applicat	ion	
CO 2:	Practice various types of UI based applications									
CO 3:	Manipulate database using various SQL Commands									
CO 4:	Write java	applica	tions	for vari	ous dat	abase re	quirem	ents		
Mapping of	COs to POs	S								
COs PO 1	PO 2 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	PO 12
CO_1	* *		*							
CO 3	* *		*							
CO 4	* *		*							
Course con	tent and out	comes:								
Content				Compe	tencies					
Unit 1: Inst	allation of J	DK too	ls							
Installation	of JDK too	ols, sett	ing	• Use	of JDK	tools for	r java a	pplicatio	n (C3)	
environment	t variables	for ja	ava	• Solv	e the is	sues rela	ted to i	ava settii	ng envir	onment
application,	writing sin	mple ja	ava	• Solve the issues related to java setting environment variables (C3)						
program, pr	actice to co	mpile a	and	- 4 1		- /	1			
run java application				• Anai	yse sin	ipie java	applica	ation (C4	•)	
Unit 2: Intr	oduction to	OOP's	conc	epts						
Implementa	tion of OOP	's conce	pts	• Appl	y OOP	's conce	pts in ja	ava appli	cation (C3)
in java	application	such	as	• Solv	e the	issues s	uch as	multin	le inhe	ritance
anangulatio	n verious	tupog	of	5010	,	11.		manup		
encapsulatio	n, various	types	01	exce	ption h	andling(C3)			
Inheritance,	oart									



from this other techniques such as	• Write java programs to understand more about file
exception handling, packages,	read and write (C3)
interfaces, IO streams.	

Unit 3: Introduction to Window based applications

Implementation of window based	• Write UI applications for different look and feel
applications using swing	(C3)
components such as forms, menu	• Use of swing components and layout managers for
based applications. Applying event	UI design (C3)
handling mechanism to the	• Test III applications (C3)
applications	• Test of applications (C3)

Unit 4: Database applications using JDBC driver

Installation of JDBC driver, use of	• Test various Structured Ouery Language (SOL)
it in database applications, creating	commands (C4)
database, manipulating data	• Write database applications using JDBC driver and
through window based applications	mysql database (C3)

Learning strategies, contact hours and student learning time

Learning strategy	Contact h	ours	Student learn	ing 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:		Summativ	e:	
Theory Assignment		Sessional E	Examination	
Lab Assignment		University	End	Semester
		Examinatio	on	



Lab Test	ab Test Viva								
Viva									
Mapping of assessment with Cos									
Nature of assessmen	nt	CO 1	CO 2	CO 3	CO4				
Sessional Examinat	ion 1	*	*						
Sessional Examinat	ion 2			*	*				
Assignment/Present	ation	*	*	*	*				
End Semester Exam	nination								
Laboratory examina	ntion	*	*	*	*				
Feedback	End-Sem	ester Feedb	ack						
Process	Life Sellie		den						
Reference Material	 Patrick Reference George O'Reilly "Databa Laborator (Indian Ir Hill Comp "Fundar 	Naughton e", Tata Mc e Reese - ase system ries), Henn nstitute of panies, Inc. nentals of I	and Herbe Graw Hill. "Database Concepts ry F. Kort Technolog Database sy	ert Schildt Programm ",Author: h(Bell Lab y, Bombay	 – "JAVA 2 – The Complete ning with JDBC and Java", Abraham Silberschatz (Bell poratories) and S. Sudarshan y, Publishers: The McGraw- uthor: Elmasri and Navath 				



Name o	f the Program: Master of Engineering - ME (Blockchain Technology)												
Course	Title:				Mini	Mini Project - 1							
Course	Code:	BCH 6	95		Cour	Course Instructor:							
Academ	nic Yea	ar: 2020	- 2021		Seme	ester:	First Year	, Semeste	r 1				
No of C	Credits	: 4			Prere	equisites	S: Any	program	ming la	nguage ai	nd circuit		
Suman		Studen	ta ara	vnaata	d to go	s loot o n	roblom i	a tha ara	of the	in interes	t and the		
Synop	515:	Students are expected to select a problem in the area of their interest and the											
		area of their specialization that would require an implementation in hardware /											
		software or both in a semester											
Course	e												
Outco	mes	On suc	cessful	compl	etion of	f this co	ourse, stu	dents wil	ll be abl	e to			
(COs):	:			_									
CO	1.	Apply	the obj	ectives	of the	project	work and	d provide	e an ade	quate bac	kground		
	1:	with a	detaile	d litera	ture sur	vey							
		Breakd	lown th	e proje	ect into	sub blo	cks with	sufficien	t details	to allow	the work		
CO	2:	to be re	eproduc	ced by	an inde	penden	t research	ner					
	2	Compo	ose hard	dware/s	oftwar	e design	n, algoritl	hms, flov	vchart, 1	nethodol	ogy, and		
CO	3:	block o	liagram	ı									
CO	4:	Evalua	te the r	esults									
CO	5:	Summa	arize th	e work	carried	l out							
Mappi	ng 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						*					*		
CO5:							*						
Course	e conte	ent and	outcon	nes:						1	-		
Conten	<i>it</i>					Compet	encies						
Phase	1												



Problem identification, synopsis	A	t the end of the topic student	t should be able to:				
submission, status submission, mid	1.	Identify the problem/speci	fication (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	t presentation report				
		(C3)	1 1				
	6.	Prepare and present	mid-term project				
		presentation slides (C3, C	5)				
	7.	Develop project in	nplementation in				
		hardware/software or both	h in chosen platform				
		(C5)					
Phase 2							
Status submission, final evaluation.	1.	1. Prepare the progress report (C3)					
	2.	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	n in chosen platform				
		(C3, C5)					
	5.	Justify the methods used	and obtained results				
		(C6)					
Learning strategies, contact hours and	stu	ident 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	(CBL)			-		-		
Clinic		-		-				
Practical				-		-		
Revision				-	-			
Assessment				03		-		
TOTAL		51		09				
Assessment Methods	5:		·					
Formative:	Summative:							
Project Problem Selec	ction				Mid-Term Presentation			
Synopsys review					Second status review			
First status review				Demo & Final Presentation				
Mapping of assessme	ent with Co	s			·			
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5		
Mid Presentation		*	*					
Presentation	*	*	*	*	*			
Feedback Process	• Enc	ack	1	I				
Reference Material	Particular t	o the ch	iosen proje	ect				



Name o	of the P	rogram	:		Maste	Master of Engineering - ME (Blockchain Technology)								
Course	Title:				Semi	Seminar - 1								
Course	Code:	BCH 6	97		Cour	Course Instructor:								
Acaden	nic Yea	r: 2020	- 2021		Seme	Semester: First Year, Semester 1								
No of C	Credits:	1			Prere	equisites	: Commu	inication	n Skill					
Synops	sis:	1. To	select,	search	and lea	ırn techi	nical litera	ture.						
		2. To Identify a current and relevant research topic.												
		3. To	prepare	e a topi	c and d	leliver a	presentati	on.						
		4. To	develo	p the sl	cill to v	vrite a te	echnical re	port.						
		5. De	velop a	bility to	o work	in grou	ps to revie	w and r	nodify t	echnical	content.			
Course	e													
Outco	nes	On suc	cessful	compl	etion of	f this co	urse, stude	ents wil	l be able	e to				
(COs):														
CO 1.		Show o	compet	ence in	identif	ying rel	evant info	rmation	, definir	ng and ex	plaining			
		topics	under d	iscussi	on.									
CO 2.		Show of	compet	ence in	workir	ng with a	a methodo	logy, st	ructurin	g their or	al work,			
CO 2.		and syn	nthesizi	ing info	ormatio	n.								
CO 3.		Use ap	propria	te regi	sters ar	nd voca	bulary, an	d will d	lemonst	rate com	mand of			
005.		voice r	nodulat	tion, vo	ice pro	jection,	and pacin	g.						
CO 4.		Demor	strate	that the	ey have	e paid c	lose attent	tion to	what ot	hers say	and can			
		respon	d const	ructive	ly.									
		Develo	p pers	suasive	speec	h, pres	ent inform	nation	in a co	ompelling	g, well-			
CO 5.		structu	red, an	d logica	al seque	ence, res	spond resp	ectfully	to oppo	osing idea	as, show			
0.05:		depth	of kno	owledge	e of c	omplex	subjects,	and o	levelop	their ab	oility to			
		synthes	size, ev	aluate	and ref	lect on i	nformatio	n.						
Маррі	ng of (COs to 1	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	*							*	*		*			
CO5:	*							*	*		*			



Learning strategies, contact hours and student learning time										
Learning strategy			Co	ontact h	ours	Student learning				
						time (Hrs)				
Lecture		-								
Seminar				-		-				
Quiz				-		-				
Small Group Discussi	on (SGD)			14		-				
Self-directed learning	(SDL)			-		-				
Problem Based Learn	ing (PBL)			-		-				
Case Based Learning	(CBL)			-		-				
Clinic				-		-				
Practical				-		-				
Revision				-		-				
Assessment			-			-				
TOTAL			14			-				
Assessment Methods	5:				1					
Formative:					Summative:					
Seminar Topic Select	ion									
Synopsys review										
PPT Review										
Mapping of assessme	ent with Cos	S			I					
Nature of assessment	CO 4	CO 5								
Presentation		*	*	*	*	*				
Feedback Process	• End	I								
Reference Material	Particular t	o the chos	en Semin	ar						



LIFE (1	Deemed to be University under Section 3 of the UGC Act, 1956)
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Name of	of the P	rogram			Mast	Master of Engineering - ME (Blockchain Technology)						
Course	Title:				Dev	DevOps for Cloud						
Course	Code:	CDC-	607		Cou	Course Instructor:						
Academ	nic Yea	r: 2020	- 2021		Sem	ester: 1	first Yea	ar, Semester 2				
No of Creatis: 5 Pro					Prer	equisites	:					
Synop	SIS:	This C	ourse p	rovides	s insigi	nt on:						
		1.	Devoj	ps Prod	uct Li	fe Cycle	s Stage					
		2.	Autor	nation	of proc	duct lifed	cycle.					
Course	e											
Outco	mes	On suc	cessful	compl	etion c	of this co	urse, st	udents will b	be able to	0		
(COs):												
CO 1:		Explai	n the co	oncept	of auto	mation of	of Prod	uct Life Cyc	le stages	•		
CO 3		Demor	strate	Contir	nuous	Integrat	tion /	Continuous	Testin	g / Cor	ntinuous	
Deployment of Product.					ıct.							
Compare and contrast exit				st exist	ing Soft	ware M	lethodologie	s with D	evops Lif	fe Cycle		
stages.												
CO 4:	Design and Devops methodologies for Product development and Relea						d Release	<u>,</u>				
CO 5:		Explain	n the co	oncepts	of Too	ols used	in each	stages of De	evops .			
Маррі	ng 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	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:			1					
Conten	ıt					Compete	encies					
Unit 1	:	DevOp	s Intro	oductio	n							
Unders	tandin	g D	evelop	ment	-	1. I	Explain	about the	e Prod	uct Life	Cycle	
Develo	pemen	t SDLO	C : W	aterFal	1 &	S	Softwar	e methodolo	gies (C2	2)		
Agile -	Und	erstandi	ng Ope	erations	-	2. I	Describ	e Devops	life cy	cle for	Product	
						Development and Release (C2)						



Dev vs Ops - DevOps to the rescue -	3. Explain the stages of Devops (C2)
What is DevOps - DevOps SDLC -	4. Describe about Continuous Integration /
Continous Delivery model -	Continuous Deployment pipeline. (C2)
DevOps tools for DevOps SDLC -	5. Write the significance of automation in
DevOps Roles & Responsiblities.	Product life cycle management. (C3)
	6. Describe different between standard software
	methodologies and Devops software
	methodologies. (C2)
Unit 2: Linux	
Linux Introduction, Principles & Linux	1. Explain the evolution of Linux OS (C2)
distro - Booting - Command line	2. Explain Linux File System (C2)
utililities & Basic commands - Linux	3. Demonstrate Linux Users and Groups (C3)
Filesystem - Filters & I/O	4. Describe OS Level Virtualization techniques
Redirections - Users & Group	like Containers (C3)
administration - File permissions &	5. Demonstrate basic Linux Commands (C4)
Ownerships - Sudo - Software	
Managemen - Useful tools: ssh, telnet,	
scp, rsync, disk utils, backups	
etc - Service & Process management -	
Shell Scripting - Systems and HW stats	
- Linux Containers (lxc) - Dockers -	
Kubernetes and Microservices .	
Unit 3: Networking fundamental	ls
Components of computer networks -	1. Explain Computer network and devices (C2)
Classification: LAN, WAN, Peer to	2. Demonstrate subnetting and its need (C3)
Peer network, Server based - Switches	3. Explain IPV4 Addressing scheme (C2)
- Routers - Network Architecture -	4. Demonstrate type of Network Devices like
Protocols - Port numbers - DNS -	Switches, Hub, Router using Simulator Tools
DHCP - IP Addresses - Ip Addresses	(C4)
& Subnet Masks - IP Address Ranges	5. Describe networking Services like DNS,
- Subnetting - Private Vs Public	DHCP, NACL, FTP etc (C4)



networks - High Availablity -		
Firewalls & NACL - Web Application		
Architecture - Infrastructure -		
Network layout - Services &		
Components - Architecture from a		
DevOps perspective.		
Unit 4: Automation, Orchestration	n & Co	nfig Management
Version control system with Git :	1.	Explain need and types of version control
What is VCS & why it is needed -		software (C1)
DevOps use cases - Setup your own	2.	Describe architecture of Distributed version
repo with git - Manage your code		control systems (C2)
base/source code with GIT & GITHUB	3.	Explain Git and Github as case study (C3)
Unit 5: Continuous Integration v	vith Jen	kins
Introduction to continuous integration	1.	Describe about Continuous Integration /
Build & Release and relation with		Continuous Deployment pipeline. (C2)
DevOps - Understanding	2.	Write the significance of automation in
development and developers - Why		Product life cycle management. (C3)
Continuous integration Jenkins	3.	Describe different between standars software
introduction and setup - Jenkins		methodologies and Devops software
projects/jobs - Jenkins plugins		methodologies. (C2)
Jenkins administration: Users -	4.	Give examples for Automation of stages of
Nodes/slaves - Managing plugins -		Product development using Devops . (C2)
Managing software versions -	5.	Write the limitation of a Current Software
Introduction - Phases - Java builds		methodologies for Product Development.
- Build and Release job/project setup		(C3)
Nexus: Intro & Setup - Software	6.	Describe the architecture of Continuous
versioning & Hosted repository -		Integration server. (C2)
Integration with Jenkins - Continuous	7.	Apply Devops methodologies for Product
integration job/project setup Complete		Development and Release(C3
Jenkins project: Packinging Artifacts -		
Static code Analysis - Tomcat setup		
Staging & productions - Artifacts		



deployments to webservers from	
Jenkins - Build Pipeline - Jenkins	
not just CI tool anymore - More	
DevOps use cases of Jenkins	
Unit 5: Ansible	
Configuration Management &	1. Write the steps in Automation of Testing in
Automation - What is Ansible & its	Web development. (C3)
features - Ansible setup on local &	2. Explain the operations Continuous Testing.
cloud - Understanding Ansible	(C5)
architecture & Execution - Inventory	3. Write the taxonomy of Continuous Integration
Ad hoc commands: Automating	/ Continuous Delivery / Continuous
change Management with Ad Hoc	Deployment (C3)
commands - Playbook Introduction -	4. Design a Workflow for Automation of
Ansible configuration with ansible.cfg $$ - $$	Product life cycle using Devops (C5, P3).
Ansible documentation - Modules,	5. Construct a Continuous Integration /
modules & lots of modules - Writing	Continuous Deployment pipeline (C5)
playbook for webserver & DB server	6. Compare Standard Software methodologies
deployments - Tasks - Variables -	vs Devops methodologies for Product
Templates - Loops - Handlers -	Development. (C6, P2)
Conditions - Register - Debugging -	7. Describe about Containers and Container
Ansile Roles - Identify server roles -	Orchestration Services. (C2)
Roles structure - Creating, Managing	8. Examine the advantages of using Containers
and executing roles - Ansible Galaxy -	in Web development(C4)
Exploring Roles from Galaxy -	9. Describe Container orchestration services
Download Galaxy roles and integrate	architecture(C2)
with your code - Ansible Advanced	10. Show the function of Container orchestration
Execution - Improving execution time	services(C3)
- Limiting and selecting tasks -	11. Define Configuration Management tools and
Troubleshooting and Testing.	its need. (C1)
	12. Describe the features of Configuration
	Management. (C2)



13. Explain the architecture of Configuration
Management (C5)
14. Design a Configuration Management Codes to
administrate infrastructure of organization
(C5)
15. Explain the need of Continuous Monitoring
tools (C5)
16. Design an Architecture Continuously Monitor
infrastructure. (C4)

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	74			
Assessment Methods:					
Formative:	Summative:	Summative:			
Internal practical Test	Sessional exa	Sessional examination			
Theory Assignments	End semester	End semester examination			
Lab Assignment & Viva	Viva				



Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5			
Sessional Examinatio	Sessional Examination 1			*				
Sessional Examinatio	n 2			*	*	*		
Assignment/Presentat	ion	*	*	*	*	*		
End Semester Examir	nation	*	*	*	*	*		
Feedback Process	End-Semes	ster Feedb	back	1	11			
Reference Material	[1]. Eric Fo Shell Scrip	oster-Johr ting (Prog	nson , John C. grammer to Pr	Welch , N ogrammer	/licah Ande), Wrox Pu	erson, Beginning blications		
	[2]. Randal and Korn S UNIX Gur	K. Mich Shell Scrij us", 2nd I	ael "Mastering pting for Prog Edition, Wiley	g Unix She rammers, S Publicatio	ell Scripting System Adr ons	g: Bash, Bourne, ninistrators, and		
	[3]. Bintu Harwani, "UNIX & Shell Programming", Oxford Publications, 2013							
	[4]. John Ferguson Smart, "Jenkins: The Definitive Guide",O'reilly Publications							
	[5]. Mitesh	Soni, "Je	enkins Essenti	als", Packt	Publicatio	ns		
	[6]. Rafal Leszko, "Continuous Delivery with Docker and Jenkins", Packt Publications							
	[7]. Veselin Publication	n Kantsev 1s	, "Implementi	ing DevOp	os on AWS'	', Packt		
	[8]. Randal	l Smith,	"Docker Orche	estration",	Packt Pub	lications		
	[9]. Alan Berg, "Jenkins Continuous Integration Cookbook", Packt Publications							
	[10]. Kumaran S., Senthil, "Practical LXC and LXD Linux Containers for Virtualization and Orchestration", Apress Publications							
	[11]. Kons Publication	stantin Iva Is	anov, " Contai	nerization	with LXC"	', Packt		



[12]. Karl Matthias, Sean Kane, "Docker: Up & Running:Shipping
Reliable Containers in Production", O'Reilly Media



Name	Name of the Program:			Maste	Master of Engineering - ME (Blockchain Technology)							
Course	e Title	:			Netw	ork Sec	urity an	d Analys	is			
Course	e Code	BCH	602		Cour	Course Instructor:						
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 2						
No of	Credit	s: 3			Prer	Prerequisites: Microprocessor architecture ,						
					Micro	ocontrol	ler Arc	hitecture	, Assem	bly langu	age and	
Synon	sic.	This C	ourse n	rovides	insigh	Number systems						
Synop.	313.		The source allows students to understand the network devices and the det								the data	
		1 H0			s studel	ints to ui					the data	
		IOT	mats to	or diffe	rent pro	otocols.	As lot	of data is	populat	ed in the	present	
		WO	rld an	analys	sis of t	these p	ackets	using the	e moder	n tools	help to	
		unc	lerstand	the at	tacks ar	nd the n	ature of	the netw	ork.			
Course	е											
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, sti	udents wi	ll be able	e to		
(COs):	:											
CO	1:	Identify some of the factors driving the need for network security										
CO	2:	Identif	y and c	lassify	particu	lar exan	nples of	attacks				
CO	3:	Define	the ter	ms vuli	nerabili	ty, threa	at and a	ttack				
CO	4:	Identif	y physi	cal poi	nts of v	ulnerab	ility in s	simple ne	tworks			
CO	5.	Compa	re and	contras	t symm	symmetric and asymmetric encryption systems and their						
	5:	vulnera	ability t	o attac	k, and e	explain (the char	acteristics	s of hybr	id systen	ns.	
CO	6:	Analyz	the p	ackets	through	the net	work to	ols				
Mappi	ng of (COs to 1	POs									
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	
CO 1	*	*		*								
CO 2	*	*										
CO 3	*	*										
CO 4	*	*										
CO 5				*								
CO 6			*	*								
Course	e conte	ent and	outcon	nes:								
Conten	nt and a second s					Comp	etencies	1				



Unit 1:	
INTERNET SECURITY &	At the end of the topic student should be able to:
ENCRYPTIONEncryptionofstaticdata,IPSec,AH,ESP,IKE,ISAKMP/Oakley,Tunnelmode,Transport mode,Virtual Private Networks(VPNs),SSHTunneling,IP6Issues,Cloud Security Issues.	 List out the attack scenario in cloud. (C1) Explain different types of encryption algorithms to protect the static data. (C2)
Unit 2:	
FIREWALLS: Packet Filters, Stateful, Stateless, Bastion Host, Circuit Level, Application gateway, SOCKS, DMZ, Host-Based Firewall, Egress Filtering, Network Address Translation (NAT), Multi-homing, IPTables/NetFilter, implementing NAT.	 Examine the need of security for the given network scenario. (C2) Infer the design of stateful firewall and stateless firewall. (C2) Appraise the importance of DMZ. (C4)
Unit 3:	
SNIFFERSANDPACKETCRAFTING:Libpcap,dSniff,Wireshark,tcpdump,MitigationofSnifferAttacks,ARPCachePoisoning,PortStealing,Switchflooding,DNSandIPSpoofing,SessionHijacking,SequenceNumbers,Ettercap,idlehostscanning,DefaultTTLs,Countermeasures,PacketCraftingusingeghping,scapy.	 summarize the importance of Scapy Tool. (C2) Explain ARP ICMP Protocols. (C2) Interpret the packet capture analysis and network flow analysis. (C3)
Unit 4:	
Metasploit: Basics of Penetration Testing: The Phase of PTES, Types of	1. Identify Metasploit Framework. (C2)



Penetration	Tests.	Metasploit:	2.	2. Explain the steps involved in the penetration					
Introduction,	Metasploit	Basics:		Testing. (C2)					
Terminology,	Metasploit	Interfaces,	3.	Apply	Scanning	Tools	and	gathering	
Metasploit	Utilities.	Intelligence		informa	tion. (C3)				
Gathering:	Passive	Information							
Gathering, Act	ive Informatio	n Gathering,							
Target Scannin	g. Vulnerabili	ty Scanning:							
Basic Vulnerability Scan, Scanning with									
scanning tools, Using Scan Results for									
Autopwning.									

Learning strategies, contact nours and student learning time	I	Learning strategies,	contact h	ours and	student	learning time
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Learning strategy		Conta	Contact hours			Student learning		
					time (Hrs)			
Lecture		3	30		60			
Quiz		()2		04			
Small Group Discussion (SGD)	()2		0	2			
Self-directed learning (SDL)			-		0	4		
Problem Based Learning (PBL)		()2		0	4		
Case Based Learning (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 Co	S							
Nature of assessment	CO 1	CO 2	CO 3	C4	C5	C6		
Sessional Examination 1	*	*	*					



Sessional Examinatio	on 2			*	*				
Assignment/Presentat	tion	*	*	*	*	*	*		
End Semester Examin	nation	*	*	*	*	*	*		
Laboratory examinati	on	*	*	*	*	*	*		
Feedback Process	End-Sem	ester Feedl	back		L	L			
Reference Material	1. Cryp	tography a	and Network S	ecurit	y - Princ	iples and	Practice,		
	Stallin	llings William, Pearson Education; Seventh edition, 2017.							
	2. Cryp	tography .	And Network	Secur	ity, Forou	uzan, Mc	Graw Hill		
	Educa	tion, 2015							
	3. Cryp	ptography and Network Security, Atul Kahate, McGraw							
	Hill E	Education; Third edition, 2017.							
	4. Netwo	etwork Security Essentials: Applications and Standards,							
	Willia	/illiam Stallings, Prentice Hall, 4 th edition, 2010.							
	5. Meta	asploit - The Penetration Tester's Guide by David							
	Kenn	ennedy, Jim O'gorma , Devon Kearns and Mati Aharoni – No							
	Starch	Press Pub	olication						
	6. Inter	networkii	ng with TCP/I	P Vo	l I: Pri	inciples,	Protocols		
	and A	d Architecture, Douglas E Comer, 3rd edition. PHI, 1997.							
	7. TCP/	IP Illustr	ated, Volume	e I, T	he Prot	ocols, W	Richard		
	Steve	ns, Interna	tional Student I	Editior	n, 1999.				
	8. RFC'	RFC's on IPSEC, SSL, TLS, HTTPS, Kerberos - Internet							
	resour	ces.							



Name	of the	Program	n:		M. I	M. E. in Blockchain Technology							
Course Title:				Advanced Blockchain Application Development									
Course Code: BCH 604				Course Instructor:									
Academic Year: 2020 - 2021				Sem	Semester: First Year, Semester 2								
No of C	Credits	s: 3			Pre	requisite	s:	Basics	of sen	sors, Ba	sics of		
					com	municati	on						
Synopsis: This Course provides				rovides	insight on								
The course allo				ows stu	idents to have an understanding of the python construct and								
		to build	applic	ations f	or blo	ocking us	ing the	web framew	orks bas	ed on py	hon and		
~		JavaSc	ript.										
Course	e												
Outco	mes	On suc	cessful	comple	tion o	of this co	urse, st	udents will b	be able to	C			
(COs):													
CO	1:	Discus	s and D	escribe	Obje	ect Orient	ed Prog	gramming co	oncepts v	vith Pyth	on		
CO	2:	Develo	p an bl	ockchai	n app	olications	using l	Python and i	ts frame	work.			
CO 3: Develop the database ap					application and build it.								
CO	4:	Develo	p and t	ouild ap	plicat	blication based on REST API.							
Mappi	ng of (COs to 1	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	PO 9	PO 10	PO 11		
CO 1	*	*	*		*								
CO 2	*	*											
CO 3	*	*											
CO 4	*	*	*		*								
Course	e conte	ent and	outcon	nes:					1				
Conten	nt (Compete	encies						
Unit 1	:				I								
Introdu	iction	to	A	Applicat	tion	1. To c	lescribe	e the differe	ence bet	ween pr	ocedural		
Develo	pment	_	Introdu	iction	to	and	object o	priented lang	uage. (C	(1)			
proced	ural	vs C	Dbject	Orien	ited	2. To e	xplain t	he construct	s involve	éd in pytł	non.(C2)		
Langua	age – I	Introduc	tion to	Pythor	1 -		T			1.7	` '		
Python	dataty	pes – Co	onstruc	ts - Pytl	hon								
Examp	les wit	h basic o	constru	cts									



Unit 2		
Object oriented Concepts – Class – Objects – Encapsulation – Abstraction – Polymorphism – Inheritance – Association – Aggregation – Composition - Object oriented	1. To describe the OOPS written in Python (C1)	S concepts and the way
Unit 3:		
Socket Programming with python – database applications - email applications - REST API – Python web frameworks – Buidling Blockchain applications from Scratch – Using Frameworks - Case study	 To explain the conception involved in creating app To explain the blockchat development process. (0) 	t of sockets and the API blications (C2) in framework applications C2)
Learning strategies, contact hours and	student learning 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:		Summative:					
Internal practical Test	,			Sessional examination			
Theory Assignments		End semester examination					
Lab Assignment & Viva				Viva			
Mapping of assessme	ent with C	OS					
Nature of assessment	CO 1	CO 2	CO 3	CO 4			
Sessional Examination	*	*					
Sessional Examination	n 2			*	*		
Assignment/Presentat	ion	*	*	*	*		
End Semester Examin	ation	*	*	*	*		
Laboratory examination	on	*	*	*	*		
Feedback Process	End-Sem	ester Feedba	ack				
Reference Material	1. Pyth o	on: The Co	mplete Refe	e rence , Martin C. B	rown , McGraw Hill		
	Educa	tion; Forth	edition, 20	18.			
	2. Hand	s-On Pyt	hon for	Finance: A pr	ractical guide to		
	imple	menting fi	nancial an	analysis strategies using Python, Krish			
	Naik	, Packt Publ	lishing Limi	ted , 2019			
	3. Learı	ning Pytho	on: Powerful Object-Oriented Programming,				
	Mark	Lutz, 5th E	dition, O'R	eilly Media; 5 editi	on, 2013.		
	4. Maste	ering Obje	ct-Oriented	l Python: Build po	werful applications		
	with	reusable co	ode using (OOP design patter	rns and Python 3.7,		
	Steve	n F. Lott, 2r	nd Edition,	2019			
	5. Flask	Web Dev	elopment:	Developing Web	Applications with		
	Pytho	on, Miguel (Grinberg, O	'Reilly Media; 2 ed	itions, 2018		
	6. Begin	ning Web	Developm	ent with Python:	from prototype to		
	produ	uction with	i flask, tor	nado and nginx,	Andrei Dan, Kindle		
	Editic	n					
	7. Hand	s-On RES	Tful API	Design Patterns a	and Best Practices:		
	Desig	n, develop	, and dep	loy highly adapta	able, scalable, and		



	secure RESTful web APIs, Harihara Subramanian , Pethuru Raj,
	Packt Publishing; 1 st edition, 2019.
8.	Hands-On Blockchain for Python Developers: Gain blockchain
	programming skills to build decentralized applications using
	Python, Arjuna Sky Kok, Packt Publishing, 1st edition, 2019.



Name	of the	Program	n:		M. E	M. E. in Blockchain Technology							
Course Title:				Bloc	Blockchain Verification and Testing								
Course Code: BCH 606				Cou	Course Instructor:								
Acade	mic Ye	ear: 202	20 - 202	21	Sem	Semester: First Year, Semester 2							
No of	Credit	s: 3			Prer	equisite	s: B	asic Program	mming				
Synop	sis:	This C	ourse p	rovides	sinsigh	nt on							
The course allows					s stude	ents to h	ave an	understandi	ng of the	python c	construct		
and to build appli					lication	ns for bl	ocking	using the	web fram	neworks ł	based on		
		pyt	hon an	d javaso	cript.								
Course	e												
Outco	mes	On suc	cessful	compl	etion o	of this co	urse, st	tudents will	be able t	0			
(COs):	:												
CO 1:		Design	test ca	ses suit	able fo	or a softw	ware de	evelopment	for differ	ent doma	ins.		
CO 2:		Identif	y and u	se the t	est too	ols for Bl	ockcha	ain testing a	nd autom	ation.			
CO 3:		Identif	y suitał	ole tests	to be	carried of	out.						
CO 4:		Prepare	e test pl	lanning	based	based on the document.							
CO 5:		Write t	est plai	ns and t	est cas	est cases designed.							
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	e conte	ent and	outcon	nes:									
Conten	ıt 🛛					Compete	encies						
Unit 1	:												
INTRO	DUCT	TION:	Testin	g as	an	1 Toe	xplain	the process	s of testi	ng and it	s related		
Engine	ering	Activity	– Te	sting a	as a	axio	ms (C2	2)					
Process	s – T	esting	axiom	s – B	asic	2. To	describ	be the cor	ncept of	defects	and it		
definiti	ions	– Sof	tware	Tes	ting	10 char	acterist	ics.(C1)			und It		
Princip	oles –	The Te	ester's	Role i	n a	- IIII							



Software Development Organization -	3. To describe the testing in blockchain and smart
Origins of Defects - Cost of defects -	contacts and its tools.(C1)
Defect Classes – The Defect Repository	
and Test Design $-$ Defect Examples $-$	
Developer/Tester Support of	
Developing a Defect Repository -	
Defect Prevention strategies.	
Testing in Blockchain - Smart Contract Testing - Peer/Node Testing – Introduction to tools for testing blockchain: Ethereum Tester - Truffle -	
Ganache (formally Testrpc) - Populus -	
Manticore - Hyperledger Composer -	
Exonum Testkit - Embark Framework -	
Corda Testing Tools	
Unit 2:	
Overview of the Software - What is Software? - Software Technologies - What is Web Application - Web Application Technologies - Software Development Lifecycle(SDLC): Waterfall Model - Iterative Model - Spiral Model - V-Model - Big Bang Model - Agile Model - RAD Model	 To describe the models of SDLC(C1) To explain the process involved in each model.(C2)
Overview of the Software - What is Software? - Software Technologies - What is Web Application - Web Application Technologies - Software Development Lifecycle(SDLC): Waterfall Model - Iterative Model - Spiral Model - V-Model - Big Bang Model - Agile Model - RAD Model Unit 3:	 To describe the models of SDLC(C1) To explain the process involved in each model.(C2)



Software requirements specification -	
(SRS): What is SRS - Finding gap in	
SRS - How to Write a Test Plan from	
SRS Document - How to test software	
requirements specification (SRS)? -	
Review SRS Document and Create Test	
Scenarios	
Functional Testing: Unit Testing -	
Integration Testing - System Testing	
Regression Testing - Acceptance	
Testing	
Non-Functional Testing: Performance	
Testing - Load Testing - Usability	
Testing - Security Testing - Portability	
Testing	
Manual Testing: Writing test scenarios -	
Test planning - Test case design	
Test data identification - Reviewing and	
Execution of Test cases/scripts	
Unit 4:	
Software test automation – skill needed	1. To describe the process of automation (C3)
for automation – scope of automation –	2. To explain the metrics and measurement of test
design and architecture for automation –	automation. (C2)
requirements for a test tool – challenges	3. To explain the choice of tools and usage of
in automation – Test metrics and	selenium.(C2)
measurements - project, progress and	
productivity metrics Need for	
Automation testing – Tool Selection –	



Frameworks - Test cas	Frameworks - Test case using Selenium						
– QTP – and other tool	S						
Learning strategies, c	ontact hou	urs and st	tudent learn	ing time			
Learning strategy			Con	tact hours		Student learning	
						time (Hrs)	
Lecture				30		60	
Quiz				02		04	
Small Group Discussion	on (SGD)			02		02	
Self-directed learning ((SDL)			-		04	
Problem Based Learnin	ng (PBL)			02		04	
Case Based Learning (CBL)			-		-	
Revision				02		-	
Assessment				06		-	
TOTAL				44		74	
Assessment Methods:			L		I		
Formative:			Summative:				
Internal practical Test				Sessional examination			
Theory Assignments				End semester examination			
Lab Assignment & Viva				Viva			
Mapping of assessment	nt with Co	S					
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5	
Sessional Examination	1	*	*	*			
Sessional Examination	2			*	*	*	
Assignment/Presentation	on	*	*	*	*	*	
End Semester Examina	ation	*	*	*	*	*	
Laboratory examinatio	n	*	*	*	*	*	
Eadhadr Drassa							



Reference Material	1.	Software Testing – Principles and Practices, Srinivasan Desikan
		and Gopalaswamy Ramesh, Pearson Education, 2006.
	2.	Software Testing, Ron Patton, Second Edition, Sams Publishing,
		Pearson Education, 2007
	3.	Practical Software Testing, Ilene Burnstein, Springer International
		Edition, 2003.
	4.	Software Testing in the Real World – Improving the Process,
		Edward Kit, Pearson Education, 1995.
	5.	Software Testing Techniques, Boris Beizer, 2nd Edition, Van
		Nostrand Reinhold, New York, 1990.
	6.	Foundations of Software Testing _ Fundamental Algorithms and
		Techniques, Aditya P. Mathur, Dorling Kindersley (India) Pvt. Ltd.,
		Pearson Education, 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.



Name of the Program:					Maste	Master of Engineering - ME (Blockchain Technology)								
Course	e Title:				Cloud	Cloud Computing								
Course	e Code	: BC	H-616		Cour	Course Instructor:								
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 2								
No of	Credit	s: 3			Prer	equisite	es: F	Familiarity in	develo	ping app	plication			
~	-				using	any hi	gh-leve	l language						
Synopsis: This Course provides i				s insigh	t on									
		Clo	oud Co	mputin	g is the	delive	ry of co	omputing serv	vices—i	ncluding	servers,			
		stor	rage, d	atabase	s, netw	orking	, softwa	are, analytics	s, and in	ntelligenc	e—over			
		the	Interne	et ("the	e cloud'	') to of	fer fast	er innovatior	n, flexib	le resour	ces, and			
		eco	nomies	s of sca	le. The	student	s are in	troduced wit	h the bas	sic under	standing			
		of t	he arch	itectur	e of clo	oud com	puting	and its vario	us types	. Also th	e course			
		dise	cusses	the cha	racteris	tics, rea	search i	issues and ap	plication	n implem	entation			
		on	the clo	ıd.										
Course	e													
Outco	mes	On suc	cessful	compl	etion of this course, students will be able to									
(COs):	:			-										
CO 1:		Describ	be the r	leed an	d archit	l architecture Distributed Computing paradigms								
CO 2:		Explain	n the C	haracte	ristics a	ristics and architecture of Cloud Computing								
CO 3:		Compa	ire and	contras	t service models and deployment models of Cloud									
004		Explain the concept of Virtualization as a prime Enabling Technology of Cloud												
CO 4:		Computing												
		Explain the concept of Web Services as a prime Enabling Technology of Cloud												
CO 5:		Computing												
		Design an Infrastructure in Cloud for High availability and Fault Tolorant Wab												
CO 6:		applications												
applica			uons											
Mapping 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	*	* *			*		1							
CO 3 * *			*											
CO 4	*	*			*									



CO 5 * * * * *									
CO 6 * * * *									
Course content and outcomes:									
Content	Competencies								
Unit 1:									
Introduction: Evolution of Cloud Computing, Enabling technologies, Cloud computing infrastructure models, Public, private, and hybrid clouds, Architectural layers of cloud computing, Cloud application programming interfaces, Inside Grid, HPC, Clouds	 To explain the architecture of cloud infrastructure (C2) To explain the types of the cloud. (C2) 								
Unit 2:									
Cloud Architecture: Models for cloud computing, Types of Clouds and Services, Security, Privacy, and Trust management issues, Cloud Economics and Business Models, Resource management and scheduling, QoS (Quality of Service) and Resource Allocation, Virtual Machines Provisioning and migration services, Support for Market-Aware Cloud Services, Pricing Schemes and Risk Management, SLA (Service Level Agreements) negotiation and management Accounting, Billing and Verification Infrastructure Unit 3:	 To explain the virtual machines concepts. (C2) To describe the cloud services and it s management. (C2) 								



Infrastructure models: Infrastructure	1. To explain the types of cloud in detail. (C2)
models & its advantages, Private	
Clouds, Public Clouds, Hybrid Clouds	
Unit 4:	
Important Delivery Mechanisms:	1. To explain the infrastructure, platform, software,
Infrastructure as a Service, Platform as	and other services in detail. (C2)
a Service, Software as a Service, Data as	
a Service, other delivery mechanisms	
like Globalization as a Service, etc.	
Unit 5:	
Parallelization Concepts: High	1. To explain the concept of load and balancing it.
Availability, Replication, Load	(C2)
Balancing, Interoperability between	2. To explain the interoperability of the cloud. (C2)
Clouds, Internetworking between	
Clouds (InterClouds)	
Unit 6 :	
Case Study: Building and Deploying	² 1. To explain the cloud applications and its
Social Network Applications on Clouds	, characteristics through the case studies
Portability of applications and data	^a discussed. (C2)
between different cloud providers	,
Reliability of applications and services	s
running on the cloud, Content Delivery	7
Networks using Storage Clouds, Building	5
and Hosting Internet Service Applications	5
on Cloud, Experience with Building and	1
Using Cloud Infrastructure, Legal issues	5
in Cloud Computing, Business Computing	5
on Clouds	
Unit 7:	



Key Issues:	Recovery,	Data	1.	То	explain	the	research	issues	in	cloud
Segregation,	Underlying Encryption	n, and		com	puting. (C2)				
the other draw	vbacks of Cloud Comp	outing								

Learning strategies, contact hours and student learning time

Learning strategy	Con	tact 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:				I			
Formative:			Summative:				
Internal practical Test			Sessional examination				
Theory Assignments			End semester examination				
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 Examination	*	*	*	*	*	*	
Laboratory examination	*	*	*	*	*	*	



Feedback Process	End-Semester Feedback									
Reference Material	1. Introduction to Cloud Computing, Timothy Chou, Active Book									
	Press 2nd Edition									
	2. Cloud Computing: Principles and Paradigms, R Buyya, Wiley,									
	2010.									
	3. Cloud Computing: Principles, Systems and Applications, L									
	Gillam, Springer, 2010.									



Name of the Program:					Master of Engineering - ME (Blockchain Technology)										
Course	e Title	8			Mach	Machine Learning									
Course	e Code	: BCI	H-617		Cour	Course Instructor:									
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 2									
No of (Credit	s: 3			Prer	Prerequisites: Programming with Python and Data									
					Visua	alizatior	1								
Synop	sis:	This C	ourse p	rovides	s insigh	insight on									
		1. Ne	urons a	nd biol	ogical	ogical motivation, activation functions and threshold units,									
		sup	work me	odels in											
		Artificial Neural Networks.													
		2. Lea	arning f	from un	classifi	ied data	using	clustering tec	hniques						
		3. Suj	pport V	ector N	Iachine	es for lir	ear and	d non-linear o	classific	ation.					
		4. De	ep Lea	rning	and de	esign o	f conv	olutional ne	ural ne	twork fo	or Deep				
		Lea	arning.												
		5. Ap	plicatio	ons and	design	design of Reinforcement Learning algorithms.									
Course	e														
Outco	mes														
(COs):	:														
CO 1:		Explai	n conce	pt lear	ning an	d hypot	hesis sj	pace							
		Descri	be activ	ation f	unction	nctions, weights and threshold units used in artificial neural									
CO 2:		networ	ks, sup	ervised	and unsupervised learning, gradient descent approach, types										
		of perc	eptron	models	, overfi	itting									
		Apply	Decisio	on Tree	, PAC,	PAC, Bayes and Markov nets, K-NN, SVM, clustering and									
CO 3:		back p	ropagat	ion mo	dels for machine learning										
CO 4:		Analy	se diffe	rent ma	chine learning algorithms										
Design ensemble me					ethods, back propagation neural network. K-means and										
CO 5:		agglon	nerative	cluste	ring models										
Mapping of COs to POs															
	8														
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11				
CO 1	*			101	200										
CO^{2}		*													
			*												
003			*												



CO 4 *									
CO 5 *									
Course content and outcomes:						1			
Content	Competencies								
Unit 1:									
Introduction: Definition of learning systems - Goals and applications of machine learning - Aspects of developing a learning system - Training data, concept representation, and function approximation.		1. E 2. E 1e 3. II te	Define I Describe earning llustrate echniqu	Machine Lean e the applica gapproaches e different ty ues (C3)	rning (C tions fo seem ap vpes of 1	1) r which n propriate machine	machine . (C2) learning		
Unit 2:									
Inductive Classification: The concept learning task - Concept learning as search through a hypothesis space - General-to-specific ordering of hypotheses - Finding maximally specific hypotheses - Version spaces and the candidate elimination algorithm - Learning conjunctive concepts. The importance of inductive bias.	1.	Relation (C4). Appland and a	y diffe most s	cept learning rent algorithr pecific hypo C3)	g and h ns to ob theses f	nypothesi tain most from the	s space general training		
Unit 3:									
Predictive analytics – SupervisedlearningDecision Tree learning: Representingconcepts as decision trees - Recursiveinduction of decision trees - Picking thebest splitting attribute - Entropy andinformation gain - Searching for simple	1. 2. 3.	Cons algor Expl and learn Expl accur	struct ithm (C ain the target ing sys ain diff racy in	decision the C5) method of che function in the tem (C2) ferent validate training and	ree ma oosing t he desig ion tech testing o	achine training et gn of a t unique to of data se	learning xamples machine find the t (C5)		


Ensemble methods (bagging and	4.	Choose a suitable method of ensemble learning
boosting): Using committees of		approach (C3).
multiple hypotheses - Bagging,	5.	Explain various ensemble techniques (C5)
boosting, and DECORATE - Active		
learning with ensembles		
Unit 4:		
Computational learning theory:	1.	Apply K-nearest neighbour, SVM, Logistic
Models of learnability: learning in the		Regression and PCA (C3)
limit - Probably approximately correct	2.	Predict the target value for the new instance using
(PAC) learning - Sample complexity:		Naïve Bayes classifier. (C3)
quantifying the number of examples	3.	Construct explicit generalizations (C5)
needed to PAC learn - Computational	4.	Discriminate Instances Based and Case-based
complexity of training. Sample		learning (C4)
complexity for finite hypothesis spaces.	5.	Explain the Kernel trick for learning non-linear
		functions (C5)
Bayesian learning: Probability theory		
and Bayes rule - Naive Bayes learning		
algorithm - Parameter smoothing -		
Generative vs. discriminative training -		
Logistic regression - Bayes nets and		
Markov nets for representing		
dependencies.		
Instance-based learning: Constructing		
explicit generalizations versus		
comparing to past specific examples -		
K-Nearest Neighbour algorithm - Case-		
based learning.		
Support Vector Machine (SVM):		
Maximum margin linear separators -		
Quadractic programming solution to		



finding maximum margin separators -				
Kernels for learning non-linear				
functions.				
Unit 5:				
Descriptive analytics – unsupervised	1. Relate biological neurons wi	ith artificial neurons		
learning	and the motivation for ANN	development. (C1)		
Artificial Neural Networks: Neurons	2. Distinguish Supervised and u	nsupervised learning		
and biological motivation - Linear	(C2).			
threshold units -Perceptrons:	3. Describe about error reductio	on techniques in used		
representational limitation and gradient	Artificial Neural Networks ba	ased learning (C2)		
descent training - Multilayer networks	4. Write the usability of	different activation		
and back propagation - Hidden layers	functions for ANN learning s	ystem. (C3)		
and constructing intermediate,	5. Describe the architecture of	various perceptron		
distributed representations –	networks. (C2)			
Overfitting.				
Unit 6 :				
Clustering: Learning from unclassified	1. Write the different metho	ds of learning from		
data - Clustering. Hierarchical	unclassified data (C3).			
Aglomerative Clustering - Non-	2. Explain the operations of various clustering			
Hierarchical Clustering - k-means	models in machine learning	g (C5)		
partitional clustering - Expectation	3. Describe the methods u	sed for measuring		
maximization (EM) for soft clustering -	dissimilarity between two	clusters. (C2)		
Semi-supervised learning with EM using	^g 4. Apply clustering techniques for data analysis.			
labeled and unlabled data.	(C3)			
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		74
Assessment Methods:					
Formative:			Summat	ive:	
Internal practical Test			Sessional	l examinat	ion
Theory Assignments			End seme	ester exam	ination
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-Semes	ster Feedb	oack			
Reference Material1.Pattern Bishop2.Machin edition,3.An intr Shawe- Press, 14.Machin Sense of 2012.5.Artific Peter N	 Pattern Recognition and Machine Learning, Christopher M. Bishop. Springer, 1st Edition, 2006. Machine Learning, Tom Mitchell, McGraw-Hill Education, 1st edition, 1997. An introduction to support vector machines, Cristianini, N. and J. Shawe-Taylor. Cambridge University Press, Cambridge University Press, 1st edition, 2000. Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Flach, Peter. Cambridge University Press, 1st edition, 2012. Artificial Intelligence: A Modern Approach, Russell, Stuart and Data in Data in University Press, 1st edition 				



	5. Pattern Classification, Duda, R., P. Hart, and D. Stork. Wiley
	Publishers, Second Edition,2000.
	7. A Course in Machine Learning, Hal Daumé III . Available online
	at <u>http://ciml.info/</u>
4	B. Analytics in a Big Data World, Bart Baesens. Wiley,1 st Edition,
	2014.
	Ensemble Learning, Thomas G. Dietteri in The Handbook of Brain
	Theory and Neural Networks, Second edition, (M.A. Arbib, Editor),
	Cambridge, MA: The MIT Press, 2002.
	0. Generative and discriminative classifiers: naïve Bayes and
	logistic regression. Available online at
	http://www.cs.cmu.edu/~tom/mlbook/NBayesLogReg.pdf



Name	Name of the Program:					Master of Engineering - ME (Blockchain Technology)						
Course Title:					Entre	Entrepreneurship						
Course	e Code	: EN	P-601		Cour	se Inst	ructor:					
Acade	mic Ye	ear: 202	20 - 202	21	Seme	ester:	First Y	ear, Semeste	r 2			
No of	Credits	s: 3			Prere	equisite	s:					
Synop	sis:	This co	ourse in	troduce	es stude	ents to th	ne theor	ry of entrepre	eneurship	o and its p	ractical	
		implen	nentatio	on. It f	focuses	on dif	ferent	stages relate	d to the	e entrepre	neurial	
		process	s, inclu	iding b	ousiness	s mode	l innov	vation, mone	etization	, small b	usiness	
		management as well as strategies that improve performance of new business								usiness		
		venture	es. Cen	tered of	n a mix	ture of	heoreti	cal explorati	on as we	ell as case	studies	
		of real-	world	exampl	es and g	guest lec	ctures, s	students will	develop	an underst	tanding	
		of suce	cesses,	opport	unities	and ris	ks of e	entrepreneurs	ship. Th	is course	has an	
		interdis	sciplina	ry app	roach a	nd is the	erefore	open to stude	ents fron	n other Ma	ajors.	
Course	e											
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, st	udents will b	e able to):		
(COs)	:											
CO 1.		To impart knowledge on the basics of entrepreneurial skills and competencies to						ncies to				
		provide the participants with necessary inputs for creation of new ventures.										
		To fam	iliarize	the par	rticipan	ts with	the con	cept and over	view 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	ess sta	rting with pro	e-ventur	e stage		
CO 4:		To Cre	ate and	exploi	t innov	ative bu	siness	ideas and ma	rket opp	ortunities		
CO 5.		To Bu	ild a m	nind-set	t focusi	ng on	develop	oing novel a	nd uniqu	ie approa	ches to	
0.05:		market	opport	unities								
000		To exp	plore n	ew vis	stas of	entrep	eneurs	hip in 21st	century	environn	nent to	
		generat	te inno	vative b	ousiness	s ideas t	hrough	case studies				
Mappi	Mapping of COs to POs											
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 1	*											
CO 2				*								
CO 3			*									
CO 4						*						



CO 5			*				
CO 6					*		
Course content and outcomes:		-1		I	1		
Content	Compet	encies					
Unit 1: Introduction to Entrepre	neurship)					
Meaning and Definition of	1. 1	Explain	the meaning	of Entre	preneursh	ip (C1)	
Entrepreneurship-Employment vs	2.	Discuss	the theories	of Entre	preneurshi	ip (C1)	
Entrepreneurship, Theories of	3.	Discuss	the approac	to the sto	Entrepren	eurship	
Entrepreneurship, approach to		(C1)					
entrepreneurship, Entrepreneurs VS							
Manager							
Unit 2: Entrepreneurial Traits							
Personality of an entrepreneur, Types of	1.	Discuss	the Personal	ity traits	of entrepr	eneurs.	
Entrepreneurs		(C2)					
Unit 3: Process of Entrepreneurship							
Factors affecting Entrepreneurship	1.	Identify	the fundame	entals an	d responsi	bilities	
process		of entre	preneurship ((C2)			
	2.	Exempl	ify one's cap	abilities	in relation	n to the	
	1	rigors o	f successful v	ventures	(C3)		
	3.	Identify	and diffe	erentiates	s the di	ifferent	
		characte	eristics and	compe	etencies	of an	
		entrepre	eneurs (C2)				
Unit 4: Business Start-up Process							
Idea Generation, Scanning the	1.	Explain	the Process	of Busin	ess start u	p (C1)	
Environment, Macro and Micro	2.	Develop	o creativity	and crit	tical think	ting in	
analysis		identify	ing opportun	ities (C5	5)		
	3.	Apply i	nnovative ap	pproache	es in envis	sioning	
		ones en	trepreneurial	career (C3)		
Unit 5: Business Plan writing							
Points to be considered, Model Business	1.	Identify	different bus	siness m	odels (C3))	
plan	2.	Describ	e different pa	rts of a b	ousiness pl	an(C2)	
Unit 6: Case studies	1						



AVED BY	(Deemea to be t	Sniversity i	nuer section 5 c	of the OGC Att, 193	<i>,</i>				
Indian and Intern	ational	1.	Perform	n self-as	sessme	nt	and	analyse	
Entrepreneurship			entrepre	eneurial	persor	nal	traits	and	
			compete	encies (C4)				
		2.	Evaluat	e oneself a	nd plan	cou	rses of a	iction to	
			help	develop	one's	s	entrepr	eneurial	
			characte	eristics and	l compe	etenc	ties. (C5))	
Learning strategies, contact ho	urs and s	tuden	t learnir	ng time					
Learning strategy			Conte	act hours		St	udent le	arning	
							time (H	Irs)	
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				Sessional	l examir	natic	on		
Theory Assignments		End semester ex			amination				
Lab Assignment & Viva	Viva								
Mapping of assessment with Co	0S			I					
Nature of assessment	CO 1	0	CO 2	CO 3	CO	4	CO 5	CO 6	
Sessional Examination 1	*		*						
Sessional Examination 2				*	*				

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Assignment/Presentation

End Semester Examination



Feedback Process	•		End-Semester Feedback			
Reference Material		1.	NVR Naidu and T. Krishna Rao, "Management and			
			Entrepreneurship", IK International Publishing House Pvt. Ltd			
			2008.			
		2.	Mohanthy Sangram Keshari, "Fundamentals of			
			Entrepreneurship", PHI Publications, 2005			
		3.	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:			Mast	Master of Engineering - ME (Blockchain Technology)								
Course	e Title				Devo	Devops for Cloud Lab						
Course	Course Code: CDC 607L					Course Instructor:						
Acade	mic Ye	ear: 202	20-202	1	Seme	ester:	Year, S	emester				
No of	Credit	s: 1			Prer	equisite	s: Ubu	ntu OS, I	Network	ing and S	Software	
					Life	Cycle						
Synop	sis:	This C	ourse p	rovides	s insigh	t on:						
		1. De	evops P	roduct	Life Cy	ycles Sta	age.					
		2. Au	ıtomati	on of p	roduct	lifecycl	e.					
Course	e											
Outco	Dutcomes On successful completion of this course, students will be able to											
(COs):	:											
CO 1:		Explain the concept of automation of Product Life Cycle stages.										
CO 2:		Design an Devops methodologies for Product development and Release										
CO 3.	Demonstrate Continuous Integration / Continuous Testing / Continuous							ntinuous				
0.0.5.		Deploy	ment c	of Produ	ict.							
CO4:		Explain	n the co	oncepts	of Too	ls used	in each	stages of	Devops			
CO5:		Demor	strate (Continu	ious M	onitorin	g of Pro	duction	Environr	nent.		
Mappi	ing of (COs to 1	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		*	*		*							
CO 5		*	*		*							
Course content and outcomes:												
Conter	ıt				(Compete	encies					
Unit 1	: D	evOps 1	ntrodu	iction								



Understanding Development	1. Demonstrate differences between
- Developement SDLC : WaterFall &	Waterfall and agile software development
Agile - Understanding Operations -	methodologies (C2)
Dev vs Ops - DevOps to the rescue	
- What is DevOps - DevOps SDLC	
- Continous Delivery model -	
DevOps tools for DevOps SDLC	
- DevOps Roles & Responsiblities.	
Unit 2: Linux	
Linux Introduction, Principles &	1. Design Ubuntu based VM using
Linux distro – Booting - Command	hypervisor to understand booting process,
line utililities &	linux file system, linux networking,
Basic commands - Linux Filesystem	Users, Groups and Permissions, tools (ssh
- Filters & I/O Redirections - Users	, scp etc) (C3)
& Group administration - File	2. Design a docker environment to
permissions &	containerize web application (C3)
Ownerships	3. Design a Kubernetes cluster to deploy
- Sudo - Software Managemen -	containerized application using
Useful tools: ssh, telnet, scp, rsync,	Kubernetes deployment and service
disk utils, backups	models (C4)
etc - Service & Process management	
- Shell Scripting - Systems and HW	
stats – Linux Containers	
(lxc) - Dockers – Kubernetes	
and Microservices	
Unit 3: Networking fundamentals	
Components of computer networks	1. Design a College/ University network
- Classification: LAN, WAN, Peer to	using packet tracer to understand computer
Peer network, Server based - Switches	networking devices like Hub, Switches,
- Routers - Network Architecture	Routers and Firewalls (C3)



- Protocols - Port numbers - DNS	2. Design a Network project using Packet
- DHCP - IP Addresses - Ip	tracer to understand Networking services
Addresses & Subnet Masks - IP	like DNS, DHCP, FTP etc (C3)
Address	
Ranges - Subnetting - Private Vs	
Public networks	
- High Availaiblity - Firewalls &	
NACL - Web Application	
Architecture - Infrastructure - Net	
work layout - Services & Components	
- Architecture from a DevOps	
perspective.	
Unit 4: Automation, Orchestration	& Config Management
Version control system with Git	1. Create Github account and set up
: What is VCS & why it is needed	repository and use git commands to Clone
- DevOps use cases - Setup your	, Fork and commit files to Github
own repo with git - Manage your code	repositories (C4)
base/source code with GIT & GITHUB	
Unit 5: Continuous Integration with 3	Jenkins
Introduction to continuous integration.	1. Design a Continuous Integration server
- Build & Release and relation with	using Jenkins in Master Slave architecture
DevOps - Understanding	(C3)
development and developers - Why	2. Demonstrate CI/CD for JAVA/PHP/nodejs
Continuous integration Jenkins	web application (C4)
introduction and setup - Jenkins	3. Design an Eclipse Selenium testing project
projects/jobs - Jenkins plugins	to automate Web application Testing
Jenkins administration: Users	Process (C4)
- Nodes/slaves - Managing plugins	
- Managing software versions	
- Introduction - Phases - Java	
builds - Build and Release job/project	
setup Nexus: Intro & Setup	



- Software versioning & Hosted	
repository - Integration with Jenkins	
- Continuous integration job/project	
setup Complete Jenkins	
project: Packinging Artifacts - Static	
code Analysis - Tomcat setup Staging	
& productions	
- Artifacts deployments to	
webservers from Jenkins - Build	
Pipeline - Jenkins not just CI tool	
anymore - More DevOps use cases of	
Jenkins	
Unit 6: Ansible	
Configuration Management	1. Design a Configuration management
& Automation - What is Ansible &	service using Ansible to administer group
its features - Ansible setup on local &	of nodes in lab (C2)
cloud - Understanding Ansible	2. Demonstrate installation of Software
architecture & Execution - Inventory	packages like git , Eclipse , Mysql on
Ad hoc commands: Automating	group of nodes using Ansible (C4)
change Management with Ad Hoc	3. Design a Continuous monitoring server
commands - Playbook	using Nagios to monitor group of servers
Introduction - Ansible configuration	for different dervices like CPU Utilization
with ansible.cfg - Ansible	, RAM Usage , Network Bandwidth ,
documentation - Modules, modules	Apache server logs , Database server logs
& lots of modules - Writing playbook	etc (C5)
for webserver & DB server	
deployments - Tasks - Variables -	
Templates - Loops - Handlers -	
Conditions - Register - Debugging	
- Ansile Roles - Identify server roles	
- Roles structure - Creating,	
Managing and executing roles	



- Ansible Galaxy - Exploring Roles									
from Galaxy - Download Galaxy roles									
and integrate with your code - Ansible									
Advanced Execution - Improving									
execution time - Limiting and									
selecting tasks - Troubleshooting and									
Testing									

Learning strategies, contact hours and student learning time

Learning strategy		Contac	t hours	5	Studen time	t learning e (Hrs)			
Lecture		1	2			-			
Seminar		-	-			-			
Quiz		-	-			-			
Small Group Discussion (SGD)		-	-			-			
Self-directed learning (SDL)		-	-			-			
Problem Based Learning (PBL)		-	-			-			
Case Based Learning (CBL)		0	3			-			
Clinic		-	-			-			
Practical		2	4			-			
Revision		0	3			-			
Assessment		0	6			-			
TOTAL		4	8			-			
Assessment Methods:									
Formative:			Sı	umma	ative:				
Internal practical Test			Se	ession	al examinati	ion			
Theory Assignments			Eı	nd ser	nester exam	ination			
Lab Assignment & Viva			V	iva					
Mapping of assessment with Cos	s								
Nature of assessment	CO 1	CO 2	CO) 3	CO 4	CO 5			



Sessional Examination	n 1	*	*	*	*	*			
Assignment/Presentat	ion				*	*			
Laboratory Examinati	on	*	*	*	*	*			
Feedback Process	End-Seme	ster Feedbac	k						
Reference Material	1. Eri	c Foster-Jo	hnson , Joł	nn C. Welc	h, Micah	Anderson,			
	Be	ginning	Shell S	Scripting	(Program	mer to			
	Pro	ogrammer), V	Wrox Public	ations					
	2. Ra	ndal K. Mio	chael "Mast	ering Unix	Shell Scrip	ting: Bash,			
	Во	urne, and K	orn Shell S	cripting for	Programme	ers, System			
	Ad	ministrators	, and UNI	IX Gurus",	2nd Editi	on, Wiley			
	Pu	blications							
	3. Bir	ntu Harwani,	"UNIX o	& Shell F	Programming	g", Oxford			
	Pu	blications, 20	013						
	4. Joł	nn Fer	guson	Smart,	"Jenkins:	The			
	De	finitive Guic	le",O'reilly l	Publications	5				
	5. Mi	tesh Soni, "J	enkins Esse	ntials", Pacl	kt Publicatio	ns			
	6. Ra	fal Leszko,	"Continuou	us Deliver	y with D	ocker and			
	Jen	ikins", Packt	Publication	IS					
	7. Ve	selin Kantse	v, "Im	plementing	DevO	ps on			
	AV	VS", Packt P	ublications						
	8. Ra	ndall Smith,	"Docker Or	chestration'	', Packt Pub	lications			
	9. Ala	an Berg	, "Jenki	ns Con	tinuous	Integration			
	Co	okbook", Pa	ckt Publicat	ions					
	10. Ku	maran S., S	Senthil, " F	Practical L	XC and L	XD Linux			
	Co	ntainers	for	Virt	ualization	and			
	Ore	Orchestration", Apress Publications							
	11. Ko	nstantin I	vanov, "	Container	ization wi	th LXC"			
	, Pa	ackt Publica	tions						



12. Karl	Matthias,	Sean Kane,	"Docker:	Up
& Rum	ning:Shipping	Reliable	Cor	ntainer
in Prod	uction",O'Reilly	y Media		



Name	of the	Program	m:		Mast	er of En	gineerin	g - ME (Blockch	ain Tech	nology)		
Course	e Title				Netw	ork Sec	urity and	l Analysi	is Lab				
Course	e Code	BCH	602L		Cour	Course Instructor:							
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 2							
No of (Credit	s: 1			Prer Micro	equisite	s: ller Arch	Microp itecture	orocesso , Assem	r archite bly langu	cture , age and		
G				• 1	Num	ber syst	ems						
Synop	SIS:	This C	ourse p	rovides	s insigh	insight on							
		The	e cours	e allow	s stude	nts to ur	nderstand	l the netv	work dev	vices and	the data		
		for	formats for different protocols. As lot of data is populated in the present										
		WO	world an analysis of these packets using the modern tools help to										
		understand the attacks and the nature of the network.											
Course	e												
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, stu	dents wil	ll be able	e to			
(COs):	:												
CO	1:	Identif	Identify some of the factors driving the need for network security										
СО	2:	Identif	y and c	lassify	particu	lar exan	nples of a	attacks					
СО	3:	Define	the ter	ms vuli	nerabili	ty, threa	at and att	ack					
CO	4:	Identif	y physi	cal poi	nts of v	ulnerab	ility in si	mple net	tworks				
CO	5.	Compa	are and	contras	t symm	symmetric and asymmetric encryption systems and their							
	5.	vulnera	ability t	o attac	k, and e	, and explain the characteristics of hybrid systems.							
CO	6:	Analyz	ze the p	ackets	through	the net	work too	ols					
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				*									
CO 6			*	*									
Course	e conte	ent and	outcon	nes:				•	•	•			
Conten	nt –				(Compete	encies						
Unit 1	:												



INTERNET SECURITY &	At the end of the topic studen	t should be able to :							
ENCRYPTION	Apply encryption algorithm t	to protect the attack							
	on confidentiality (C13)								
Unit 2:									
FIREWALLS:	Model secure network infrastructure for the given scenario. (C4)								
Unit 3:									
SNIFFERS AND PACKET	Demonstrate network analys	sis using Wireshark							
CRAFTING:	(tshark), tcpdump, Scapy, Si	not tools to identify							
	malicious behavior in the netw	work traffic. (C1)							
Unit 4:									
Metasploit	Test for security vulnerabilities using Metasploit								
	tools. (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	s:								
Formative:					Summa	ative:			
Internal practical Test	t				Sessional examination				
Theory Assignments		End ser	nester exa	aminatio	n				
Lab Assignment & Viva		Viva							
Mapping of assessme	ent	with Co	s						
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		*	*	*	*	*	*	
Laboratory examinati	on		*	*	*	*	*	*	
Feedback Process	En	d-Seme	ter Feedl	back					
		u-seme:		Jack					
Reference Material	1.	Crypto	ography	and Networ	k Security - 1	Principle	s and Pr	actice,	
		Stalling	gs Willia	m, Pearson E	ducation; Se	venth edi	tion, 201	7.	
	2.	Crypto	ography	And Netwo	rk Security,	Forouzar	n, McGra	aw Hill	
		Educat	ion, 2015						
	3.	Crypto	ography	and Netwo	rk Security	, Atul Ka	ahate, M	lcGraw	
		Hill Ed	ucation;	Third editior	n, 2017.				
	4.	Netwo	rk Secu	rity Essenti	als: Applic	ations a	nd Stan	dards,	
		Williar	n Stalling	gs, Prentice H	Hall, 4 th edition	on, 2010.			
	5.	Metas	ploit -	The Peneti	ration Test	er's Gui	de by	David	
		Kenne	dy , Jim (O'gorma, Do	evon Kearns	and Mat	i Aharon	ni – No	
		Starch	Press Pul	olication					
	6.	Intern	etworki	ng with TC	P/IP Vol I	: Princi	ples, Pr	otocols	
		and Ar	chitectu	re, Douglas	E Comer, 3r	d edition.	PHI, 19	97.	
	7.	TCP/I	P Illustr	ated, Volu	me I, The	Protoco	ls, W F	Richard	
		Stevens	s, Interna	tional Studer	nt Edition, 19	999.			
	8.	RFC's	on IPS	EC, SSL, T	ГLS, HTTP	S, Kerb	eros - I	nternet	
		resourc	es.						



Name	of the	Program	n:		M.E	M. E. in Blockchain Technology							
Course	e Title:	:			Adva	nced B	lockcha	in Application	on Deve	lopmen	t Lab		
Course	e Code	: BCH	I 604L		Cour	Course Instructor:							
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 2							
No of	Credit	s: 1			Prer	equisite	s:	Basics	of sen	sors, H	Basics	of	
					comm	nunicati	on						
Synop	sis:	This C	ourse p	rovides	insigh	t on							
		The	e cours	e allow	s stude	nts to h	ave an ı	understandin	g of the	python	const	ruct	
		and	l to bui	ld appl	lication	s for bl	ocking	using the w	eb fram	eworks	based	on	
		pyt	hon and	d JavaS	cript.								
Course	e												
Outco	mes	On suc	On successful completion of this course, students will be able to										
(COs):	:												
CO 1:		Discus	s and D	escribe	e Objec	t Orient	ed Prog	gramming co	ncepts v	vith Pyt	hon		
CO 2:		Develo	p an bl	ockcha	in appl	ications	using H	Python and it	ts frame	work.			
CO 3:		Develo	p the d	atabase	applic	ation ar	nd build	it.					
CO 4:		Develo	p and b	ouild ap	plicatio	on based	d on RE	ST API.					
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	<i>PO</i> 8	PO 9	PO 10	PO	11	
CO 1	*	*	*		*								
CO 2	*	*	*		*								
CO 3	*	*	*		*								
CO 4	*	*	*		*								
Course	e conte	ent and	outcon	nes:		1	·ł		I	1			
Conten	ıt				(Compete	encies						
Unit 1	:												



IntroductiontoApplicationDevelopment–IntroductiontoproceduralvsObjectOrientedLanguage–IntroductiontoPythonPython datatypes–Constructs-Examples with basic constructs	1. To const	illustrate to ructs involved	solve in pytho	problems on (C2)	using	the
Unit 2						
Object oriented Concepts - Class -Objects - Encapsulation - Abstraction -Polymorphism-Inheritance-Association-Aggregation-Composition-Objectorientedprogramming with Python - Examples	1. To ill and t	lustrate to solve he way written	problen	ms the OOI	PS conce	pts
Unit 3:						
Socket Programming with python – database applications - email applications - REST API – Python web frameworks – Buidling Blockchain applications from Scratch – Using Frameworks - Case study	 To illustrate and to solve problems based of socket programming in python. (C2) To illustrate applications based on the blockcha framework. (C2) 					on ain
Learning strategies, contact hours and	student l	earning time				
Learning strategy		Contact hours		Studer tim	nt learnin e (Hrs)	g
Lecture		12			-	
Seminar		-			-	
Quiz		-			-	
Small Group Discussion (SGD)		-			-	
Self-directed learning (SDL)		-			-	
Problem Based Learning (PBL)		-			-	
Case Based Learning (CBL)		03			-	



Clinic				_	_
Draatiacl				-	
Practical				24	-
Revision				03	-
Assessment				06	-
TOTAL				48	-
Assessment Methods	s:				
Formative:				Summat	ive:
Internal practical Test	t			Sessional	examination
Theory Assignments				End seme	ester examination
Lab Assignment & Viva				Viva	
Manning of assessm	ent with C	05			
Nature of assessment			CO^2	CO 3	<u>CO 4</u>
Sessional Examinatio	n 1	*	*	0.0.5	04
			•		v
Sessional Examinatio	on 2			*	*
Assignment/Presentat	tion	*	*	*	*
End Semester Examin	nation	*	*	*	*
Laboratory examinati	on	*	*	*	*
Feedback Process	End-Sem	ester Feedb	back	·	
Reference Material	1. Pyth o	on: The Co	mplete Refe	erence, Mar	tin C. Brown , McGraw Hill
	Educa	ation: Forth	edition, 20	18.	, ,
	2. Hand	s-On Pv	thon for	Finance:	A practical guide to
	imple	ementing f	inancial an	alvsis strat	egies using Python. Krish
	Naik	Packt Pub	lishing I imi	ted 2019	
	3 Loom	ning Puth	on. Power	ful Object	Oriented Programming
	J. Lean Mark	Intz 5th E	Edition O'P	eilly Media	5 edition 2013
		ning Ohia	ot Oriented	Duthon. D	uild nowarful applications
	4. IVIASU	noucoble -	odo voir-a	OD doctor	nottoms and Dether 27
	with			or design	patterns and rython 3.7,
	Steve	n F. Lott, 2	nd Edition, 2	2019	



5.	Flask Web Development: Developing Web Applications with
	Python, Miguel Grinberg, O'Reilly Media; 2 editions, 2018
6.	Beginning Web Development with Python: from prototype to
	production with flask, tornado and nginx, Andrei Dan, Kindle
	Edition
7.	Hands-On RESTful API Design Patterns and Best Practices:
	Design, develop, and deploy highly adaptable, scalable, and
	secure RESTful web APIs, Harihara Subramanian , Pethuru Raj,
	Packt Publishing; 1 st edition, 2019.
8.	Hands-On Blockchain for Python Developers: Gain blockchain
	programming skills to build decentralized applications using
	Python , Arjuna Sky Kok, Packt Publishing, 1 st edition, 2019.



Name	of the	Program	n:		Mast	Master of Engineering - ME (Blockchain Technology)							
Course	e Title				Block	kchain V	erification	and Tes	ting LA	В			
Course	e Code	BCH	I 606L		Cour	rse Instru	uctor:						
Acade	mic Ye	ear: 202	20 - 202	21	Seme	Semester: First Year, Semester 2							
No of C	Credit	s: 1			Prer	equisites	: Basic	Program	ming				
Synops	sis:	This C	ourse p	rovides	insigh	t on							
		The co	urse all	ows stu	idents t	to have a	n understar	nding of	the pyth	on const	ruct and		
		to build	l applic	ations f	for bloc	king usi	ng the web	framew	orks base	ed on pyt	hon and		
		javascı	ript.										
Course	e												
Outco	mes	On suc	On successful completion of this course, students will be able to										
(COs):													
CO	1:	Design	Design test cases suitable for a software development for different domains.										
CO	2:	Identify and use the test tools for Blockchain testing and automation											
CO	3:	Identify suitable tests to be carried out											
CO	4:	Prepar	e test p	lanning	based	on the do	ocument						
CO	5:	Write t	est pla	ns and t	est cas	es design	ed						
C0	6:	Use of	automa	atic test	ing too	ls							
CO	7:	Develo	op and v	validate	a test j	plan							
Mappi	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	PO 7	PO 8	<i>PO</i> 9	PO 10	PO 11		
CO 1	*	*	*	*	*								
CO 2	*	*	*		*								
CO 3	*	*	*		*								
CO 4	*	*	*		*								
CO 5	*	*	*		*								
CO 6	*	*	*		*								
CO 7	*	*	*		*								
Course	e conte	ent and	outcon	nes:									
Conten	nt 🔤					Competencies							
Unit 1													



Unit 2:

Overview of the Software - What is	
Software? - Software Technologies - What is Web Application - Web Application Technologies - Software	1. To illustrate the process involved in model through UML diagrams. (C2)
Development Lifecycle(SDLC):	
Waterfall Model - Iterative Model - Spiral	
Model - V-Model - Big Bang Model -	
Agile Model - RAD Model	
Unit 3:	



Software Testing Life Cycle - (STLC):	
Understand Requirement - Create Test	1. Compass a SPS document and arrests a test
Cases - Manual Testing - Automation	nlon (C6)
Testing - Test Report	
Software requirements specification -	
(SRS): What is SRS - Finding gap in SRS	
- How to Write a Test Plan from SRS	
Document - How to test software	
requirements specification (SRS)? -	
Review SRS Document and Create Test	
Scenarios	
Functional Testing: Unit Testing -	
Integration Testing - System Testing	
Regression Testing - Acceptance Testing	
Non-Functional Testing: Performance	
Testing - Load Testing - Usability Testing	
- Security Testing - Portability Testing	
Manual Testing: Writing test scenarios -	
Test planning - Test case design	
Test data identification - Reviewing and	
Execution of Test cases/scripts	
Unit 4:	
Software test automation – skill needed	4 To illustrate the test cases using selenium (C2)
for automation - scope of automation -	+. 10 musual inclust cases using selement. (C2)
design and architecture for automation -	
requirements for a test tool – challenges in	
automation – Test metrics and	

I



measurements – project, progress and productivity metrics. – Need for Automation testing – Tool Selection – Frameworks - Test case using Selenium – QTP – and other tools

Learning strategies,	contact hours and	student learning time
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Learning strategy		Con	tact hoi	S	Student learning				
							time (Hrs)		
Lecture				12			-		
Seminar				-			_		
Quiz				-			-		
Small Group Discussion (SGD)	I			-			-		
Self-directed learning (SDL)				-			-		
Problem Based Learning (PBL)				-			_		
Case Based Learning (CBL)				03			-		
Clinic				-			-		
Practical				24		-			
Revision		03					-		
Assessment		06					-		
TOTAL		48					-		
Assessment Methods:		I				I			
Formative:					ative:	ive:			
Internal practical Test					al exa	l examination			
Theory Assignments		End seme					ester examination		
Lab Assignment & Viva		Viva							
Mapping of assessment with (Cos				1				
Nature of assessment	Nature of assessment CO 1				CO 5	CO 6	C7		
Sessional Examination 1	*	*	*						
Sessional Examination 2				*	*	*	*		



Assignment/Presentat	tion	*	*	*	*	*	*	*		
End Semester Examin	nation	*	*	*	*	*	*	*		
Laboratory examinati	on	*	*	*	*	*	*	*		
Feedback Process	End-Sen	End-Semester Feedback								
Reference Material	1. Soft	ware Testi	ng – P	rincip	les and	l Practio	ces , Sri	nivasan Desikan		
	and (Gopalaswa	my Ran	nesh, F	Pearson	Educati	on, 200)6.		
	2. Soft	ware Testi	ng, Ro	n Patt	on, Sec	cond Ed	ition, S	Sams Publishing,		
	Pearson Education, 2007									
	3. Practical Software Testing, Ilene Burnstein, Springer Interna									
	Editi	on, 2003.								
	4. Soft	ware Testi	ing in t	he Re	eal Wo	rld – In	nprovi	ng the Process,		
	Edw	ard Kit, Pea	arson E	ducati	on, 199	5.				
	5. Soft	ware Test	ing Te	chniq	ues, Bo	oris Bei	zer, 21	nd Edition, Van		
	Nost	rand Reinh	old, Ne	w Yor	k, 1990).				
	6. Four	ndations of	f Softwa	are Te	sting_	Fundar	nental	Algorithms and		
	Tech	niques, Ad	ditya P.	Mathu	ır, Dorl	ing Kinc	lersley	(India) Pvt. Ltd.,		
	Pears	son Educat	ion, 200)8.						
	7. Ben Laurie, Peter Laurie, "Apache: The Definitive Guid									
	Editi	dition, O'Reilly Media,2009.								
	8. Bria	8. Brian Totty, David Gourley, Marjorie Sayer, Anshu Aggarwal, Sailu								
	Redo	ly, "HTTP:	The De	efinitiv	ve Guid	e", O'Re	illy Me	edia, 2009.		



Name	of the	Program	n:		M. I	M. E. in Blockchain Technology							
Course	e Title:				Clou	Cloud Computing Lab							
Course	e Code	: BC	H-616I		Cou	Course Instructor:							
Acade	mic Ye	ear: 202	20 - 202	21	Sem	nester:	First Y	ear, Semeste	r 2				
No of	Credit	s: 1			Prei	requisite	s: F	amiliarity in	develo	oping app	olication		
usi						g any hig	gh-leve	l language					
Synop	sis:	This Co	ourse p	rovides	s insig	ht on							
		Cloud	Comp	uting is	the	delivery	of co	mputing serv	ices—ir	ncluding	servers,		
		storage	, datab	ases, n	etwor	king, sof	tware,	analytics, an	d intell	igence—	over the		
		Interne	t ("the	e cloud	") to	offer f	aster	innovation,	flexible	resourc	es, and		
		econon	nies of	scale.	The stu	udents ar	e intro	duced with th	ne basic	understa	nding of		
		the arc	hitectu	re of	cloud	computi	ng and	l its various	types.	Also the	course		
		discuss	es the	charact	eristic	cs, resear	ch issu	es and applic	ation in	nplement	ation on		
		the cloud.											
Course	e												
Outco	mes	On suc	cessful	compl	etion o	on of this course, students will be able to							
(COs):	:												
CO 1:		To ider	ntify the	e type o	of clou	ıd availat	ole in th	ne market					
CO 2:		To setu	ıp a pri	vate clo	oud an	d unders	tand th	e steps involv	ved				
CO 3:		To illu	strate th	ne vario	ous ste	eps involv	ved in u	ising the pub	lic cloud	d services	9		
Mappi	ing of (COs to l	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	*	*			*								
Course	e conte	ent and	outcon	nes:	1	•			L	•			
Content						Compete	encies						
Unit 1	•												
Introduction: Evolution of Cloud						1. To io	dentify	the type of c	cloud pl	atforms a	vailable		
Compu	ıting,	Enablin	ng teo	chnolog	gies,	s, in the marks (C3)							
Cloud	compu	ting infr	astructu	ire moo	dels,	111 (11)							
Public,	priva	ite, and	l hybr	id clo	uds,								



Architectural layers of cloud	
computing, Cloud application	
programming interfaces, Inside Grid,	
HPC, Clouds	
Unit 2:	
Cloud Architecture: Models for cloud	1. To illustrate, install and manage the virtual
computing, Types of Clouds and	machines (C2)
Services, Security, Privacy, and Trust	
management issues, Cloud Economics	
and Business Models, Resource	
management and scheduling, QoS	
(Quality of Service) and Resource	
Allocation, Virtual Machines	
Provisioning and migration services,	
Support for Market-Aware Cloud	
Services, Pricing Schemes and Risk	
Management, SLA (Service Level	
Agreements) negotiation and	
management Accounting, Billing and	
Verification Infrastructure	
Unit 3:	<u> </u>
Infrastructure models: Infrastructure	1. To illustrate the installation steps in a private
models & its advantages. Private	cloud. (C2)
Clouds, Public Clouds, Hybrid Clouds	2. To illustrate the usage of public cloud (C2)
TT •/ 4	
Unit 4:	Γ
Important Delivery Mechanisms:	1. To explore and illustrate the services of the cloud.
Infrastructure as a Service, Platform as	(C2)
a Service, Software as a Service, Data as	



a Service, other delivery mechanisms		
like Globalization as a Service, etc.		
Unit 5:		
Parallelization Concepts: High	1. To illustrate the concept of lo	bad balancing. (C2)
Availability, Replication, Load		
Balancing, Interoperability between		
Clouds, Internetworking between		
Clouds (InterClouds)		
Unit 6 :		
Case Study: Building and Deploying	^g 1. To illustrate the applica	ation on the cloud
Social Network Applications on Clouds	, (private/public/both)	
Portability of applications and data	a	
between different cloud providers	,	
Reliability of applications and services	5	
running on the cloud, Content Delivery	/	
Networks using Storage Clouds, Building	y	
and Hosting Internet Service Applications	5	
on Cloud, Experience with Building and	1	
Using Cloud Infrastructure, Legal issues	5	
in Cloud Computing, Business Computing	5	
on Clouds		
Unit 7:		
Key Issues: Recovery, Data	1. To illustrate the application	n of cloud security.
Segregation, Underlying Encryption, and	1	
the other drawbacks of Cloud Computing		
Learning strategies, contact hours and	student learning time	
Learning strategy	Contact hours	Student learning
		time (Hrs)
Lecture	12	-
Seminar	-	-
Quiz	-	-



Small Group Discussi	ion (SGD)		-	-				
Self-directed learning	(SDL)	-	-					
Problem Based Learn	ing (PBL)	-	-					
Case Based Learning	(CBL)		03	-				
Clinic			-	-				
Practical			24	-				
Revision			03	-				
Assessment			06	-				
TOTAL			48	-				
Assessment Methods	5:							
Formative:			Summative:					
Internal practical Test	t		Sessional exam	Sessional examination				
Theory Assignments			End semester e	End semester examination				
Lab Assignment & Viva			Viva	Viva				
Mapping of assessme	ent with Co	s						
Nature of assessment		CO 1	CO 2	CO 3				
Sessional Examinatio	n 1	*	*					
Sessional Examinatio	n 2		*	*				
Assignment/Presentat	tion	*		*				
Laboratory examinati	on	*	*	*				
Feedback Process	End-Semes	ster Feedback						
Reference Material	1. Introd	uction to Cloud	Computing, Timothy	y Chou, Active Book				
	Press 2	nd Edition						
	2. Cloud	Computing: Pri	inciples and Paradig	ms, R Buyya, Wiley,				
	2010.	2010.						
	3. Cloud	Computing: P	rinciples, Systems a	and Applications, L				
	Gillam	, Springer, 2010.						



Name of the Program:					Mast	Master of Engineering - ME (Blockchain Technology)							
Course	Course Title:					Machine Learning Lab							
Course Code: BCH-617L					Cour	Course Instructor:							
Academic Year: 2020 - 2021					Seme	ester:	First Y	ear, Semester	r 2				
No of (Credit	s : 1			Prer	equisite	s:	Programming	g with I	Python a	nd Data		
	_				Visua	alizatior	1						
Synops	sis:	This Co	ourse p	rovides	s insigh	t on							
		1. Net	urons a	nd biol	ogical	motivat	ion, ac	tivation funct	tions and	d thresho	ld units,		
		sup	ervised	and	unsupe	ervised	learni	ng, perceptro	on netw	vork mo	dels in		
		Art	ificial l	Neural	Networ	·ks.							
		2. Lea	arning f	from un	classifi	ed data	using	clustering tec	hniques	•			
		3. Sup	oport V	ector N	Iachine	s for lin	ear and	d non-linear c	classifica	ation.			
		4. Dee	ep Lea	rning	and de	esign o	f conv	volutional ne	ural ne	twork fo	or Deep		
		Lea	arning.										
		5. Ap	plicatio	ons and	design	of Rein	forcem	ent Learning	algorith	nms.			
Course	9												
Outco	nes	On suc	cessful	compl	etion of	this co	urse, st	udents will b	e able to)			
(COs):													
		Apply	activati	ion fun	ctions,	weights	and th	nreshold units	s used in	n artificia	l neural		
CO 1:		networ	ks, sup	ervised	and un	supervis	sed lear	ming, gradien	t descer	it approac	ch, types		
		of perc	eptron	models	, overfi	tting							
		Demon	strate	Decisi	on Tre	n Tree, PAC, Bayes and Markov nets, K-NN, SVM,							
CO 2:		clusteri	ing and	back p	oropaga	opagation models							
CO 3:		Analys	e diffei	rent ma	chine le	earning	algorit	hms					
00.4		Design	ensen	nble m	ethods,	back	propag	ation neural	networ	k, K-me	ans and		
CO 4:		agglom	nerative	cluste	ring mo	odels							
		Apply	activati	ion fun	ctions,	weights	and th	nreshold units	s used in	n artificia	l neural		
CO 5: networks, supervised and uns							sed lear	ming, gradien	t descer	it approac	ch, types		
of perceptron models, o						tting							
Маррі	Mapping 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	*				*									
Course	e conte	nt and	outcon	nes:										
Conten	et					Competencies								
Unit 1	:													
Introd	uction:	Defin	ition c	of lear	ning	1.	Iden	tify pro	ogramming er	nvironm	ents avai	lable for		
system	s - Go	oals and	d appli	ications	s of		the n	nachine	e learning (C	1)				
machin	le lea	rning	- A	spects	of	2.	Class	sify t	the pros a	and co	ns of	various		
develop	ping a l	earning	system	ı - Trai	ning		envii	ronmer	nts for ML co	ding (C	2)			
data,	concep	ot rep	resenta	tion,	and									
functio	n appro	oximatio	on.											
Unit 2:														
Induct	ive Cla	assificat	tion: T	he con	cept	1.	Desi	gn a	machine lea	arning 1	nodel to	get a		
learnin	g task	- Co	ncept l	earning	g as	Maximally Specific Hypothesis for the given								
search	throug	h a hy	pothes	is spa	ce -	training examples (C5).								
Genera	l-to-spe	ecific	orde	ring	of	2. Construct a machine learning model to obtain								
hypoth	eses -	Fir	nding	maxim	hally	most general and most specific hypotheses for the								
specific	e hypo	theses	- Vers	ion sp	aces		given training examples (C5)							
and the	candid	late elin	nination	n algori	thm									
- Leai	ming c	onjunct	ive con	cepts.	The									
importa	ance of	inducti	ve bias.											
Unit 3	:													
Predic	tive a	nalytic	s – S	Superv	ised	1.	Deve	elop a	machine l	earning	classifie	r using		
learnir	ıg						decis	sion tre	e and randon	n forest ((C5)			
Decisio	on Tree	e learni	ing: Re	epresen	ting	2.	Deve	elop	machine le	earning	models	using		
concep	ts as de	ecision	trees -	Recur	sive		Ense	mble n	nodels. (C5)					
inducti	on of de	ecision	trees -	Picking	g the									
best sp	olitting	attribut	te - Ei	ntropy	and									



information gain - Searching for simple trees and computational complexity Ensemble methods (bagging and boosting): Using committees of multiple hypotheses - Bagging, boosting, and DECORATE - Active learning with ensembles Unit 4:	
Computational learning theory: Models of learnability: learning in the limit - Probably approximately correct (PAC) learning - Sample complexity: quantifying the number of examples needed to PAC learn - Computational complexity of training. Sample complexity for finite hypothesis spaces.	 Design a learning method to determine the sample complexity of training examples (C5) Analyse bias-variance trade-off, under-fitting and over-fitting concepts (C4) Design a machine learning model using K-NN, SVM, Bayes learning, Bayesian and Markov Networks (C5). Develop a machine learning classifier models using different approach (C5)
 Bayesian learning: Probability theory and Bayes rule - Naive Bayes learning algorithm - Parameter smoothing - Generative vs. discriminative training - Logistic regression - Bayes nets and Markov nets for representing dependencies. Instance-based learning: Constructing explicit generalizations versus comparing to past specific examples - K-Nearest Neighbour algorithm - Case- based learning. 	



Support Vector Machine (SVM):								
Maximum margin linear separators -								
Quadractic programming solution to								
finding maximum margin separators -								
Kernels for learning non-linear								
functions.								
Unit 5:								
Descriptive analytics – unsupervised	1. Demonstrate activation fund	ctions, weights and						
learning	threshold units in artificial ne	eural networks (C3)						
Artificial Neural Networks: Neurons	2. Design of ANN models for c	lassification (C5)						
and biological motivation - Linear								
threshold units -Perceptrons:								
representational limitation and gradient								
descent training - Multilayer networks								
and back propagation - Hidden layers								
and constructing intermediate,								
distributed representations –								
Overfitting.								
Unit 6 :								
Clustering: Learning from unclassified	1. Analyze the performan	nce of clustering						
data - Clustering. Hierarchical	ta - Clustering Hierarchical techniques on different data (C4)							
Aglomerative Clustering - Non-	2. Apply clustering techniques for data analysis.							
Hierarchical Clustering - k-means	(C3)	2						
partitional clustering - Expectation								
maximization (EM) for soft clustering -								
Semi-supervised learning with EM using								
labeled and unlabled data.								
Looming stustering contact house]	tudont looming time							
Learning strategies, contact nours and student learning time								
Learning strategy	Contact nours	suaent learning						
Lesture	10	ume (firs)						
Lecture	12	-						



Seminar				-		-	
Quiz				-		-	
Small Group Discussion (SGD)				-		-	
Self-directed learning (SDL)			-		-		
Problem Based Learning (PBL)			-		-		
Case Based Learning	sed Learning (CBL)			03		-	
Clinic	linic			-		-	
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	ent with Co	S		I			
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5	
Sessional Examination	n 1	*	*	*			
Sessional Examination 2				*	*		
Assignment/Presentation *		*	*	*	*		
End Semester Examination *		*	*	*	*		
Laboratory examination *		*	*	*	*		
Feedback Process End-Semester Feedback							
Reference Material	1. Pattern	n Recog	nition and	Machine	Learning,	Christopher M.	
Bishop. Springer,1 st Edition, 2006.							
2. Machine Learning, Tom Mitchell, McGraw-Hill Education, 1 st							
	edition, 1997.						


3.	An introduction to support vector machines, Cristianini, N. and J.
	Shawe-Taylor. Cambridge University Press, Cambridge University
	Press, 1 st edition, 2000.
4.	Machine Learning: The Art and Science of Algorithms that Make
	Sense of Data, Flach, Peter. Cambridge University Press, 1 st edition,
	2012.
5.	Artificial Intelligence: A Modern Approach, Russell, Stuart and
	Peter Norvig, Prentice Hall, 3 rd Edition, 2009.
6.	Pattern Classification, Duda, R., P. Hart, and D. Stork. Wiley
	Publishers, Second Edition,2000.
7.	A Course in Machine Learning, Hal Daumé III . Available online
	at <u>http://ciml.info/</u>
8.	Analytics in a Big Data World, Bart Baesens. Wiley,1st Edition,
	2014.
9.	Ensemble Learning, Thomas G. Dietteri in The Handbook of Brain
	Theory and Neural Networks, Second edition, (M.A. Arbib, Editor),
	Cambridge, MA: The MIT Press, 2002.
10.	Generative and discriminative classifiers: naïve Bayes and
	logistic regression. Available online at
	http://www.cs.cmu.edu/~tom/mlbook/NBayesLogReg.pdf
	3. 4. 5. 6. 7. 8. 9.



Name of the Program:					Mast	Master of Engineering - ME (Blockchain Technology)						
Course Title:				Entr	Entrepreneurship Lab							
Course	e Code	: ENP-	601L		Cour	se Inst	ructor:					
Acade	mic Ye	ar: 202	20 - 202	21	Seme	ester:	First Ye	ar, Semes	ter 2			
No of	Credits	s: 1			Prer	equisite	es: -					
Synop	sis:	This c	ourse i	ntrodu	ces stu	dents to	o the th	eory of	entrepre	neurship	and its	
		practic	al imp	lement	ation.	It focu	ises on	different	t stages	related	to the	
		entrepr	reneuria	al proce	ess, inc	luding	business	s model i	nnovatio	on, mone	tization,	
		small b	ousines	s manag	gement	as well	as strat	egies that	improv	e perform	nance of	
		new bu	siness	venture	s. Cant	ered on	a mixtu	re of theor	retical ex	ploratior	n as well	
		as case	studies	s of real	-world	exampl	es and g	uest lectu	res, stud	ents will	develop	
		an und	lerstand	ling of	succes	ses, op	portunit	ies and ri	sks of e	entrepren	eurship.	
		This co	ourse ha	as an in	terdisci	plinary	approac	ch and is t	herefore	open to	students	
		from o	ther Ma	ajors.								
Course	e											
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, stu	idents wil	l be able	e to		
(COs):	:											
CO 1:		Unders	stand th	e conce	ept of e	ntreprer	neurship)				
CO 2.		To app	raise th	e entre	preneui	rial proc	ess start	ting with p	pre-vent	ure stage	through	
02.		group o	discussi	ion								
		To Bui	ild a m	ind-set	focusir	ng on de	evelopin	ig novel a	nd uniq	ue approa	aches to	
CO 3:		market	opport	unities	by con	sidering	g case st	udies and	underst	and the c	omplete	
		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	<i>PO</i> 8	<i>PO</i> 9	PO 10	PO 11	
CO 1	*					*		*				
CO 2						*						
CO 3												
Course	Course content and outcomes:											
Conten	ii					compete	encies					



Unit 1: Introduction to Entrepreneurs	ship				
Meaning and Definition of	1. Discuss the theories	of Entrepreneurship			
Entrepreneurship-Employment vs	(C1)				
Entrepreneurship, Theories of	2. Discuss the approaches	s to Entrepreneurship			
Entrepreneurship, approach to	(C1)				
entrepreneurship, Entrepreneurs VS					
Manager					
Unit 2: Process of Entrepreneurship					
Factors affecting Entrepreneurship	1. Exemplify one's capal	bilities in relation to			
process	the rigors of successfu	l ventures (C3)			
	2. Identify and differen	tiates the different			
	characteristics and c	competencies of an			
	entrepreneurs (C2)				
Unit 3: Business Plan writing					
Points to be considered, Model Business	1. Identify different busin	ness models (C3)			
plan	2. Describe different parts of a business				
	plan(C2)				
Unit 4: Case studies					
Indian and International	1. Perform self-assessm	nent and analyse			
Entrepreneurship	entrepreneurial pers	sonal traits and			
	competencies (C4)				
	2. Evaluate oneself and p	lan courses of action			
	to help develop or	ne's entrepreneurial			
	characteristics and con	npetencies. (C5)			
Learning strategies, contact hours and s	tudent learning time				
Learning strategy	Contact hours	Student learning time (Hrs)			
Lecture	12	-			
Seminar	-	-			
Quiz	-	-			



Small Group Discussi		-	-			
Self-directed learning	(SDL)		-	-		
Problem Based Learn	ing (PBL)		-	-		
Case Based Learning	(CBL)		03		-	
Clinic			-		-	
Practical			24		-	
Revision			03		-	
Assessment			06		-	
TOTAL			48		-	
Assessment Methods	:	I			<u> </u>	
Formative:				Summative:		
Internal practical Test			Sessional examination			
Theory Assignments			End semester examination			
Lab Assignment & Viva			Viva			
Mapping of assessme	ent with Co	S				
Nature of assessment		CO 1	CO 2		CO 3	
Sessional Examination	n 1	*	*			
Sessional Examination	n 2				*	
Assignment/Presentat	ion		*		*	
Laboratory Examinati	on	*	*		*	
Feedback Process	• Enc	l-Semester	Feedback			
Reference Material	1. NV	R Naidu	and T. Krisl	nna Rao,	"Management and	
	repreneursł	nip", IK Internat	ional Publi	shing House Pvt. Ltd		
	200	98.				
	2. Mo	hanthy	Sangram Ke	eshari, ʻ	'Fundamentals of	
	Ent	repreneursł	nip", PHI Public	ations, 200	5	



3.	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 (Blockchain Technology)



Course	Title:				Min	Mini Project - 2								
Course	Code:	BCH 6	96		Cou	Course Instructor:								
Acader	nic Yea	r: 2020	- 2021		Sem	Semester: First Year, Semester 2								
No of (Credits:	4			Prei	requisites	: Any	program	ming lar	nguage an	d circuit			
Synon	sis	Studen	ts are e	vnecte	d to s	elect a pr	oblem in	the area	of thei	r interest	and the			
bynop	515.	orea of	area of their specialization that would require an implementation in hardware /											
		area of their specialization that would require an implementation in hardwa												
		softwa	re or bo	oth in a	semes	ster								
Cours	e													
Outco	mes	On suc	cessful	compl	etion	of this co	urse, stude	ents wil	l be able	e to				
(COs):	:													
CO	1.	Apply	the obj	ectives	of the	e project v	work and	provide	an adec	uate bac	kground			
	1.	with a	detailed	d literat	ure su	urvey								
~~~~		Breakd	lown th	e proje	ct into	o sub bloc	ks with su	ifficient	details	to allow t	he work			
co	2:	to be re	eproduc	ced by a	an ind	ependent	researche	r						
	•	Compo	ose hard	lware/s	oftwa	oftware design, algorithms, flowchart, methodology, and								
co	3:	block d	liagram	1										
CO	4:	Evalua	te the r	esults										
CO	5:	Summa	arize th	e work	carrie	ed out								
Mappi	ing 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	PO 8	<i>PO</i> 9	PO 10	PO 11			
CO 1				*										
CO 2					*			*						
CO 3							*			*				
CO 4						*					*			
CO5:							*							
Cours	e conte	ent and	outcon	nes:				1		1				
Content						Compete	encies							
Phase	1													
Proble	m i	dentifica	ation,	syno	psis	At the er	nd of the t	opic stu	dent sho	ould be al	ole to:			
submis	sion,	status	submis	ssion,	mid	1. Ident	ify the pr	oblem/s	pecifica	tion (C1)				
evaluat	tion.					2. Disc	uss the pro	oject (C	2)					



	3.	Prepare the outline (C3)						
	4.	4. Describe the status of the project (C2)						
	5.	5. Prepare a mid-term project presentation report						
		(C3)						
	6.	Prepare and present	mid-term project					
		presentation slides (C3, C	5)					
	7.	Develop project in	nplementation in					
		hardware/software or both	n in chosen platform					
		(C5)						
Phase 2								
Status submission, final evaluation.	1.	Prepare the progress repor	rt (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	n in chosen platform					
		(C3, C5)						
	5.	Justify the methods used	and obtained results					
		(C6)						
Learning strategies, contact hours and	stu	dent 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 (CBL)		-	-					
Clinic		-	-					
Practical		-	-					



Revision	-		-			
Assessment		-				
TOTAL		09				
Assessment Methods:		1				
Formative:				Summativ	ve:	
Project Problem Selection	on			Mid-Term	Presentation	
Synopsys review	Second status review					
First status review				Demo & Final Presentation		
Mapping of assessment	t with Cos					
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	
Mid Presentation	*	*				
Presentation	*	*				
Feedback Process	ack					
<b>Reference Material</b> P	articular to the ch	osen proje	ect			

Name of the Program:	Master of Engineering - ME (Blockchain Technology)
Course Title:	Seminar - 2
Course Code: BCH 698	Course Instructor:
<b>Academic Year:</b> 2020 - 2021	Semester: First Year, Semester 2



No of	No of Credits: 1 Prerequisites: Communication Skill													
Synop	sis:	1. To	select,	search	and lea	rn techi	nical lite	erature.						
		2. To	Identif	y a cur	rent and	ł releva	nt resea	rch topic.						
		3. To	prepar	e a topi	c and d	eliver a	present	ation.						
		4. To develop the skill to write a technical report.												
		5. De	5. Develop ability to work in groups to review and modify technical content.											
Course	e													
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, sti	idents wi	ll be a	able to				
(COs):	:													
CO 1.		Show	compet	ence in	identif	ying rel	evant in	formatior	n, def	ining and e	xplaining			
001.		topics	under d	iscussi	on.									
CO 2.		Show	compet	ence in	workin	ig with a	a metho	dology, st	ructu	ring their o	oral work,			
CO 2.		and sy	nthesizi	ing info	ormatio	n.								
CO 3.		Use ap	propria	ite regi	sters ar	nd voca	bulary,	and will o	demo	nstrate cor	nmand of			
005.		voice r	nodula	tion, vo	oice pro	jection,	and pac	cing.						
CO 4·		Demor	nstrate	that the	ey have	e paid c	lose atte	ention to	what	others say	and can			
0.		respon	d const	ructive	ly.									
		Develo	op pers	suasive	speec	h, pres	ent info	ormation	in a	compelli	compelling, well-			
CO 5.		structured, and logical sequence, respond respectfully to opposing ideas, show												
005.		depth of knowledge of complex subjects, and develop their ability to												
		synthesize, evaluate and reflect on information.												
Mappi	ing of	COs to 2	POs											
COs	<i>PO 1</i>	<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	*							*	*		*			
CO5:	*							*	*		*			
Learn	ing str	ategies,	contac	t hour	s and s	tudent	learnin	g time	•	1	1			
Learnii	ng stra	tegy					Contact	t hours		Student	learning			
							time (Hrs)							



Lecture		-				-	
Seminar		-				-	
Quiz				-			-
Small Group Discussi	ion (SGD)			14			-
Self-directed learning	(SDL)			-			-
Problem Based Learn	ing (PBL)			-			-
Case Based Learning	(CBL)			-			-
Clinic				-			-
Practical				-			-
Revision				-			-
Assessment				-			-
TOTAL			14				-
Assessment Methods	5:	L					
Formative:					Summative:		
Seminar Topic Select	ion						
Synopsys review							
PPT Review							
Mapping of assessme	ent with Cos	S					
Nature of assessment	CO 1	CO 2	CO 3	CO 4		CO 5	
Presentation	*	*	*	*		*	
Feedback Process	• End	l-Semester	Feedbac	k			
Reference Material	Particular t	o the chose	en Semin	ar			

Name of the Program:	Master of Engineering - ME (Blockchain Technology)							
Course Title:	Project Work							
Course Code: BCH 799	Course Instructor:							
<b>Academic Year:</b> 2020 - 2021	Semester: Second Year, Semester 3, 4							



No of Credits: 25					Pre skil	<b>requisites</b> : ls.	SDLC.	Comm	unication	n Skills, 1	technical				
Synops	sis:	The pr	oject w	ork aiı	ns to	challenge analytical, creative ability and to allow									
		student	ts to sy	ynthesiz	ze, ap	pply the expertise and insight learned in the core									
		discipli	ine.												
		Studen	ts buil	d self	-confi	idence, d	emonstra	te inde	pendenc	ce, and	develop				
		profess	ionalis	m on si	acces	sfully com	pletion of	of the pro	oject.						
Course	e														
Outco	mes	On successful completion of this course, students will be able to													
(COs):	:														
	1	To be a	acquain	ted wit	h woi	king envi	ronment	and pro	cesses th	nat in plac	ce at the				
CO	1:	relevan	t Indus	stries.											
CO	2:	To fam	iliarize	the ch	alleng	ges as rele	vant prof	essional	s.						
CO	3:	Review	v the lit	erature	and c	levelop so	olutions for	or real ti	me onb	oard proje	ects.				
CO	4:	Write t	echnica	al repor	t and	nd deliver presentation.									
CO	5:	Apply	engine	ering ar	nd ma	anagement principles to achieve project goal.									
Маррі	ng of (	COs to l	POs												
COs	PO 1	PO 2	<i>PO 3</i>	<i>PO</i> 4	PO S	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	*	*	*	*											
CO5:						*	*	*	*	*	*				
Course	e conte	ent and	outcon	nes:					L		L				
Content						Compete	ncies								
Phase	1:														
Problem	m i	dentifica	ation,	syno	psis	At the en	d of the	opic stu	dent sho	ould be al	ole to:				
submission, status submission, mid						1. Ident	ify the pr	oblem/s	pecifica	tion (C1)					
evaluat	tion.					2. Discuss the project (C2)									



	4.	Prepare a mid-term project	ct presentation report					
		(C3)						
	5.	Prepare and present	mid-term project					
		presentation slides (C3, C	5)					
	6.	Develop project in	nplementation in					
		hardware/software or both	h in chosen platform					
		(C5)						
Phase 2								
Status submission, final evaluation.	1.	Prepare the progress repor	rt (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.	5. Justify the methods used and obtained results						
		(C6)						
Learning strategies, contact hours and	l stu	ident learning time						
Learning strategy		Contact hours	Student learning					
			time (Hrs)					
Lecture		-	-					
Seminar		-	-					
Quiz		-	-					
Small Group Discussion (SGD)		14	-					
Self-directed learning (SDL)		-	-					
Problem Based Learning (PBL)		-	-					
Case Based Learning (CBL)		-	-					
Clinic		-	-					
Practical		-	-					
Revision		-	-					
Assessment		-	-					



TOTAL			14		-					
Assessment Methods	:									
Formative:			Summative:							
Project Problem Selec	tion			Mid-Term Presentation						
Synopsys review				Second status review						
First status review					Demo & Final Presentation					
Mapping of assessme	ent with Cos	5								
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5				
Mid Presentation		*	*							
Presentation	*	*	*	*	*					
Feedback Process	• End	-Semes	ster Feedb	back						
<b>Reference Material</b>	Particular to	o the ch	iosen proj	iect						



## PROGRAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING

Sl.No.	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
1	CSE 601	Data Structures and Algorithms	3	*	*		*		*					
2	BCH 601	Blockchain Application Development	3	*	*	*	*	*		*				
3	BCH 603	Blockchain Technology	3	*	*	*	*	*						
4	BCH 605	Cryptocurrency and Smart Contracts	3	*	*	*	*	*						
5	BCH-615	Distributed Computing and Databases	3	*	*	*	*	*						
6	BDA-623	Architecture of Big Data Systems	3	*	*	*		*	*	*			*	
7	CSE-604	Database Programming in Java	3	*	*	*	*	*						
8	CSE 601L	Data Structures and Algorithms Lab	1		*	*		*			*			
9	BCH 601L	Blockchain Application Development Lab	1	*	*	*	*	*						
10	BCH 603L	Blockchain Technology Lab	1	*	*	*		*						
11	BCH 605L	Cryptocurrency and Smart Contracts Lab	1	*	*	*	*	*						
12	BCH-615L	Distributed Computing and Databases Lab	1	*	*	*	*	*						
13	BDA-623L	Architecture of Big Data Systems Lab	1	*	*	*		*	*			*	*	
14	CSE-604L	Database Programming in Java Lab	1		*	*		*						
15	BCH 695	Mini Project – I	4				*	*	*	*	*		*	*
16	BCH 697	Seminar – I	1	*							*	*		*
17	CDC 607	DevOps for Cloud	3	*	*	*		*						



18	BCH 602	Network Security and Analysis	3	*	*	*	*							
19	BCH 604	Advanced Blockchain Application Development	3	*	*	*		*						
20	BCH 606	Blockchain Verification and Testing	3	*	*	*	*	*						
21	BCH-616	Cloud Computing	3	*	*		*	*						
22	BCH-617	Machine Learning	3	*	*	*								
23	ENP-601	Entrepreneurship	3	*		*	*		*		*		*	
24	CDC 607L	DevOps for Cloud Lab	1	*	*	*		*						
25	BCH 602L	Network Security and Analysis Lab	1	*	*	*	*							
26	BCH 604L	Advanced Blockchain Application Development Lab	1	*	*	*		*						
27	BCH 606L	Blockchain Verification and Testing Lab	1	*	*	*	*	*						
28	BCH-616L	Cloud Computing Lab	1	*	*			*						
29	BCH-617L	Machine Learning Lab	1	*	*	*	*	*						
30	ENP-601L	Entrepreneurship Lab	1	*					*		*		*	
23	BCH 696	Mini Project – II	4				*	*	*	*	*		*	*
24	BCH 698	Seminar – II	1	*							*	*		*
25	BCH 799	Project Work	25	*	*	*	*	*	*	*	*	*	*	*