

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 (Healthcare Data Analytics)



TABLE OF CONTENTS

Contents

NATURE AND EXTENT OF THE PROGRAM:	3
PROGRAM EDUCATION OBJECTICE (PEO):	
GRADUATE ATTRIBUTES:	
QUALIFICATIONS DESCRIPTORS	7
PROGRAM OUTCOMES:	9
COURSE STRUCTURE, COURSEWISE LEARNING OBJECTIVE, AND COURSE OUTCOMES (COS)	11
PROGRAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING1	.57



NATURE AND EXTENT OF THE PROGRAM

An engineering graduate skillset requirement is changing with invent of the new technologies. In particular Healthcare is one of India's largest sector both in terms of revenue and employment. Healthcare Data Analytics are playing an important role in business, government, healthcare and education. Big Data in healthcare is important for growing importance of big data architectures in Healthcare. Data Analytics combines principles and techniques from mathematics, computer science and machine learning for offering predictive and prescriptive solutions. Digital Health Exchange provides comprehensive aggregation of information to deliver data driven care system.

ME (Healthcare Data Analytics) Program is a comprehensive two-year postgraduate program, which aims to provide hands-on experience to prepare industry-ready Healthcare Data Analytics professionals. The program ME (Healthcare Data Analytics) helps engineering graduates to learn, understand, and practice big data analytics in particular to healthcare and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on healthcare applications. Healthcare Data Analytics enables Ease of Diagnosis & prediction, Business Intelligence supports Healthcare administrative and management's strategic plan.

ME (Healthcare Data Analytics) postgraduate degree would welcome graduates from any discipline with 50% mark in qualifying exam. Students after successfully completing the program will get career opportunities as an Big Data Architect, Healthcare Data Analyst, Data Scientists, Big Data Engineer and Business Analyst.



PROGRAM EDUCATION OBJECTIVE (PEO)

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

Master of Engineering - ME (Healthcare Data Analytics) program are as follows.

PEO No	Education Objective
PEO 1	Enable to draw upon advanced knowledge in order to apply analytical and computational approach to solve technological problems in the areas of healthcare IT and data analytics.
PEO 2	Introduce state of art technologies in the area of data analytics and inculcate ethical practices to make industry ready professional.
PEO 3	Promote multidisciplinary research and societal advancement through entrepreneurship.



GRADUATE ATTRIBUTES

S No.	Attribute	Description
1	Scholarship of Knowledge	Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyse and synthesise existing and new knowledge, and integration of the same for enhancement of knowledge.
2	Critical Thinking	Analyse complex engineering problems critically, apply independent judgement for synthesising information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.
3	Problem Solving	Think laterally and originally, conceptualise and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.
4	Research Skill	Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.
5	Usage of modern tools	Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.
6	Collaborative and Multidisciplinary work	Possess knowledge and understanding of group dynamics, recognise opportunities and contribute positively to collaborative- multidisciplinary scientific research, demonstrate a 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.
		Demonstrate knowledge and understanding of engineering and
	Project Management	management principles and apply the same to one's own work, as a
7	and Finance	member and leader in a team, manage projects efficiently in
	and 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 and
8	Communication	effectively, such as, being able to comprehend and write effective
0	Communication	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
9	Life-long Learning	engage in life-long learning independently, with a high level of
	Life-long Learning	enthusiasm and commitment to improve knowledge and competence
		continuously.
		Acquire professional and intellectual integrity, professional code of
	Ethical Practices and	conduct, ethics of research and scholarship, consideration of the
10	Social Responsibility	impact of research outcomes on professional practices and an
	Social Responsibility	understanding of responsibility to contribute to the community for
		sustainable development of society.
	Independent and	Observe and examine critically the outcomes of one's actions and
11	Reflective Learning	make corrective measures subsequently, and learn from mistakes
	Achecuve Learning	without depending on external feedback.



QUALIFICATIONS DESCRIPTORS

1. Demonstrate

(i) A systematic, extensive and coherent knowledge and understanding of an academic field of study as a whole and its applications, and links to related disciplinary areas/subjects of study; including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues in the field of Healthcare Data Analytics;

(ii) Procedural knowledge that creates different types of professionals related to the Healthcare Data Analytics, including research and development, teaching and government and public service;

(iii) Professional skills in the domain of Healthcare data management, Data visualization and data analytics, various healthcare databases, including a critical understanding of the latest developments, and an ability to use established techniques in the healthcare domain.

- 2. Demonstrate comprehensive knowledge about data visualization and data analytics, including current research, scholarly, and/or professional literature, relating to essential and advanced learning areas pertaining to the healthcare field of study, and techniques and skills required for identifying problems and issues related.
- 3. Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, analysis and interpretation of data.
- 4. Methodologies as appropriate to the subject(s) for formulating evidence based solutions and arguments
- 5. Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the chosen field of study.



- 6. Communicate the results of studies undertaken in an academic field accurately in a range of different contexts using the main concepts, constructs and techniques of the healthcare data Aanalytics.
- 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 and to identify and analyse problems and issues and seek solutions to real-life problems.



PROGRAM OUTCOMES

After successful completion of Master of Engineering - ME (Healthcare Data Analytics), Students will be able to:

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



PO 6	Collaborative and Multidisciplinary work	Possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a 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.					
	Project	Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work,					
PO 7	Management and	as a member and leader in a team, manage projects efficiently					
	Finance	in respective disciplines and multidisciplinary environments					
		after consideration of economical and financial factors					
PO 8	Communication	Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.					
PO 9	Life-long Learning	Recognize the need for and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.					
PO 10	Ethical Practices and Social Responsibility	Ethical Practices and SocialAcquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship consideration of the impact of research outcomes on professional practices and an understanding of responsibility to					
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 (Healthcare Data Analytics)

Semester: 1

Semester: 2

Subject Code	Subject Title	L	Т	Р	С	Subject Code	Subject Title	L	Т	Р	С
BDA 601	Fundamentals of Machine Learning	3	-	-	3	BDA 605	Machine Learning for Big Data	3	-	-	3
MCL 601	Applied Probability and Statistics	3	-	-	3	MCL 602	Advanced Applications of Probability and Statistics	3	-	-	3
HDA 601	Healthcare Data Management	3	-	-	3	HDA 603	Big Data in Healthcare	3	-	-	3
HDA 602	Digital Image Processing	3	-	-	3	HDA 604	Medical Imaging Systems	3	-	-	3
	Elective - 1	3	-	-	3		Elective - 2	3	-	-	3
BDA 601L	Fundamentals of Machine Learning Lab	-	-	3	1	BDA 605L	Machine Learning for Big Data Lab	-	-	3	1
MCL 601L	Applied Probability and Statistics Lab	-	-	3	1	MCL 602L	Advanced Applications of Probability and Statistics Lab	-	-	3	1
HAD 601L	Healthcare Data Management Lab	-	-	3	1	HDA 603L	Big Data in Healthcare Lab	-	-	3	1
HDA 602L	Digital Image Processing Lab	-	-	3	1	HDA 604L	Medical Imaging Systems Lab	-	-	3	1
	Elective - 1 Lab	-	-	3	1		Elective - 2 Lab	-	-	3	1
HDA 695	Mini Project - 1	-	-	4	-	HDA 696	Mini Project - 2	-	-	-	4
HDA 697	Seminar - 1	-	-	1	-	HDA 698	Seminar - 2	-	-	-	1
	Total	15	-	15	25	Total		15	-	15	25

SECOND YEAR (FINAL YEAR): ME (Healthcare Data Analytics)

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



List of Electives(Theory)

	Elective - 1	Elective - 2		
Code	Subject	Code	Subject	
BDA-610	Principles of Data Visualization	ENP-601	Entrepreneurship	
HDA-605	Data Structures and Data Interpretation with Python (For electrical stream students)	HDA-606	Text Analytics in Healthcare	
		HDA-607	Block chain Technology	
		IOT-605	Responsive Web Application	
			Development	
		CSE-631	IT Project Management	

List of Electives(Lab)

	Elective - 1	Elective - 2		
Code	Subject	Code	Subject	
BDA- 610L	Principles of Data Visualization Lab	ENP-601L	Entrepreneurship Lab	
HDA-	Data Structures and Data Interpretation	HDA-	Text Analytics in Healthcare Lab	
605L	with Python Lab (For electrical stream students)	606L	-	
		HDA-	Block chain Technology	
		607L	Lab	
		IOT-605L	Responsive Web Application	
			Development Lab	
		CSE-631L	IT Project Management Lab	



Name of the Institution / Department: Manipal School of Information Sciences

Name of the Institution / Department						-					ra Data	
name	of the	Progra	m:		Master of Engineering - ME (Healthcare Dat Analytics)						le Data	
Course Title:						Fundamentals of Machine Learning						
Course Code: BDA-601						rse Inst			8			
Acade	mic Ye	ear: 202	20 - 202	21	Sem	ester:	First Y	ear, Sem	ester 1			
No of	Credit	s: 3			Prer	equisite	es:	Basic P	rogramm	ing – pi	referably	
					Pythe	on						
Synop	sis:	This C	ourse p	orovide	s insigh	t on						
		1. Th	is cou	rse pro	ovide t	he con	cept of	f machir	ne learni	ing, appl	ications,	
		tec	hniques	s, desig	n issue	s and ap	proach	es to mad	chine lear	rning.		
		2. Th	is cour	se prov	vide the	fundan	nental l	knowledg	ge about	concept]	learning,	
		hyp	pothesis	s and b	ias.							
		3. To	implen	nent ma	achine l	earning	algoritl	nms such	as Decis	ion Tree	learning,	
		Pro	obably	Appro	ximate	y Corr	ect (PA	AC) lear	ning, B	ayesian	learning,	
		Ins	tance-b	ased	learning	g, Prin	cipal (Compone	nt Anal	ysis (PC	CA) and	
		En	semble	metho	ds in re	al time	data set	for vario	ous analy	sis.		
Cours	e											
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, st	udents w	ill be abl	e to		
(COs)	:											
CO 1:		Identif	y the g	oals, a	pplicati	ons, typ	bes and	design i	ssues of	machine	learning	
		technic	ques.									
CO 2:		Relate	concep	t learni	ing and	hypoth	esis spa	.ce.				
CO 3:		Apply	PCA le	arning	approa	ch to re	duce th	e dimens	ion.			
CO 4:		Analys	se diffe	rent ma	chine l	earning	algorit	nms.				
CO 5:		Design	ensem	ble me	thods.							
Mappi	ing of (COs to POs										
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 1	*											
CO 2		*										
CO 3			*									
CO 4		1		*								
CO 5				*								
	l											



Course content and outcomes:							
Content		Competencies					
Unit 1:	Introduction						
Definitio	n of Machine Learning, Goals	1. Define N					

Definition of Machine Learning, Goals	1. Define Machine Learning (C1)
and applications of machine learning,	2. Describe about any three applications for
Basic design issues and approaches to	which machine learning approaches seem
machine learning, Types of machine	appropriate. (C2)
learning techniques	3. Illustrate different types of machine
	learning techniques (C3)
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, Inductive bias.	 Relate concept learning and hypothesis space (C4). Apply different algorithms to obtain most general and most specific hypotheses from the training examples. (C3)
Unit 3: Decision Tree learning	
Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute, Entropy and information gain, Searching for simple trees and computational complexity.	 Apply decision tree algorithm to find the hypothesis space (C3) Construct decision tree machine learning algorithm (C5) Explain the method of choosing training examples and target function in the design of a machine learning system (C2) Explain different validation technique to find the accuracy in training and testing of data set (C5)
Unit 4: Computational learning the	ory
Models of learnability: learning in the	1. Define various terms related to
limit, Probably Approximately Correct	



TRED BY - (Deemea to be	
(PAC) learning, Sample Complexity:	2. Describe different models learning in the
quantifying the number of examples	limit (C2)
needed to PAC learn, Computational	3. Calculate the number of training examples
complexity of training. Sample	required in different types of learning
complexity for finite hypothesis spaces,	approaches (C4).
Noise Learning Multiple Classes, Bias-	
variance trade-off, under-fitting and	
over-fitting concepts	
Unit 5: Bayesian learning	
Probability theory and Bayes rule,	1. Write the applications of Bayes theorem
Naive Bayes learning algorithm -	(C3)
Parameter smoothing, Generative vs.	 Describe the use of Logistic Regression in
discriminative training, Logistic	Machine Learning (C2)
regression, Bayes nets and Markov nets	 Predict the target value for the new instance
for representing dependencies	using Naïve Bayes classifier. (C3)
Unit 6: Instance-based learning	
Constructing explicit generalizations	1. Construct explicit generalizations (C5)
versus comparing to past specific	2. Discriminate Instances Based and Case-
examples, K-Nearest Neighbour	based learning (C4)
learning algorithm, Case-based	3. Explain K-nearest neighbour learning (C5)
reasoning (CBR) learning	
Unit 7: Continuous Latent Variable	2S
Principal Component Analysis (PCA),	1. Describe use of Principal Component
Applications of PCA	Analysis for the complex data set (C2).
	2. Apply PCA to choose principal
	components for the given data set (C3)
Unit 8: Ensemble methods (bagging	g and boosting)
Using committees of multiple	1. Choose a suitable method of ensemble
hypotheses, Bagging, Boosting,	learning approach (C3).
DECORATE, Active learning with	 Explain various ensemble techniques (C5)
ensembles	



Learning strategies,	contact ho	urs and	student learn	ning ti	ime	<u>,</u>	
Learning strategy	Contact ho	urs		Stuc	Student learning time		
				(Hr.	s)		
Lecture	30			60			
Quiz	02			04			
Small Group Discussi	02			02			
Self-directed learning	(SDL)		-			04	
Problem Based Learn	ing (PBL)		02			04	
Case Based Learning	(CBL)		-			-	
Revision			02			-	
Assessment	06			-			
TOTAL			44			74	
Assessment Methods	5:						
Formative:			Sı	immative	:		
Internal practical Test			Se	essional ex	amination		
Theory Assignments				End semester examination			
Lab Assignment & Viva	Viva						
Mapping of assessme	ent with Co)S					
Nature of assessment		CO 1	CO 2	C	0	CO 4	CO 5
				3			
Sessional Examinatio	n 1	*	*				
Sessional Examinatio	n 2			*		*	
Assignment/Presentat	ion	*	*	*	* *		
End Semester Examin	*	* * *		*	*		
Feedback Process	• En	d-Semes	ster Feedback				
Reference Material	1. T. Mitc	hell, "M	lachine Learn	ing", I	Mc	Graw-Hill,	1997.
	2. E. Alpa	aydin, "N	Machine Learn	ning",	MI	T Press, 20	010.
	3. C. Bishop," Pattern Recognition and Machine Learning", Sprin						earning", Springer,
	2006.						



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



CO 4:Construct Bayesian models for analysing practical problems.CO 5:Use sample information and perform hypothesis-test analysis using							
Course Code:MCL 601Course Instructor:Academic Year: 2020-2021Semester: First Year, Semester 1No of Credits: 3Prerequisites: Basic Algebra and CalculusSynopsis:This course provides an introduction to fundamental concepts in proband statistics that are essential for data science applications.CourseOutcomesOutcomesOn successful completion of this course, students will be able to(COs):Understand and apply the basic principles of sampling.CO 1:Understand and apply the basic principles of sampling.CO 3:Calculate & interpret probability as a measure of quantifying uncertaintyCO 4:Construct Bayesian models for analysing practical problems.CO 5:Use sample information and perform hypothesis-test analysis using	ability						
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CO 4:Construct Bayesian models for analysing practical problems.CO 5:Use sample information and perform hypothesis-test analysis using	Model random phenomena using random variables.						
CO 5: Use sample information and perform hypothesis-test analysis using the sample information and performance information and performan	Calculate & interpret probability as a measure of quantifying uncertainty.						
CO 5:	Construct Bayesian models for analysing practical problems.						
	Use sample information and perform hypothesis-test analysis using an						
appropriate statistical technique to explain attributes of a population.	appropriate statistical technique to explain attributes of a population.						
Mapping of COs to POs							
COs PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 H	PO 11						
CO1 * I	011						
CO 2 * * * *							
CO 3 * * * * * *							
CO 4 * * * * * *							
CO 5 * * * * * * *							
Course content and outcomes:							
Course content and outcomes:							
Course content and outcomes: Content Competencies							



matter - Binomial & multinomial	
coefficients - Distribution problems	probability (C1, C3).
Set theory; sample space; outcomes;	3. Differentiate and relate frequency-based
events - Frequency based definition of	interpretation of probability to classical
probability - Equally likely vs. not	approach (C4).
equally likely outcomes - Axioms of	4. Apply Bayesian principle for modelling
probability	practical problems (C5).
Conditional probability; probability tree	
model; chain rule - Decomposition and	
the law of total probability - Bayes' rule	
- intuition, dependence/independence of	
events.	
Unit 2: Random variables	
Modelling using discrete random	1. Understand and differentiate discrete and
variables: Bernoulli, geometric,	continuous random variables of practical
binomial, negative binomial,	interest (C2, C4).
hypergeometric, and Poisson	2. Gain solid foundation in the mathematical
distributions - Probability mass	aspects of random variables (C2).
function and cumulative distribution	3. Understand how to use random variables to
function - Expectation and variance:	model random phenomena (C4).
discrete case - Modelling using	4. Compare and contrast practical applicability of
continuous random variables: uniform,	random variables (C6).
normal, log-normal, exponential, and	
beta distributions; probability density	
function - Expectation and variance:	
continuous case - Functions of random	
variables.	
Unit 3: Sampling and parameter estim	ation
Population and sample - Statistic &	1. Differentiate population and sample (C4).
sampling distribution - Sample mean	2. Describe population parameters using
and variance - Central limit theorem –	inferences drawn from a sample (C6).
intuition and applications	
L	



Point estimation - Standard error -	3. Design and apply appropriate hypothesis tests
Interval estimation: interpretation of	for practical problems (C3).
confidence interval - Hypothesis	4. Communicate and explain the results of
testing: p-values, significance level and	hypothesis testing (C6).
their interpretations, application to	
analysis of one- /two-sample mean and	
paired data.	

Learning strategies, contact h	nours and	student	learning	time	
Learning strategy			act 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:		Summa	tive:		
Internal practical Test		Sessional examination			
Theory Assignments		End semester examination			
Lab Assignment & Viva				Viva	
Mapping of assessment with	Cos			I	
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5
Sessional Examination 1	*	*			
Sessional Examination 2		*	*	*	
Assignment/Presentation	*	*	*	*	*



End Semester Examin	nation	*							
Feedback Process	• Enc	• End-Semester Feedback							
Reference Material	1. Introdu	ction 1	to Prob	ability,	Charles M	. Grinst	ead, American		
	Mathemati	cal Soc	ciety; 2n	d Revis	ed Edition 1	997. Ava	ailable online at		
	https://oper	https://open.umn.edu/opentextbooks/textbooks/introduction-to-							
	probability	probability							
	2. A First	2. A First Course in Probability, Sheldon Ross, 9th Edition, Pearson							
	Education	Education India; 9th Edition, 2013.							
	3. Biostatistics Open Learning textbook - Online resource from								
	University	University of Florida available at https://bolt.mph.ufl.edu/6050-6052/							
	4. All of S	Statistic	es: A Co	oncise C	course in Sta	tistical I	nference, Larry		
	Wasserman	n – Spr	inger.						



Name of the Program:	Master of Engineering - ME (Healthcare Data					
	Analytics)					
Course Title:	Healthcare Data Management					
Course Code: HDA 601	Course Instructor:					
Academic Year: 2020-202						
No of Credits: 3	Prerequisites: Database Management, MSSQL, Python					
Synopsis: This Course p	provides insight on					
1. This cours	1. This course provide the knowledge of healthcare system architecture, types					
of healthc	are data and database.					
2. This cour	rse provide the concept of epidemiology and achievements in					
epidemiol	ogy, experimental epidemiology, cofounding.					
3. This court	se provide the knowledge of measuring disease frequency, death					
rates, mor	bidity and comparing disease occurrence.					
4. This cours	4. This course provide knowledge of types of healthcare databases, standards,					
records, E	records, EMR, HER, interchange standards and genomics.					
5. This cour	5. This course provide the concept the of structured and unstructured data,					
SQL, NO	SQL, NOSQL and genome databases.					
6. This cours						
	re-design, quality management methods.					
Course						
Outcomes On successful	On successful completion of this course, students will be able to					
(COs):						
CO 1: Describe the	Describe the architecture of healthcare systems, healthcare databases and its					
applications.	applications.					
Explain the	Explain the concept of epidemiology and its uses, measuring health and					
CO 2: disease, ot	oservational epidemiology, experimental epidemiology,					
confounding.	confounding.					
CO 3: Differentiate	different type of healthcare databases, standards and records.					
CO 4: Compare and	contrast file systems and DBMS, structured and unstructured					
data, epidemi	ology databases and genome databases.					
CO 5: Describe heat methods.	Ithcare process analysis, process-redesign, quality management					
Mapping of COs to POs						



COs P	01	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11
CO 1 *		*									
CO 2			*								
CO 3 *		*									
CO 4				*	*						
CO 5			*			*	*				
Course content and outcomes:											
Content						Compe	tencies				
Unit 1:			on to H								
Architect				•		1. Explain about Architecture of Healthcare					
Healthcare Data – Types of Healthcare						system? (C2)					
Data – Healthcare Databases &						1 7					
Applications – Healthcare Informatics					atics	the public health at different systems? (C2)					
vs Clinical Informatics											
Unit 2:	oducti	on to E	pidemi	iology							
Definition	1 ,	scope,	and	uses	of	3. Def	ine	Epidemi	ology?	Purpos	se of
epidemio					and	Epi	demiolo	gy? Two	and Thr	ree board	types of
public ł	oublic health - Achievements in				in	epi	demiolog	gy with a	n examp	les? (C1)	
epidemio	epidemiology.					4. Exp	olain	about	Potentia	al Erro	ors In
						Epi	demiolo	gic Studi	es? (C2))	
Unit 3:	Me	asurin	g healtl	n and d	lisease						
Defining h					Ũ	5. Def	inition	of conf	ounding	? Explai	n about
disease fr	-	•		-		Cor	nfoundin	g? (C1)			
informatio						6. Exp	olain abo	out Electr	onic Me	dical reco	ords with
Death rate			aity -	Compa	arıng	exa	mples? ((C2)			
disease oc	curre	nce									
Unit 4:	Тур	pes of s	tudies		I_						



Observations and experiments -	7. Explain briefly about EHR? And write Primary
Observational epidemiology -	and Secondary Uses of an EHR. (C2)
Experimental epidemiology - Potential	
errors in epidemiological studies –	
Confounding	
Unit 5: Data in Healthcare	
Open Data for Healthcare – World	8. Discover out Measuring disease frequency for
Health Organization data - Types of	a given values. (C3)
Health Care Databases - Standards -	
Healthcare Records – Hospital	
Information Systems – Need for	
Standardization – EMR – EHR - EHR	
Functional Model Standards - Health	
Data Interchange Standards - Health	
Information Exchange – Introduction to	
Genomics – Basics of Genomics – DNA	
structure	
Unit 6: File Systems Vs DBMS	
Entity Relationship – Normalization -	1. Explain about Traditional file system and
ACID properties Structured and	disadvantages of traditional file system. (C2)
Unstructured data - Storing data - SQL -	2. Identify Advantages and disadvantages of
NOSQL – Tools for Healthcare Databases	Database Management System? (C1)
– OpenMRS – Working with SQL –	3. Explain the main components of ER(Entity
NOSQL tools - Epidemiology Databases	Relation ship) models with examples. (C2)
and Registries-Public Health Information	4. Define Normalization and Levels of
Tools – Genome	Normalization with examples. (C1)
Databases	5. List Types of Data? (C1)
	6. Describe NOSQL Database and Types of
	NOSQL Database. (C1)
Unit 7: Healthcare Process Analysis	
Cint 7. Intantical e l'Interess Allarysis	



Concepts of Processes and Process Analysis: Process Mapping Theory and Rationale - Interpreting and Creating Process Diagrams - Acquiring Clinica Process Knowledge - Process Analysis Process Re-design - Facilitating Meetings for Implementation Decisions - Quality Improvement Methods - Leading and Facilitating Change - Process Change Implementation and Evaluation Maintaining and Enhancing the Improvements .	 Outline process re-design. (C1) Explain the concept of Quality Improvement Methods. (C2)
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Learning strategies, contact hours a	and student learning t	ime	
Learning strategy	ning strategy Contact hours		
		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:	
Internal practical Test	Sessional examination		
Theory Assignments	End semester examination		
Lab Assignment & Viva		Viva	
Mapping of assessment with Cos			



Nature of assessment	CO 1 CO 2 CO 3 CO 4 CO 5							
Sessional Examinatio	n 1	*	*					
Sessional Examinatio	n 2			*	*			
Assignment/Presentat	ion		*			*		
End Semester Examin	nation	*	*	*	*	*		
Feedback Process	End-Semester Feedback							
Reference Material	[1] Basi	ic epiden	niology, l	Bonita, R	uth, Robert	Beagle hole, and Tord		
	Kjellström, World Health Organization, 2nd edition, 2006.							
	[2] He	[2] Health Informatics: An Interprofessional Approach - Ramona						
	Nelson a	and Nanc	y Stagge	rs.				
	[3] H	ealthcare	Inform	atics - V	WIlliam H	anson - McGraw-Hill		
	Educatio	on.						
	[4] Handbook of Research on Informatics in Healthcare an							
	Biomedi	cine - At	thina A. I	Lazakidou	1.			
	[5] MO	OCS, BC	OOKS : h	ttp://www	w.healthinfo	ormaticsforum.com .		



C	Program:Master of Engineering - ME (Healthcare Data Analytics)									
	•									
	Digital Image Processing									
	Course Instructor:									
	Semester: First Year, Semester 1									
	Prerequisites: Basic knowledge of MATLAB and signal processing									
Synopsis: This Course provides i	nsight on									
1. Basic knowled	dge about image processing algorithms for image									
enhancement, s	segmentation and pattern recognition									
2. To design and	develop image analysis algorithms for simple object									
recognition task	ks.									
Course										
Outcomes On successful complet	tion of this course, students will be able to									
(COs):										
CO 1: Define major building	blocks of an image processing pipeline.									
Explain various image	e processing algorithms for enhancement segmentation									
CO 2: and classification and a	apply the appropriate techniques for various scenarios.									
CO 3: Demonstrate the use of	f morphological operators for post processing of images.									
Demonstrate the use of	f edge based and region based segmentation techniques									
CO 4: to obtain the region of	interest in an image.									
CO 5: Design a suitable featu	are extraction and classification approach.									
Mapping of COs to POs										
	PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11									
CO 1 *										
CO 2 * * *										
CO 3 * *										
CO 4 * *										
CO 5 *										
Course content and outcomes:										
Content	Competencies									
Unit 1: Digital Image Processing	Fundamentals									



Digital image Representation	1.	Explain about the basic image processing
Elements of DIP		pipeline. (C2)
Image Model	2.	Describe the terms sampling and
Sampling and quantization		quantization(C2)
Pixel relationships.	3.	Explain the various puxel relationships(C2)
Unit 2: Image Enhancement	I	
Point processing operations	1.	Describe the neighbourhood relations and
Neighbourhood processing operations		distance measures between pixels of an image.
Global processing operations		(C2)
Spatial and frequency domain filtering	2.	Describe the various pseudo-color image
Pseudo colour image processing		processing techniques. (C2)
Colour Models and colour image	3.	Write the significance of color space
processing.		conversions for image analysis. (C3)
	4.	Calculate the modified pixels values for a given
		image after histogram equalization. (C4)
Unit 3: Image Segmentation		
Unit 5. Intage Segmentation		
Point, Line and Edge detection	1.	Apply various edge detection filters to a given
	1.	Apply various edge detection filters to a given image and obtain the output image matrix. (C3)
Point, Line and Edge detection	1. 2.	
Point, Line and Edge detection Thresholding techniques		image and obtain the output image matrix. (C3)
Point, Line and Edge detection Thresholding techniques Region Based Segmentation		image and obtain the output image matrix. (C3) Describe the various thresholding techniques
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	2.	image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2)
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	2.	image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2) Compare and contrast the motion based
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	2.	image and obtain the output image matrix. (C3)Describe the various thresholding techniquesfor image segmentation. (C2)Compare and contrast the motion basedsegmentation techniques namely image
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	2.	image and obtain the output image matrix. (C3)Describe the various thresholding techniquesfor image segmentation. (C2)Compare and contrast the motion basedsegmentation techniques namely imagesubtraction approach and background
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	2.	image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2) Compare and contrast the motion based segmentation techniques namely image subtraction approach and background estimation approach. (C4)
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	2.	 image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2) Compare and contrast the motion based segmentation techniques namely image subtraction approach and background estimation approach. (C4) Apply the concept of derivatives for design of edge detectors. (C3)
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	 2. 3. 4. 	 image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2) Compare and contrast the motion based segmentation techniques namely image subtraction approach and background estimation approach. (C4) Apply the concept of derivatives for design of edge detectors. (C3)
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	 2. 3. 4. 	 image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2) Compare and contrast the motion based segmentation techniques namely image subtraction approach and background estimation approach. (C4) Apply the concept of derivatives for design of edge detectors. (C3) Compare the performance of first derivative
Point, Line and Edge detection Thresholding techniques Region Based Segmentation Clustering techniques	 2. 3. 4. 5. 	 image and obtain the output image matrix. (C3) Describe the various thresholding techniques for image segmentation. (C2) Compare and contrast the motion based segmentation techniques namely image subtraction approach and background estimation approach. (C4) Apply the concept of derivatives for design of edge detectors. (C3) Compare the performance of first derivative filters with that of second derivative filters (C4)



Unit 6: Pattern Recognition		
		for detection of an object in an image(C5)
	7.	Design a suitable feature extraction approach
	6.	Define Haralick's transforms. (C2)
		(C3)
	5.	Explain the use of LBP for texture analysis.
		image analysis. (C3)
Haralick Transform, GLCM, LBP	4.	Describe the use of GLCM for texture based
textural descriptors –Moments,		(C5)
Regional descriptors – topological and		uniquely representing an object in an image.
descriptors, polynomial approximation	3.	Select suitable regional descriptors for
Boundary descriptors – Fourier	2.	detection of a given object in an image. (C4)
Signature, Skeleton	2.	Design a suitable boundary descriptor for
Chain code, Polygonal approximation,	1.	for image representation. (C2)
Image representation		Describe the various boundary descriptors used
Unit 5: Image Representation and D		Describe hit or miss transform. (C2)
Boundary detection.	3.	of structuring element for a given task. $(C5)$
Hit or Miss Transformation		morphological operators and the size and shape of structuring element for a given tool: $(C5)$
Morphological processing applications	2.	Formulate the sequence of use of
Opening and Closing	~	operations for post processing of images. (C3)
Erosion and Dilation	1.	Describe the use of various morphological
Unit 4: Morphological Image Proce		
		image segmentation. (C3)
	9.	Describe the region based techniques used for
		quality. (C5)
		sampling and quantization on the image
	8.	Explain the impact of different levels of
		transfer function. (C3)
		enhancement technique represented by a given
	7.	Interpret the output image quality of an



Pattern recognition (PR) systems	1. Explain the building blocks of a pattern
Pattern recognition approaches	recognition system. (C3)
Training and learning in PR system	2. Describe the various feature selection approach
Feature extraction and selection	to reduce dimensionality for classification.
methods	(C3)
Dimensionality reduction, PCA	3. Design a classifier for the object classification
Applications of Pattern Recognition	problem. (C5)
	4. Describe various classifiers used in pattern
	recognition systems. (C3)
	5. Compare and contrast the various classifiers for
	a given pattern recognition task. (C5)
	6. Compare and contrast the different cross
	validation techniques for performance
	evaluation of a classifier. (C4)
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Learning strategies, contact hours a	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:		Summative:		
Internal practical Test		Sessional examination		
Theory Assignments		End semester examination		
Lab Assignment & Viva		Viva		



Mapping of assessme		-	GO 0			
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5
Sessional Examinatio	*	*				
Sessional Examinatio	n 2			*	*	
Assignment/Presentat	ion					*
End Semester Examin	*	*	*	*	*	
Laboratory examinati	*	*	*	*	*	
Feedback Process	• En	d-Semes				
Reference Material	Pearson E [2] Patter G.Strok, V	ducation, n Classifi Viley-Ind n recogni	, 2009 ication, F lerscience tion and	O Duda, I ation, Sec nalysis, I	Woods, Third edition, Peter E. Hart, David cond edition, 2001. Earl Gose, Richard, , 2002.	



Name	of the	Program	n:				Engineer	ing -	ME (Healthcar	re Data			
a	Course Title:						Analytics)							
Course Code: HAD-605						Principles of Data Visualization								
		de: HAD-605Course Instructor:Year: 2020-2021Semester: First Year, Semester 1												
			20-202	1						0.0				
No of Credits:3Synopsis:This Course provides						-	es: Progra	mming	III F yui	.011				
Synop	515.		1		U		1	1 /	1 .	6.4	• 1.4			
						ata visu	alization, t	ne art a	nd scier	ice of turi	iing data			
				ble gra	-									
					•		data visua	lizatior	is based	on data a	available			
		and	l tasks	to be ac	chieved	•								
		3. Stu	dents l	earn ho	w do da	ata extra	action, dat	a mode	lling an	d data pro	ocessing.			
		4. Stu	dents 1	earn to	map d	ata attri	butes to g	raphica	l attribu	ites, and	strategic			
		vis	ual enc	oding t	based of	n know	n propertie	es of vis	sual per	ception				
Course	e													
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, stud	ents wil	ll be abl	e to				
(COs)	:													
CO 1:		Extrac	ting, tra	ansform	ning and	d storing	g data fror	n vario	us data s	sources.				
		An un	derstan	ding o	f the k	ey tech	iniques an	d theo	ry used	in visua	lization,			
CO 2:		includi	ng data	u model	s, grapł	nical per	ception ar	nd techr	iques fo	or visual e	encoding			
		and int	eractio	n.										
		Exposi	are to	number	of co	mmon	data doma	ins and	d corres	sponding	analysis			
CO 3:		tasks.												
CO 4:		Practic	al expe	rience	buildin	g and e	valuating	visualiz	ation sy	stems.				
CO 5:		The ab	ility to	read an	d discu	ss resea	rch papers	from th	ne visua	lization li	terature.			
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	*	*			*						1			
CO 3	*	*	*								1			
CO 4	*		*		*			*						
CO 5	*	*	*	*							1			
	I													



Course content and outcomes:						
Content	Competencies					
Unit 1: Introduction to Web scrapi	ng					
Web scraping models and techniques,	1. Understanding various formats of data. (C1)					
Case study: BeautifulSoup, Scrapy,	2. Design programs to dynamically extract data					
Selenium	from web. (C4)					
	3. Design programs to read data from various data					
	sources. (C4)					
Unit 2: _Data Analysis						
Data structures for analysis: numpy,	1. Understand and integrate various data					
pandas	structures for data analysis process (C2).					
Data Wrangling: Clean, Transform,	2. Create various techniques to clean and handle					
Merge, Reshape	missing data (C4).					
Data Aggregation and Group	3. Design data filtering and transformation					
Operations	techniques (C4).					
Case study: Exploratory analysis of						
public / scrapped datasets						
Unit 3: Data Visualization						
Data Visualization – classification,	1. Describe what is the purpose of Visualization.					
infographics versus data visualization,	(C2)					
visualization for supporting exploratory	2. Describe various ways of classifying					
data analysis, visual art, choosing	visualization. (C2)					
appropriate visual encodings, rules for	3. Explain what is explorative and explanative					
visualization - Visualization techniques:	visualization. (C2)					
time series, statistical distributions,	4. Differentiate data visualization and visual art.					
maps - Data visualization for web	(C2)					
	5. Create visualization for time series data. (C4)					
	6. Create visualization for statistical distributions.					
	(C4)					
	7. Create visualization for maps, Hierarchical data					
	and network data. (C4)					



Learning strategies, contact	hours and	student l	earning	time		
Learning strategy		Contac	et hours	Student learning		
				time (Hrs)		
Lecture		30			60	
Quiz		02			04	
Small Group Discussion (SGI	D)	02			02	
Self-directed learning (SDL)		-			04	
Problem Based Learning (PB	L)	02			04	
Case Based Learning (CBL)		-			-	
Revision		02			-	
Assessment		06			-	
TOTAL	44			74		
Assessment Methods:						
Formative:				Summat	ive:	
Internal practical Test		Sessional			examination	
Theory Assignments		End sem			ester examination	
Lab Assignment & Viva		Viva				
Mapping of assessment with	ı Cos					
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	
Sessional Examination 1	*	*				
Sessional Examination 2			*	*		
Assignment/Presentation	*	*	*	*	*	
End Semester Examination	*	*	*	*	*	
Laboratory examination	*	*	*	*	*	
Feedback Process •	End-Semes	ter Feedb	ack	<u> </u>		
			· ·	C	BeautifulSoup and ons, 1 st Edition, 2018.	



2.	Web Scraping with Python: Collecting More Data from the
	Modern Web, Ryan Mitchell Shroff, O'Reilly, 2 nd Edition, 2018.
3.	Designing Data Visualizations, Julie Steele and Noah Iliinsky;
	O'Reilly Media; 1 st Edition, 2011.
4.	Python for Data Analysis, Wes McKinney; Shroff; O'Reilly; 2 nd
	Edition, 2018.



Name of the Program:				Master of Engineering - ME (Healthcare Data Analytics)										
Course Title:				Data Structures and Data Interpretation										
					with Python (For electrical stream students)									
Course Code: HDA 605					Course Instructor:									
Academic Year: 2020-2021 No of Credits: 3					Semester: First Year, Semester 1									
							Prerequisites: programming in C asight on fundamentals of data structures and tools for							
Synopsis:		visualizing and interpreting data using Python.												
Course						Tering data using 1 ymon.								
				etion of this course, students will be able to										
(COs)	:													
CO 1: Describe fundamentals queues.							s of data structures like arrays, linked list, stacks and							
CO 2:		Demonstrates sorting and searching techniques.												
CO 3:		Demonstrate problem solving using hashing and dictionaries.												
CO 4: Explain principles of visualization techniques and varieties techniques.											s of visu	alization		
Mappi	ing of (COs to 2	POs											
COs	<i>PO</i> 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	PO	5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11		
CO 1	*													
CO 2	*		*											
CO 3	*		*											
CO 4	*	*	*											
CO 5	*	*	*	*	*									
Conter	nt					C	ompeter	ncies				·		
Unit 1	: Algo	rithm sj	pecifica	tion an	d an	aly	sis tech	niques						
Analysis of recursive programs.						1. Explain recursive programs (C2).								
Solving recurrence equations.						2. Demonstrate solving recurrence equations								
General solution for a large class of					of $(C3)$.									
recurrences.						3. Employ general solution for a large class of recurrences (C3).								
Unit 2	: Elem	entary	data sti	ructure	es	•								



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

Implementation of lists, stacks, queues.	1	Demonstrate implementation of lists (C3).				
implementation of fists, stacks, queues.	1. 2.	Demonstrate implementation of fists (C3).				
	2. 3.	Demonstrate implementation of stacks (C3). Demonstrate implementation of queues (C3).				
Unit 3: Sorting and soarching tachnicu		Demonstrate implementation of queues (C3).				
Unit 3: Sorting and searching techniqu	ies					
Quick sort, heap sort, and merge sort.		Explain techniques for quick sort, heap sort				
		and merge sort (C2).				
Linear search and binary search.	2.	Explain techniques for linear search and binary search (C2).				
Unit 4: Hashing and dictionaries						
Hashing and dictionaries.	1.	Illustrate hashing and dictionaries in data structures (C3).				
Unit 5: Binary search trees						
Construction.	1.	Employ binary search trees to solve problems (C3).				
Inorder, preorder, and postorder	2.	Explain different types of traversals in binary				
traversals		search tree (C2).				
Unit 6: Principles of information visua	liza	tion				
Classification of visualizations.	1.	Explain principles of visualization techniques (C2).				
Ingredients of successful visualizations	2.	Explain classification of visualizations (C2).				
Chaosa appropriate visual appodings	3.	Identify ingredients of successful				
Choose appropriate visual encodings.		visualizations (C2).				
	4.	Demonstrate appropriate visual encodings (C3).				
Unit 7: Acquiring and parsing data	I					
Loading data from text input.	1.	Demonstrate various methods for loading				
Text, CSV, JSON, XML.		textual data (C3).				
Unit 8: Data cleansing	1					
Numpy and Pandas.	1.	Explain data cleansing on acquired data (C3).				
Unit 9: Regular expressions	<u>.</u>					
Regular expressions.	1.	Illustrate regular expressions (C2).				
Unit 10: Varieties of visualization tec	hniq	jues				



Time series.	4. Explain varieties of visualization techniques						
Statistical distributions, Q-Q Plots, scatter plot matrix, parallel coordinates.	(C3).5. Demonstrate different maps for solving problems (C3).						
Maps: flow maps, choropleth maps.							
graduated symbol maps, cartograms.							

Learning strategy	Cont	act hours	Student learning time (Hrs)				
Lecture	30		60	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:	I						
Formative:		Summat			tive:		
Internal practical Test		Sessiona			tion		
Theory Assignments		End sem			nination		
Lab Assignment & Viva							
Mapping of assessment with Co	5		1				
Nature of assessment	CO 1	CO	2	CO 3	CO 4		
Sessional Examination 1	*	*					
Sessional Examination 2		*		*			
Assignment/Presentation	*	*		*	*		
End Semester Examination	*	*	*		*		
Feedback Process • End	-Semester Fee	dback	1				



Reference Material	1. Introduction to Algorithms - Thomas H. Cormen, Charles E.
	Leiserson, Ronald L. Rivest. MIT Press. Edition 3
	2. Data Structures and Algorithms - Aho, Hopcroft and Ulmann.
	Pearson Publishers. ISBN-13: 978-0201000238
	3. Data Structures and Algorithms in Python - Michael T. Goodrich,
	Roberto Tamassia, and Michael H. Goldwasser. John Wiley &
	Sons. ISBN: 9788126562176, 812656217X Edition 1
	4. Designing Data Visualizations - Noah Iliinsky and Julie Steele -
	O'Reilly publishers ISBN: 9781449314774 Edition 1
	5. Python for Data Analysis - William McKinney – O'Reilly
	Publishers – Edition 2



Name of the Program:							Engine	ering -	ME (Healthca	re Data				
						Analytics)									
Course Title: Course Code: BDA-601L						Fundamentals of Machine Learning Lab									
						rse Inst		~							
	ear: 202	20 - 202	21				ear, Sem								
No of Credits:1Synopsis:This Course provides						-	es: Basi	cs of Pro	grammi	ng					
Synops	SIS:				U										
			1. This course provide the concept of machine learning, applicatio												
		tec	techniques, design issues and approaches to machine learning.												
		2. Th	is cour	se prov	ide the	fundar	nental k	knowledg	e about	concept	learning,				
		hyj	pothesis	s and bi	ias.										
		3. To	implen	nent ma	chine l	earning	algorith	nms such	as Decis	ion Tree	learning,				
		Pro	obably	Appro	ximate	ly Corr	ect (PA	AC) lear	ning, B	ayesian	learning,				
		Ins	tance-b	ased 1	earning	g, Prin	cipal C	Compone	nt Anal	ysis (PC	CA) and				
							-	for vario		•					
Course	e														
Outcor	mes	On suc	cessful	compl	etion of	f this co	urse, st	udents w	ill be abl	e to					
(COs):	:														
CO 1:		Identif	y the so	oftware	and to	ols for c	lesignin	g machir	e learnir	ng applica	ations.				
CO 2:		Apply	concep	t learni	ng and	hypoth	esis spa	ce.							
CO 3:		Apply	machir	e learn	ing app	broach to	o reduce	e the dim	ension.						
CO 4:		Analys	se diffe	rent ma	chine l	earning	algorith	nms.							
CO 5:		Design	n ensem	ble me	thods.										
Mappi	ng of (COs to 1	POs												
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11				
CO 1	*														
CO 2		*													
CO 3			*												
CO 4		*													
CO 5			*												
Course	e conte	ent and	outcon	nes:	1		Course content and outcomes:								



Content	Competencies
Unit 1: Introduction	
Definition of Machine Learning Goals and applications of machine learning Basic design issues and approaches to machine learning Types of machine learning techniques	 Identify programming environments available for the machine learning (C1) Classify the pros and cons of various environments for ML coding (C2)
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. Inductive bias.	 Design a machine learning model to get a Maximally Specific Hypothesis for the given training examples (C5). Construct a machine learning model to obtain most general and most specific hypotheses for the given training examples (C5)
Unit 3: Decision Tree learning	
Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute Entropy and information gain. Searching for simple trees and computational complexity.	 Develop a machine learning classifier using decision tree and random forest (C5) Examine different applications of decision tree and random forest (C4)
Unit 4: Computational learning theo	ry



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. Noise. Learning Multiple Classes. Bias-variance trade-off, under- fitting and over-fitting concepts.	 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)
Unit 5: 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	 Design a machine learning model using Bayes learning (C5). Develop a machine learning classifier models using different approach (C5) Design Bayes nets and Markov nets for representing dependencies (C5)
Unit 6: Instance-based learning	
Constructing explicit generalizations versus comparing to past specific examples. K-Nearest Neighbour learning algorithm. Case-based reasoning (CBR) learning.	 Design machine learning models to classify the instances using K-NN and CBR approaches (C5).



Unit 7: Continuous Latent Variables

Principal Component Analysis (PCA), Applications of PCA	1. Apply PCA for different complex applications (C3)
Unit 8: Ensemble methods (bagging	and boosting)
Using committees of multiple	1. Design a Bayesian Networks (C5)
hypotheses.	2. Develop machine learning models using
Bagging	Ensemble models. (C5)

Boosting

DECORATE

Active learning with ensembles.

Learning strategy	Contact hours	Student learning			
		time (Hrs)			
Lecture	12	-			
Seminar	-	-			
Quiz	-	-			
Small Group Discussion (SGD)	-	-			
Self-directed learning (SDL)	-	-			
Problem Based Learning (PBL)	-	-			
Case Based Learning (CBL)	03	-			
Clinic	-	-			
Practical	24	-			
Revision	03	-			
Assessment	06	-			
TOTAL	48	-			
Assessment Methods:					
Formative:		Summative:			



Internal practical Test		Sessional examination							
Theory Assignments						End semester examination			
Lab Assignment & Viva						Viva			
Mapping of assessme	ent with Co	S			1				
Nature of assessment		CO 1	CO 2	C	O 3	CO 4	CO 5		
Sessional Examination	n 1	*	*						
Sessional Examination	n 2			*		*			
Assignment/Presentat	ion	*	*	*		*	*		
Laboratory Examinati	on	*	*	*		*	*		
Feedback Process	• En	d-Semeste	r Feedback						
					~				
Reference Material			g, T. Mitche						
			g, E. Alpayo						
	3. Pattern	Recognit	ion and Ma	chine	Learn	ing, C. Bish	op, Springer,		
	2006								
	4. Pattern	n Classific	cation, R. D	Juda,	E. Ha	rt, and D. S	Stork, Wiley-		
	Interscience	ce, 2000							
	5. T. Hasti	ie, R. Tibsl	nirani and J.	Fried	lman, T	The Element	s of Statistical		
	Learning:	Data Mini	ng,						
	Inference a	and Predic	tion. Spring	er, 2r	nd Edit	ion, 2009			
	6. Machin	e Learning	g for Big Da	ata, Ja	ison Be	ell, Wiley Bi	g Data Series		
	7. Multidi	mensional	Neural Net	work	s Unifi	ed Theory, I	Rama Murthy		
	G								
	8. Current	t literature							



Name	Name of the Program:						Engine	ering -	ME (Healthca	re Data		
		U			Anal	Analytics)							
Cours	e Title	:			Appl	Applied Probability and Statistics Lab							
Cours	e Code	: MCL	601L		Cour	rse Inst	ructor:						
Acade	mic Ye	ear: 202	0-2021		Seme	ester: F	irst Yea	ır, Semes	ter 1				
No of Credits: 1						equisite							
Synop	sis:	This c	ourse	provide	s a ha	nds-on	introdu	ction to	fundam	ental con	cepts in		
		probab	ility an	d statis	tics that	at are es	ssential	for data	science a	applicatio	ns using		
		the R p	orogran	nming l	anguag	e.							
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:		Apply	the bas	ic princ	iples o	f sampl	ing to p	ractical p	oroblems	•			
CO 2:		Visualize probability concepts through frequency-based interpretations.								IS.			
CO 3.		Simula	te disc	erete ar	d continuous random variables for modelling random								
CO 3:		phenor	nena.										
CO 4:		Design	and ap	ply hy	pothesi	s tests f	ollowed	l by inter	pretation	of result	s.		
		Interpr	et stat	istical	results and communicate them unambiguously and								
CO 5:		effectiv	vely.										
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		*	*	*	*	*							
CO 5				*	*	*		*		*			
Course content and outcomes:													

Course content and outcomes:

Content

Competencies

Unit 1: Counting, probability concepts, and conditional probability



		In denote a difference and a single of the D
Multiplication rule; permutation;	1.	Understand the basic principles of the R
combination - Sampling: with/without		programming language (C1).
replacement and order matters/does not	2.	1 11
matter - Binomial & multinomial		basic principles of sampling and probability
coefficients - Distribution problems		(C1, C3).
Set theory; sample space; outcomes;	3.	Visualise and interpret probability concepts
events - Frequency based definition of		through a frequency-based approach (C6).
probability - Equally likely vs. not	4.	Program and analyse Bayesian models for
equally likely outcomes - Axioms of		practical problems (C4).
probability		
Conditional probability; probability tree		
model; chain rule - Decomposition and		
the law of total probability - Bayes' rule		
- intuition, dependence/independence of		
events.		
Unit 2: Random variables		
Modelling using discrete random	1.	Understand and apply R functions to simulate
variables: Bernoulli, geometric,		discrete and continuous random variables (C3).
binomial, negative binomial,	2.	Using sampling, compute and interpret
hypergeometric, and Poisson		different attributes of random variables (C4).
distributions - Probability mass	3.	Visualise and interpret histograms and
function and cumulative distribution		probability mass/density functions of random
function - Expectation and variance:		variables using state of the art visualisation
discrete case - Modelling using		libraries in R (C4).
continuous random variables: uniform,	4.	Develop codes to model random phenomena
normal, log-normal, exponential, and		using appropriate random variables (C5).
beta distributions; probability density		
function - Expectation and variance:		
continuous case - Functions of random		
variables.		
Unit 3: Sampling and parameter estim	atio	n



Population and sample - Statistic &	1. Visualise sample data through histograms (C3).
sampling distribution - Sample mean	2. Compute estimates of population parameters
and variance - Central limit theorem -	using samples and communicate the uncertainty
intuition and applications	in the estimates (C4).
Point estimation - Standard error -	3. Use R in-built functions for performing
Interval estimation: interpretation of	hypothesis tests (C4).
confidence interval - Hypothesis	4. Interpret and communicate the results of
testing: p-values, significance level and	hypothesis tests (C6).
their interpretations, application to	
analysis of one- /two-sample mean and	
paired data	

Learning strategy	Contact hours	Student learning		
		time (Hrs)		
Lecture	12	-		
Seminar	-	-		
Quiz	-	-		
Small Group Discussion (SGD)	-	-		
Self-directed learning (SDL)	-	-		
Problem Based Learning (PBL)	-	-		
Case Based Learning (CBL)	03	-		
Clinic	-	-		
Practical	24	-		
Revision	03	-		
Assessment	06	-		
TOTAL	48	-		
Assessment Methods:				
Formative:		Summative:		
Internal practical Test		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	CO 5
Sessional Examinatio	n 1	*	*			
Sessional Examinatio	n 2			*	*	
Assignment/Presentat	ion	*	*	*	*	*
Laboratory examinati	on	*	*	*	*	*
Feedback Process	• En	d-Semes	ster Feed	lback		I
Reference Material	1. Introdu	ction to	o Proba	bility, C	harles M. G	rinstead, American
	Mathemati	ical Soc	iety; 2nd	l Revised	Edition 1997.	Available online at
	https://ope	n.umn.e	du/open	textbooks	/textbooks/int	roduction-to-
	probability	7				
	2. A First	Course	in Prob	ability, Sł	neldon Ross, 9	Oth Edition, Pearson
	Education India; 9th Edition, 2013.					
	3. Biostatistics Open Learning textbook – Online resource from					
	University of Florida available at https://bolt.mph.ufl.edu/6050-6052/					
	4. All of Statistics: A Concise Course in Statistical Inference, Larry					
	Wasserma	n – Spri	nger.			



Name	of the	Program: Master of Engineering - ME (Healthcare Data Analytics)								re Data			
Cours	e Title	•				Healthcare Data Management Lab							
		· HDA	601L			rse Inst		ingement	Luo				
		ic Year: 2020-2021 Semester: First Year, Semester 1											
No of	Credit	s: 1			Prer	equisite	es: DBN	IS and file	e system	ıs			
Synop	sis:	This C	This Course provides insight on Healthcare data and various methods and										
		technic	ques to	manag	e data a	nd wor	kflow						
		1. Th	is cours	e provi	de the l	knowled	lge of he	ealthcare s	system a	rchitectu	re, types		
		of	healthc	are data	a and da	atabase.							
		2. Th	is cour	se prov	vide the	e conce	pt of e	pidemiolo	gy and	achiever	ments in		
		epi	demiol	ogy, ex	perime	ntal epi	demiolo	ogy, cofou	nding.				
		3. Th	is cours	se prov	ide the	knowle	dge of r	neasuring	disease	frequence	cy, death		
		rate	es, mor	bidity a	and con	nparing	disease	occurrenc	ce.				
		4. Th	is cours	e provi	de kno	wledge	of types	of health	care data	abases, st	andards,		
		rec	ords, E	MR, H	ER, int	erchang	e standa	ards and g	enomic	s.			
		5. Th	is cours	se prov	ide the	concep	t the of	f structure	ed and u	Instructu	red data,		
		SQ	L, NOS	SQL an	d geno	me data	bases.						
		6. Th	is cours	se provi	ide the	concept	of proc	esses and	process	analysis	process		
		re-	design,	quality	⁷ manag	gement	methods	5.					
Cours	e												
Outco	mes	On successful completion of this course, students will be able to											
(COs)	:												
CO 1:		Explai	n types	of heal	thcare	databas	es						
CO 2:		Design healthcare database											
CO 3:		Illustra	ite proc	ess ana	lysis ir	health	care data	a manager	nent				
Mappi	ing of (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	<i>PO</i> 9	PO 10	PO 11		
CO 1			*										
CO 2					*	*	*						
CO 3						*	*						



Course content and outcomes:		
Content	Competencies	
Unit 1:		
Types of healthcare databases	1. Explain EMR (C	2)
	2. Explain EHR (C2	2)
	3. Explain EPR (C2)
Unit 2:		
Design Healthcare Databases	(C6)	e management system of SQL and NO-SQL (C3)
Unit 3:		
Process Analysis	6. Illustrate process management syst	analysis in healthcare em (C5)
Learning strategies, contact hours	and student learning time	
Learning strategy	Contact hours	Student learning time (Hrs)
Lecture	12	-
Seminar	-	-
Quiz	-	-
Small Group Discussion (SGD)	-	-
Self-directed learning (SDL)	-	-
Problem Based Learning (PBL)	-	-
Case Based Learning (CBL)	03	-
Clinic	-	-
Practical	24	-
Revision	03	-
Assessment	06	-



TOTAL			48		-
Assessment Methods	:				
Formative:				Summa	ative:
Internal practical Test				Session	al examination
Theory Assignments				End ser	mester examination
Lab Assignment & Viva				Viva	
Mapping of assessme	ent with C	Cos			
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	• E	nd-Semeste	r Feedback		
Reference Material	T ea 2. H N 3. H E 4. H B	Education.			



Name of the	Master of Engineering - ME (Healthcare Data Analytics)										
Course Title		-			Digital Image Processing Lab						
Course Code	: HDA 6	02		•	Course Instructor:						
Academic Year: 2020-2021 S					ester:	First Yea	ar, Semes	ter 1			
No of Credit		Prer	equisite	s: Basi	c knowled	dge of M.	ATLAB a	nd signal			
		proc	essing								
Synopsis:	This C	Course p	provide	s insig	ht on						
•	1.	1. Image processing algorithms, their effects, appropriateness for									
		proble	em solv	ving							
	2.	-		-	e proces	sing pip	eline for	a specif	ic case.		
Course											
Outcomes	On su	ccessful	l comp	letion (of this co	ourse, st	tudents w	vill be ab	le to		
(COs):											
CO 1:	Implei	ment in	nage en	hance	ment tec	hniques					
CO 2:	Implei	nent in	nage se	gmenta	ation tec	hniques	5				
CO 3:	Implei	ment in	nage m	orphol	ogical o	peration	IS				
Mapping of	COs to	POs									
COs PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	
CO 1	*	*		*							
CO 2	*	*		*							
CO 3	*	* * * *									
Course cont	ent and	outcon	nes:	<u> </u>		1	1		1	1	
Content					Competencies						
Unit 1: In	nage En	hancen	nent ar	nd Seg	mentati	on					



Point processing operations	1. Design an image analysis approach to
Neighbourhood processing operations	enhance the image using image arithmetics
Global processing operations	using ImageJ and MATLAB tools. (C5)
Spatial and frequency domain filtering	2. Design image enhancement methods for
Pseudo colour image processing	various qualities of input images. (C5)
Colour Models and colour image	3. Compare the qualities of output images for
processing.	varying values of parameters used for
Point, Line and Edge detection	thresholding and enhancement operations.
Thresholding techniques	(C6)
Region Based Segmentation	4. Implement algorithms for threshold and
	point operations. (C2)
	5. Illustrate the suitability of various image
	enhancement techniques for varying
	qualities of input images. (C3)
	6. Design an image enhancement technique
	to improve the quality of a given image.
	(C5)
	7. Compare the outputs of contrast
	enhancement and histogram equalization
	for varying qualities of input images. (C4)
Unit 2: Image Segmentation and M	Iorphological Image Processing
Segmentation techniques, Morphological	1. Compare the performance of edge
operators	detectors on images of varying qualities
	and characteristics.(C4)
	2. Design an image segmentation approach
	using enhancement, segmentation and post
	processing using morphological
	operations. (C5)
Unit 3:	
Pattern Recognition and classification	1. Design a pattern recognition system to

detect an object from an image. (C5)



2.	Design a classifier model for detection of
	object from an image. (C5)

Learning strategy			ct hours		Student learning
					time (Hrs)
Lecture		12		-	
Seminar	-			-	
Quiz		-			-
Small Group Discussion (SGI	D)	-			-
Self-directed learning (SDL)		-			-
Problem Based Learning (PBI	L)	-			-
Case Based Learning (CBL)		03			-
Clinic		-			-
Practical		24			-
Revision		03		-	
Assessment		06		-	
TOTAL		48		-	
Assessment Methods:					
Formative:				Summ	ative:
Internal practical Test				Session	nal examination
Assignments			End semester examination		
Lab Assignment & Viva			Viva		
Mapping of assessment with	Cos				
Nature of assessment	CO 1		CO 2		CO 3
Sessional Examination 1	*		*		
Sessional Examination 2			*		*
Assignment/Presentation	*		*		*
Laboratory examination	*		*		*



Feedback Process	End-Semester Feedback
Reference	1] Digital Image Processing- Gonzalez and Woods, Third edition, Pearson
Material	Education, 2009 [2] Pattern Classification, Richard O Duda, Peter E. Hart, David G.Strok,
	Wiley-Inderscience Publication, Second edition, 2001.
	[3] Pattern recognition and Image analysis, Earl Gose, Richard, Johnson
	Baugh and Steve Jost, Prentice Hall, 2002.



Name	of the	Program	n:		Mast	laster of Engineering - ME (Healthcare Data								
					Anal	Analytics)								
Course						rinciples of Data Visualization Lab								
		: BDA-				rse Inst								
		ear: 202	20-202	1			-	ear, seme						
No of						—	es: Prog	ramming	in Pytho	on				
Synop	sis:	This C	ourse p	rovides	s insigh	t on								
		1. Th	is cours	e intro	duces d	ata visu	alizatio	n, the art	and scier	nce of turr	ning data			
		inte	o reada	ble gra	phics.									
		2. Tea	ach hov	v to des	sign and	d create	data vis	sualizatio	ns based	on data a	vailable			
		anc	l tasks †	to be ac	chieved									
		3. Stu	dents l	earn ho	w do d	ata extra	action, c	data mode	elling and	d data pro	cessing.			
		4. Stu	dents 1	earn to	map d	ata attri	butes to	o graphic	al attribu	ites, and	strategic			
		vis	ual enc	oding t	based of	n knowi	n proper	rties of vi	isual pero	ception.				
Course	e													
Outco	mes	On suc	cessful	compl	etion o	f this co	urse, st	udents w	ill be abl	e to				
(COs):	:													
CO 1:		Data so	crappin	g from	differe	nt data s	sources.							
CO 2:		Data C	leaning	g, transi	formati	ons and	Analys	sis.						
CO 3:		Data V	isualiz	ation u	sing dif	ferent to	echniqu	es, tools	and char	ts.				
Mappi	ing of (COs to 1	POs											
COs	<i>PO 1</i>	<i>PO 2</i>	<i>PO3</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	Course content and outcomes:													
Conten	ıt					Compet	encies							
Unit 1	: Dat	a Scrap	ping											
Web so	crappin	g mode	s			1. Identi	fy diffe	rent type	s of data	sources (C2).			
	11						•	• •		atic data				



Formative:	Summat	ive:				
Assessment Methods:						
TOTAL	48	-				
Assessment	06	-				
Revision	03	-				
Practical	24	-				
Clinic	-	-				
Case Based Learning (CBL)	03	-				
Problem Based Learning (PBL)	-	-				
Self-directed learning (SDL)	-	-				
Small Group Discussion (SGD)	-	-				
Quiz	-	-				
Seminar	-	-				
Lecture	12	-				
		time (Hrs)				
Learning strategy	Contact hours	Student learning				
Learning strategies, contact hours and	student learning time					
	3. Create dynamic visualizati	ion for web (C4).				
	using various visual enco					
Creating different types of charts.	2. Develop scripts to creat	e static visualization				
Visualization.	visualization (C4).					
Creating different types of	1. Develop applications for	or exploratory data				
Unit 3: Data Visualization						
r eriorin exploratory data anarysis.	to cleaned data (C4).					
Perform exploratory data analysis.	2. Design scripts to apply rec	uired transformations				
pandas, sklearn	(C4).	nanule missing data				
Unit 2: Data Analysis Working with packages like numpy,	1. Design scripts to clean,	handle missing data				
handle different data types.	dynamic web pages (C4).					
1 11 11 00 1 1 1	3. Design applications to					



Internal practical Test	Sessional examination								
Theory Assignments	End semester examination								
Lab Assignment & Viva				Viva					
Mapping of assessment	Mapping of assessment with Cos								
Nature of assessment		CO 1	CO 2		CO 3				
Sessional Examination 1		*							
Sessional Examination 2			*		*				
Assignment/Presentation		*	*		*				
End Semester Examination	on	*	*		*				
Laboratory Examination		*	*		*				
Feedback Process•	Ene	d-Semester	Feedback		•				
Reference Material 1.	Websi	te Scrapin	g with Pytho	n: Usin	g BeautifulSoup and				
	Scrapy	y, Gábor & I	Hajba, APRESS	S Publica	ations, 1 st Edition, 2018.				
2.	Web S	Scraping w	ith Python: Co	ollecting	g More Data from the				
	Moder	r n Web , Ry	an Mitchell Shr	off, O'R	eilly, 2 nd Edition, 2018.				
3.	3. Designing Data Visualizations, Julie Steele and Noah Iliinsky;								
	O'Reilly Media; 1 st Edition, 2011.								
4.	Pythor	n for Data A	Analysis, Wes 1	McKinn	ey; Shroff; O'Reilly; 2 nd				
	Edition	n, 2018.							



Name of th	e Progran	1:		Master of Engineering - ME (Healthcare Data Analytics)							
Course Tit	e:			•	tructures	and Dat	a Interpr	etation			
					ython (Fe				nts) Lab		
Course Co	e: HDA 6	05L		Cours	e Instruc	ctor:					
Academic Y	Year: 2020)-2021		Semes	ter: First	Year, Se	emester	1			
No of Cred	ts: 1			Prereq	quisites:	HDA 60	5				
Synopsis:	This c	ourse pr	ovides i	insight i	into prac	tical un	derstand	ling of c	lata struct	ures and	
	data v	isualizat	ion usii	ng the P	ython p	rogramn	ning lan	guage.			
Course											
Outcomes	On su	ccessful	comple	etion of	this cou	rse, stud	ents wil	ll be abl	le to		
(COs):											
CO 1:	Imple	ment dat	a struct	ures lik	e arrays	, linked	list, stac	cks and	queues.		
CO 2:	Imple	ment sor	ting an	d search	ning tech	iniques.					
CO 3:	Solve	practica	l proble	ems usir	ng hashi	ng and d	lictionar	ries.			
CO 4:	Use a	ppropria	te visua	lization	techniq	ues for i	interpre	ting data	a.		
Mapping	f COs to	POs									
COs PC	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	
COs PC CO1	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	

002												
CO 3			*		*							
CO 4		*	*		*							
CO 5		*	*	*	*							
Conte	Content							cies				
Unit 1	Unit 1: Algorithm specification and analysis techniques											
Analys	sis of re	cursive	program	ns.		1. Implement and understand recursive programs						
Solvin	g recurr	ence ec	luations				(C3).					
Genera	al solut	ion for	a larg	e class	of							
recurre	ences.											
Unit 2	Unit 2: Elementary data structures											
Implementation of lists, stacks, queues.						1.	Impler	nent lis	ts, stack	s, and q	ueues (C	3).



Unit 3: Sorting and searching techniqu	ıes						
Quick sort, heap sort, and merge sort. Linear search and binary search.	1.	Implement and compare performances of sorting techniques such as quick sort, heap sort and merge sort (C3, C4). Implement and compare performances of search techniques such as linear search and binary search (C3, c4).					
Unit 4: Hashing and dictionaries							
Hashing and dictionaries.	1.	Implement hashing and dictionaries for pratical problems (C3).					
Unit 5: Binary search trees							
Construction. Inorder, preorder, and postorder traversals	1. 2.	Implement binary search trees to solve practical problems (C3). Implement and compare performances of different types of traversals in binary search tree (C3, C4).					
Unit 6: Principles of information visua	liza	tion					
Classification of visualizations. Ingredients of successful visualizations Choose appropriate visual encodings.		Explore and familiarise with state of the art visualisation software (C3). Use appropriate visualisation techniques for interpreting data (C3).					
Unit 7: Acquiring and parsing data							
Loading data from text input. Text, CSV, JSON, XML.	1.	Implement various methods for loading textual data (C3).					
Unit 8: Data cleansing							
Numpy and Pandas.	1.	Apply Python libraries for data acquisition an wrangling using practical data sets (C3).					
Unit 9: Regular expressions							
Regular expressions.	1.	Implement regular expressions for analysing text from practical data sets (C3).					
Unit 10: Varieties of visualization tec	hnio	lues					
Time series.	1.	Apply in-built visualisation tools in Python for interpreting practical data sets (C3).					



Statistical distributions, Q-Q Plots,	2. Use Python libraries for implementing and
scatter plot matrix, parallel coordinates.	visualising different types of maps (C3).
Maps: flow maps, choropleth maps.	
graduated symbol maps, cartograms.	

Learning strategy		Contact hours				Student learning		
					time (Hrs)			
Lecture		12		-				
Quiz		-			-			
Small Group Discussion (SGD)		-			-			
Self-directed learning (SDL)		-			-			
Case Based Learning (CBL)		03			-			
Practical		24			-			
Revision		03			-			
Assessment		06		-				
TOTAL		48						
Assessment Methods:					•			
Formative:				Summa	tive:			
Internal practical Test		Sessional exam			ıl examina	tion		
Theory Assignments				End sem	lester exar	nination		
Lab Assignment & Viva		Viva						
Mapping of assessment with Co	S							
Nature of assessment	CO	1	CO 2		CO 3	CO 4		
Sessional Examination 1	*		*					
Sessional Examination 2			*		*			
Assignment/Presentation	*		*		*	*		
End Semester Examination	*		*		*	*		
Feedback Process • End	d-Semeste	r Feedb	ack	I				



Reference Material	1. Introduction to Algorithms - Thomas H. Cormen, Charles E.
	Leiserson, Ronald L. Rivest. MIT Press. Edition 3
	2. Data Structures and Algorithms - Aho, Hopcroft and Ulmann.
	Pearson Publishers. ISBN-13: 978-0201000238
	3. Data Structures and Algorithms in Python - Michael T. Goodrich,
	Roberto Tamassia, and Michael H. Goldwasser. John Wiley &
	Sons. ISBN: 9788126562176, 812656217X Edition 1
	4. Designing Data Visualizations - Noah Iliinsky and Julie Steele -
	O'Reilly publishers ISBN: 9781449314774 Edition 1
	5. Python for Data Analysis - William McKinney – O'Reilly
	Publishers – Edition 2



Name of the Program:	Master of Engineering - ME (Healthcare Data Analytics)										
Course Title:	Mini Project - 1										
Course Code: HDA 695	Course Instructor:										
Academic Year: 2020 - 2021	Semester: First Year, Semester 1										
No of Credits: 4	Prerequisites: Any programming language and circuit basics										
Synopsis: Students are expected	ed to select a problem in the area of their interest and the										
area of their specialization	zation that would require an implementation in hardware /										
software or both in a	semester										
Course											
Outcomes On successful comple	letion of this course, students will be able to										
(COs):											
CO 1: Apply the objectives	s of the project work and provide an adequate background										
	with a detailed literature survey										
Breakdown the project	Breakdown the project into sub blocks with sufficient details to allow the work										
to be reproduced by a	to be reproduced by an independent researcher										
Compose hardware/so	Compose hardware/software design, algorithms, flowchart, methodology, and										
CO 3: block diagram	block diagram										
CO 4: Evaluate the results											
CO 5: Summarize the work	carried out										
Mapping of COs to POs											
COs PO 1 PO 2 PO 3 PO 4	PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11										
CO 1 *											
CO 2	* *										
CO 3	* *										
CO 4	* *										
CO5:	*										
Course content and outcomes:											
Content	Competencies										
Phase 1											



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

-

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Problem Based Learning (PBL)



Case Based Learning (CBL)		-			-		
Clinic			-				
Practical		-			-		
Revision		-			-		
Assessment		03			-		
TOTAL		51			09		
Assessment Methods:							
Formative:				Summative:			
Project Problem Selection				Mid-Term Presentation			
Synopsys review				Second status review			
First status review				Demo & Final Presentation			
Mapping of assessment wit	h Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Mid Presentation	*	*					
Presentation	*	*	*	*	*		
Feedback Process	End-Semes	ster Feedl	back	1			
Reference Material Partic	ject						



Name of the Program:					Mast	er of	Engine	ering -	ME (Healthcar	re Data			
						Analytics)								
Course Title:						Seminar - 1								
Course Code: HDA 697						Course Instructor:								
		ear: 202	20 - 202	21	_			ear, Seme						
No of			1 .			equisite		mmunica	tion Ski	11				
Synop	sis:	I. To	select,	search	and lea	and learn technical literature.								
		2. To Identify a current and relevant research topic.												
		3. To	prepar	e a topi	topic and deliver a presentation.									
		4. To	develo	p the sl	cill to v	vrite a te	echnical	report.						
		5. De	velop a	bility to	o work	in grou	ps to rev	view and	modify	technical	content.			
Course	e													
Outco	mes	On suc	cessful	compl	etion of	f this co	ourse, stu	udents wi	ill be abl	le to				
(COs):	:													
		Show competence in identifying relevant information, defining and explaining												
CO 1:		topics under discussion.												
		Show competence in working with a methodology, structuring their oral work,												
CO 2:		and synthesizing information.												
CO 3:		Use appropriate registers and vocabulary, and will demonstrate command of												
		voice modulation, voice projection, and pacing.												
CO 4:		Demonstrate that they have paid close attention to what others say and can												
		respond constructively.												
		Develop persuasive speech, present information in a compelling, well-												
		structured, and logical sequence, respond respectfully to opposing ideas, show												
CO 5:	CO 5:		depth of knowledge of complex subjects, and develop their ability to											
		synthesize, evaluate and reflect on information.												
-							morma	.1011.						
Mappi	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	PO 9	PO 10	PO 11			
CO 1	*							*	*		*			
CO 2	*							*	*		*			
CO 3	*							*	*		*			
CO 4	*							*	*		*			
									1					



			* IRED 1	31 -	(Deemea to be U	niversity under	section 5 of th	be UGC Act, 12	736/				
CO5:	*							*	*			*	
Learn	ing stra	ategies,	contac	t hou	rs and st	tudent le	earning	time	•				
Learnii	ng strat	egy	Contact hours				Student learning						
							time (Hrs)						
Lecture	e					-					-		
Semina	ar			-				-					
Quiz						-				-			
Small	Group	Discussi	ion (SC	GD)		14				-			
Self-di	rected	learning	(SDL))		-				-			
Proble	m Base	d Learn	ing (Pl	BL)		-				-			
Case B	ased L	earning	(CBL)			-				-			
Clinic						-				-			
Practic	al					-							
Revisio	on					-					-		
Assess	ment					-					-		
ТОТА	L					14					-		
Assess	ment N	Methods	5:							1			
Formative:								Summative:					
Semina	ar Topi	c Select	ion										
Synops	sys revi	iew											
PPT R	eview												
Mappi	ing of a	assessm	ent wit	th Cos	5								
Nature of assessmentCO 1						CO 2	CO 3	CO 4			CO 5		
Presentation *						*	*	*			*		
Feedback Process End-Semester						er Feedba	nck	1					
Reference Material Particular to the chosen Sen						sen Sem	inar						



Name of the	Program:	Master of Engineering - ME (Healthcare Data Analytics)						
Course Title	:	Machine Learning for Big Data						
Course Code	e: BDA-605	Course Instructor:						
Academic Y	ear: 2020 - 2021	Semester: First Year, Semester 2						
No of Credit	s: 3	Prerequisites: Programming with Python and Data						
		Visualization						
Synopsis:	This Course provides	insight on						
	1. This course prov	vide the concept of neurons and biological motivation,						
	activation function	ons and threshold units, supervised and unsupervised						
	learning, perceptro	on network models in Artificial Neural Networks.						
	2. This course prov	ide the knowledge about learning from unclassified data						
	using clustering te	echniques.						
	3. This course provi	de the concept of Support Vector Machines for linear and						
	non-linear classifi	cation.						
	4. This course provid	le the concept of Deep Learning and design of convolutional						
	neural network fo	r Deep Learning.						
	5. This course prov	ride the knowledge about the applications and design of						
	Reinforcement Le	earning algorithms.						
Course								
Outcomes	On successful completion of this course, students will be able to							
(COs):								
	Describe activation fu	inctions, weights and threshold units used in artificial neural						
CO 1:	networks, supervised and unsupervised learning, gradient descent approach, types							
	of perceptron models, overfitting							
CO 2	Explain the concept	Explain the concept of hierarchical clustering and non-hierarchical clustering,						
CO 2:	support vector machin	ne, deep neural networks and reinforcement learning						
CO 2-	Demonstrate artificial neural network models, clustering models, support vecto							
CO 3: classifier models, D		ep learning models and reinforcement learning models						
CO 4:	Compare and contrast single layer, multilayer and deep neural networks in terms							
CO 4:	of accuracy in classifi	ication						
	Design back propagat	ion neural network, K-means and agglomerative clustering,						
CO 5:	deep neural network, reinforcement learning models and selection of a machine							
	learning algorithm for	r the given data analysis.						



Mapping of COs to POs												
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				*								
CO 5				*								
Cours	e conte	ent and	outcon	nes:								
Conter	ıt					Compet	encies					
Unit 1	: /	Artificia	al Neur	al Net	works	5						
Neuron	ns and	l biolo	gical	motiva	tion,	1. I	Relate	biological	neurons	s with	artificial	
Activa	tion f	unction	s and	thres	hold	neurons and the motivation for ANN						
units,	Super	vised	and ur	nsuperv	ised	development. (C1)						
learnin	ıg,	Perce	ptron	Mo	odel:	2. Distinguish Supervised and unsupervised						
represe	entatior	nal limit	ation a	nd grad	lient	learning (C2).						
descen	t train	ing, M	ultilaye	r netw	orks	3. Describe about error reduction techniques in						
and ba	ck prop	oagation	, Overf	ïtting		used	Art	ificial Ne	ural N	Jetworks	based	
						learr	ning (C	2)				
						4. 1	Write	the usabilit	y of d	ifferent a	ctivation	
						func	tions fo	or ANN lear	ning syst	tem. (C3))	
						5. I	Describ	e	the	arc	hitecture	
						of various perceptron networks. (C2)						
Unit 2	: (Cluster	ing									
Learni	n <mark>g fr</mark>	om u	nclassif	fied o	lata,	1. Write the different methods of learning from						
Cluster	ring. H	ierarchi	cal Agg	glomera	tive	unclassified data (C3).						
Clustering, Non- Hierarchical						2. Explain the operations						
	U	- k-n		partiti		of various clustering models in machine						
	xpectat				learning (C5)							
		soft c		-	emi-	3. Describe the methods used for measuring						
-		earning			sing	dissimilarity between two clusters. (C2)						
labelle	d and u	Inlabell	ed data.									



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



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		4. Explain about Markov decision process.					
		(C5)					
Learning strategies, contact l	hours and s	student lear	ning time				
Learning strategy		Contact h	ours		Student learning		
					time (Hrs)		
Lecture		30			60		
Quiz		02			04		
Small Group Discussion (SGD)	02			02		
Self-directed learning (SDL)		-			04		
Problem Based Learning (PBL)	02			04		
Case Based Learning (CBL)		-			-		
Revision		02			-		
Assessment		06			-		
TOTAL		44			74		
Assessment Methods:							
Formative:			Summative:				
Internal practical Test			Session	nation			
Theory Assignments			End semester examination				
Lab Assignment & Viva			Viva				
Mapping of assessment with	Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examination 1	*	*					
Sessional Examination 2			*	*			
Assignment/Presentation	*	*	*	*	*		
End Semester Examination	*	*	*	*	*		
Feedback Process •	End-Semes	ter Feedback	ζ.				
			ning", McGr ming", MIT				



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



Name o	of the P	rogram	:		Maste	er of Eng	gineering	g - ME (H	ealthcare	Data Ana	lytics)	
Course	Title:	_			Adva	Advanced Applications of Probability and Statistics						
Course Code: MCL 602						Course Instructor:						
Acader	nic Yea	r: 2020-	2021		Seme	ster: Fin	st Year,	Semester	2			
No of C	Credits:	3			Prere	quisites	: MCL	601				
Synop	sis:	This co	ourse p	rovides	an int	roductio	on to ac	dvanced a	applicati	ons of pr	obability	
		and sta	tistics f	for mul	tivariat	e and ti	me serie	es data.				
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:	Compu	ite and	interpr	et descr	iptive s	tatistics	s for mult	ivariate	data		
CO	2:	model	perform	nance						oblems ar		
CO	3:	multiva	ariate d	ata for	dimens	ion red	uction			PCA) ap	-	
CO	4:	Identif	-			ith mix	ed data	type fea	tures and	d cluster	using an	
CO	5:	Unders	stand th	e basic	s of tim	ne series	s model	ling and	apply to	real-life p	oroblems	
Mappi	ing of (COs to 1	POs									
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 1	*		*									
CO 2	*	*	*	*								
CO 3	*	*	*	*				*				
CO 4		*	*	*	*	*						
CO 5	*	*	*									
Course content and outcomes:												
Course	e conte	nt and	outcon									
Course Conten		nt and			(Compet	encies					
Conten	ıt	nt and		outions		Compet	encies					
Conten Unit 1	<i>ıt</i> : Multi		Distril		5			the org	anisatio	n of mu	ltivariate	



ARED BY V (Deemed to	be University under Section 5 of the UGC Act, 1956)
multivariate Gaussian – joint-,	2. Relate multivariate population and sample
marginal-, and conditional distributions,	parameters (C4).
Mahalanobis distance and outliers -	3. Understand and apply multivariate Gaussian
Properties of the multivariate Gaussian	modelling to practical problems (C2, C3).
- Parameter estimation: maximum	4. Compare parameter estimation using different
likelihood estimation (MLE) and	probabilistic approaches (C4).
maximum aposteriori estimation	
(MAP).	
Unit 2: Linear and Logistic Regression	n
Simple linear regression – regression	1. Model a linear relationship between input and
model, estimating and interpreting	output variables, and assess model performance
coefficients, accuracy of coefficient	(C5).
estimates and model, ANOVA, R2	2. Use different performance metrics to conclude
statistic - Multiple linear regression -	what is a good linear fit to the data (C6).
estimating coefficients, qualitative	3. Interpret model coefficients and investigate the
predictors, interaction effects, potential	effect of input variables on output through
problems - Logistic regression – binary	sensitivity analysis (C6).
and multinomial logistic regression	4. Apply logistic regression modelling for binary
models, estimating and interpreting	and multiclass classification and assess model
coefficients, assessing model	performance (C6).
calibration and discrimination, area	
under the ROC curve.	
Unit 3: Principal Component Analysis	s, Cluster Analysis
Geometric intuition of principal	1. Understand the mathematical foundation of
components - Maximum variance	principal component analysis (PCA) (C2).
perspective – algebraic setup,	2. Perform and interpret the output of PCA
eigenvectors and eigenvalues of sample	applied to multivariate data for dimension
correlation matrix - Interpretation and	reduction (C6).
application of principal components for	3. Assess when PCA is applicable for clustering
dimension reduction.	multivariate data (C6).
Dissimilarity measures for mixed data	4. Compare and contrast methods for clustering
types - Partition around medoids (PAM)	multivariate data with mixed data types (C6).



vs. K-means algorithms - Selecting the number of clusters.	
	Alveia
Unit 4: Bootstrapping, Time Series Ana	119818
Time series concepts: stationarity,	1. Understand the basic principles of
trend, seasonality, autocorrelation -	bootstrapping as an experimental method to
Autoregressive moving average	estimate the sampling distributions of a
(ARMA) models - Resampling,	statistic (C2).
smoothing, windowing, and rolling	2. Understand the basic mathematical
average - First and second order	principles of time series modelling (C2).
differencing - Validating time series	3. Apply time series modelling to practical
predictions.	problems (C3).
	4. Interpret the results of times series model
	predictions (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

Leanning strategy	Contact notin	Student teantin
		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:
Internal practical Test		Sessional examination
Theory Assignments		End semester examination

Viva

Lab Assignment & 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	ion	*	*	*	*	*
End Semester Examin	nation	*	*	*	*	*
Feedback Process	• End	l-Semes	ster Feed	back		
Reference Material	Gareth Jan Springer; 1 2. An Intr Everitt and 3. Machin The MIT F 4. Mathen Faisal, and	nes, Dan st Edition oduction Torsten e Learn Press; 1s natics fo I Cheng	niela Wi on, 2013 n to Ap n Hothor ing - A F t Edition r Machin 5 Soon C	tten, Trev , Corr. 7th plied Mul n– Spring Probabilist a, 2012. ne Learnin Ong, Cam	or Hastie and R n printing 2017 H ltivariate Analys er Publications, I tic Perspective, H ng, Marc Peter De bridge Universit	is with R, Brian Ist Edition, 2011. Kevin P. Murphy, eisenroth, A Aldo ty Press, 2020. –
				_	nl-book.pdf	ess available at



Name of the	Program	m:		Mast	er of Er	ngineer	ing - ME (Healthcare	e Data Ar	nalytics)	
Course Title	:			Big I	Big Data in Healthcare						
Course Code	e: HDA	603		Cou	rse Inst	ructor	:				
Academic Year: 2020-2021 No of Credits: 3					ester:	First Y	ear, Seme	ester 2			
					equisite	es: E	Basic Pyth	on progran	nming, B	asic Java	
						g					
Synopsis:	This C	ourse p	orovides	s insigh	it on						
	1. Stu	idents	learn tl	ne con	cept of	big da	ata charac	teristics, b	atch and	lambda	
	arc	architecture.									
	2. Th	e basic	s of file	systen	ns in Bi	g Data					
	3. Th	e conce	epts of l	Hadoop	o framev	vork, S	park fram	ework and	their inte	ernals.	
	4. Ma	ap-redu	ce prog	rammi	ng, Spa	rk prog	ramming.				
	5. Dit	fferent	layers v	with use	e cases o	demons	strations.				
Course	1										
Outcomes	On suc	cessful	compl	etion o	f this co	ourse, st	tudents wi	ll be able t	0		
(COs):			-								
CO 1:	Discov	ver the o	data inv	volved	olved in big data.						
CO 2:	Infer u	sing th	e distril	outed fi	uted file system.						
CO 3:	Experi	ment w	ith the	Hadoo	Hadoop and Spark framework for process the data.						
CO 4:	Develo	op Map	-reduce	applic	applications for Big Data.						
CO 5:	Develo	op Spar	k appli	cations	for Big	Data.					
Mapping of	COs to	POs									
			DO 4	DO 5	DO 6	DO 7		DO 0	DO 10	DO 11	
COs PO 1 CO 1 *	<i>PO 2</i> *	<i>PO 3</i> *	<i>PO 4</i> *	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11	
CO 2 *	*	*	*								
CO 2 *	*	*	*								
CO 3 · · · · · · · · · · · · · · · · · ·	*	*	*								
CO 5 *	*	*	*								
Course cont	ent and	outcon	nes:								
Content		Jucon			Compet	encies					
	Big Dat	9			compon						
	Dig Dat	a									



	University under section 5 of the UGC Act, 1930)
Big Data Terminologies – Why Big	1. To describe the data size in big data. (C1).
Data – Big Data in HeathCare – Case	2. To analyse the Big Data use in Healthcare
Studies of Big Data in Healthcare	application. (C4)
	3. Discover the healthcare applications as case
	study. (C3)
Unit 2: Introduction to Clustering	– Architectures
-Models of distributed computations -	1. programs with Java. (C1).
Global state of a distributed system -	2. To examine the different models and
Centralized, decentralized and hybrid	architectures of distributed computations.
architectures - Virtualization and	(C4).
distribution of computations –	3. To interpret the Centralized, decentralized
Introduction to Cloud Architecture -	and hybrid architectures. (C2).
Basics of Cloud – Introduction to AWS	4. To experiment and illustrate the cloud
& AZURE	infrastructure and its types. (C4).
Unit 3: Google File System and Had	doop System
The design rationale of GFS - Basic	1. Review the Google File System and Hadoop
architectural –aspects - Consistency	System. (C2).
model - Implementation details	2. Recognize the design rationale of GFS. (C2).
	3. Review and Summarise the Basic
	architectural and Consistency model. (C2)
Unit 4: Google Big Table	
Architecture of column-oriented data	1. Infer the basics of Google Big Table. (C2).
stores - Bigtable data model and its	2. Describe the Architecture of column-oriented
rationale Bigtable implementation	data stores. (C2).
details –AWS dynomo DB	3. Infer the Bigtable data model and its rationale
	Bigtable. (C2).
	4. Explain and illustrate the AWS dynomo DB.
	(C4).
Unit 5: MapReduce	
Google's MapReduce architecture -	1. Scalability in the batch layer MapReduce: a
Fault-tolerance in MapReduce systems.	paradigm for Big Data computing. (C4).



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- Two-stage map-reduce example	2. To illustrate a Case study. Example:
Incremental MapReduce	Summing bird library for distributed
	MapReduce platforms. (C5).
	3. Explain the MapReduce programming and
	working. (C2).
	4. Discuss on the Google's MapReduce
	architecture. (C2).
Unit 6 : The Hadoop environment	
HDFS - MapReduce with YARN -	1. Explain the concept of Fault-tolerance in
Cluster setup and configuration - Hive –	MapReduce systems. (C2).
data summarization, query and analysis -	2. Practice the Two-stage map-reduce
Spark – high volume in-memory data	example. (C6).
querying and analysis - HBase distributed	3. Rearrange and explain the Incremental
database	MapReduce. (C6).
Unit 7: The Hadoop environment	
HDFS - MapReduce with YARN -	1. Explain the working of Hadoop
Cluster setup and configuration - Hive –	environment. (C2).
data summarization, query and analysis -	2. Explain the HDFS and its utility. (C2).
Spark – high volume in-memory data	3. Illustrate example of MapReduce with
querying and analysis -	YARN and its architecture. (C4).
HBase distributed database	4. Illustrate and experiment Cluster setup and
	configuration. (C4).
	5. Explain Hive data summarization, query
	and analysis. (C2).
	6. Explain the Spark high volume in-memory
	data querying and analysis. (C2).
	7. Explain and illustrate HBase distributed
	database. (C2).
Unit 8: Stream data	
Steam data in HIS – handling Stream Data	1. Discuss on the introduction of stream data.
with kafka and Tensorflow – Models	(C2)
	× /



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	2. Explain the	steam data in HIS. (C2).
	3. To experim	nent and illustrate handling
	Stream Data	a with Kafka and TensorFlow.
	(C2).	
Unit 9: IoT in healthcare		
M2M Architecture IoT with Big Data -	1. Discuss on t	the IoT in Healthcare. (C2).
MQTT protocol – Case studies.	2. Explain the	M2M Architecture IoT with Big
	Data. (C2).	
	3. Illustrate a	and experiment the MQTT
	protocol. (C	4).
	4. Explain and	d experiment the case studies.
	(C2).	
Learning strategies, contact hours and s	tudent learning time	6
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:		mative:
Internal practical Test		onal examination
	Ende	semester examination
Theory Assignments		



Mapping of assessme	ent with C	os				
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	
Sessional Examinatio	*	*				
Sessional Examinatio			*	*		
Assignment/Presentat	ion					*
End Semester Examin	*	*	*	*	*	
Feedback Process • End-Semester Feedback						
Reference Material	 Health Informatics: An Interprofessional Approach - Ramona Nelson and Nancy Staggers. Healthcare Informatics - WIlliam Hanson - McGraw-Hill Education. Handbook of Research on Informatics in Healthcare and Biomedicine - Athina A. Lazakidou. 					Iill



Name of the	Program:	Master of Engineering - ME (Healthcare Data Analytics)				
Course Title	:	Medical Imaging Systems				
Course Code: HDA 604		Course Instructor:				
Academic Y	ear: 2020-2021	Semester: First Year, Semester 2				
No of Credit	s: 3	Prerequisites: Healthcare Data Management and				
<u> </u>	1 701 *	Digital Imaging Representation & Characteristics				
Synopsis:	-	ides the theoretical background of imaging techniques in idards in healthcare.				
	2. This course provi	ides the depth knowledge on medical imaging formats used				
	for reporting and	visualization.				
	3. This course pro	ovides the overview of medical image archival and				
4. This course elucidate the workflow involved in Radiodiagnosis and in						
	in a hospital set-u5. This course prov	p. vides the concept of phenotyping medical images using				
	radiomics and pathomics.					
	6. This course gives	the knowledge of remote diagnosis using tele-radiology and				
	telemedicine tech	nology.				
Course						
Outcomes	On successful comple	etion of this course, students will be able to				
(COs):						
	Explain the techniqu	e involved in medical image acquisition using different				
CO 1:	modalities and illustra	ate medical image format used to view, report and visualize				
	using different anaton	nical planes and views for better diagnosis.				
CO 2:	Identify and explain i	nteroperability standards in Healthcare.				
CO 2:	Describe the radiolog	gical workflow from patient registration for a study till				
CO 3:	reporting the study with archiving medical images and reports.					
CO 4:	_	ison of imaging data with phenotypes extracted using				
	radiomics and pathom					
CO 5:	Explain the important	nce of privacy and confidentiality in tele-radiology and				
	telemedicine.					
Monning of	COs to POs					



			WSPIRED F	y Litt (D	eemed to b	e Unive	ersity und	er Section 3 o	f the UGC Act, 195	6)		
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	$F \mid P$	<i>PO</i> 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	nt and	outcon	nes:				1		1	1	1
Conten	ıt					Co	mpete	encies				
Unit 1	:]	Introdu	iction t	o Imag	ging S	yste	ems i	n Healt	thcare			
Introdu	iction	to Ra	diodiag	nosis	and	1.	Desc	cribe th	e role of R	adiodiagr	nosis and	imaging
imagin	g, Int	eropera	bility	standa	ards,		in m	edicine	(C2)			
medica	ıl imagi	ng evol	ution			2.	Und	erstand	the use of i	interopera	bility star	ndards in
							healt	thcare (C3)			
						3.	Clas	sifies	the evolution	tion of a	medical	imaging
							mod	alities ((C3)			
Unit 2: Human Anatomical Planes and View								iews				
Introdu	iction	to H	uman	Anato	omy,	1.	Iden	tifies t	he differe	nt anator	nical pla	nes and
Directi	onal Te	erms, P	lanes o	f the b	ody,	views to visualize medical images (C2)						
Body C	Cavities					2. Describe human anatomy (C2)						
						3.	3. Identify and summarize the understanding on					
							medical imaging modalities (C2)					
Unit 3	:]	Medica	l Imag	ing Mo	daliti	ies						
X-ray,	C	Compute	ed To	omograj	phy,	1.	Reco	ognizes	the phy	ysics of	electror	nagnetic
Magne	tic	Resona	ance	Imag	ging,		spec	trum (C	C1)			
Ultrasc	onograp	ohy, Po	ositron	Emiss	sion,	2.	2. Outlines the interaction of X-rays with matters					matters
Tomog	graphy,	Therma	al Imag	ing			(C1, C2)					
						3.	Desc	cribe the	e evolution	of CT sc	an (C2)	
						4.	Men	norize t	he concept	of magne	etic field ((C1)
						5.	Und	erstand	the role of	f magnetio	c field in	imaging
							hum	an body	y (C2, C3)			
						6.	Men	norize	the resona	nce effec	t and its	role in
							gene	erating e	echo (C1)			



	7.	Explain the different modes and effects of sound
		waves in imaging human body (C3)
	8.	Explain the role of ionization and gamma
		radiation in imaging human body (C2)
	9.	Memorize the role of near-infrared illumination in
		low-light imaging to capture temperature (C1)
Unit 4: DICOM		
Introduction to DICOM, Value	1.	Identifies the role of interoperability standards in
Representations and Dictionary,		healthcare (C1)
Encoding data elements, encoding data	2.	Explains the role of DICOM in medical imaging
groups, Element and Group lengths,		(C2)
Storing Image Data, unique Identifier,	3.	Categorize the real world data to DICOM world
DICOM IODs, DICOM SOPs, DIMSE		using DICOM dictionary and value
Services, Conformance statement,		representation (C4)
Association Establishment, Transfer	4.	Identifies method for encoding and decoding
Syntax and Abstract Syntax, DICOM		DICOM data elements (C4)
Modules	5.	Apply the knowledge of DICOM in
		understanding the workflow establish an
		association till releasing an association (C3)
	6.	Identifies DICOM services and category of
		services (C4)
Unit 5: HL7		
Background and general Information,	1.	Describe the background of HL7, data based on
reading of data based on HL7		HL7 formatting (C2)
formatting, and Data Exchange between	2.	Construct HL7 messages for data exchange
medical applications. Essentials of		between two application using HL7 version 2
messages, based on HL7 Version2		(C5, PO5)
formatting.		
Unit 6 : PACS		



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Introduction to PACS, Comparison of a	1.	illustrate the importance of	f PACS and its	
PACS system with a film based system,		application in medical ima	ge archiving and	
PACS components, Image archiving and		communication (C3, PO6)		
distribution, Image database, Image	2.	Discover the difference be	tween traditional	
workstation requirements, Systems		image archiving and PACS	S based (C3)	
operation, Maintenance and reliability.	3.	Demonstrate the radiologic	cal workflow (C3,	
		PO6)		
	4.	Explain basic functionaliti	es of RIS (C2)	
Unit 7: Radiology Information Sy	rster	m		
Basic functionalities of RIS, Radiology	1.	Identify radiomic and p	athomics phenotype	
work flow, Results and Reporting		(C2)		
Unit 8: Radiomics and Pathomics	i			
Radiographic phenotyping, Clinical	1.	Explains clinical signific	ance of the feature	
Significance of quantitative approach,		extraction and analysis (C2		
features and feature selection,	2.	Demonstrate phenotype		
PyRadiomics, Image analytics using		Pyradiomics (C6)		
radiomic and Pathomics features	3.	Compare radiomic fea	tures for clinical	
		significance (C6)		
Unit 9: Telemedicine and Telerad	diol	ogy		
International Regulations in eHealth,	1.	Describe regulations,	confidentiality and	
Telemedicine History, Confidentiality and		privacy aspects in eHealth	(C2, PO10)	
privacy, Telecommunication system	Describe telecommunication in telemedicine and			
applied to telemedicine, Devices, Image	tel	e-radiology (C1)		
transfer and viewing, Applications				
of teleradiology				
Learning strategies, contact hours and st	tude	ent learning time		
Learning strategy	Co	ontact hours	Student learning	
Learning strategy			1	
Learning strategy			time (Hrs)	
Lecture	30		time (Hrs) 60	



						1	
Small Group Discuss	ion (SGD)	02			02		
Self-directed learning	-			04			
Problem Based Learn	ing (PBL)	02			04		
Case Based Learning	(CBL)		-			-	
Revision			02			-	
Assessment			06			-	
TOTAL			44			74	
Assessment Methods	5:						
Formative:				Summa	ative:		
Internal practical Test	t			Session	al exam	ination	
Theory Assignments				End ser	nester e	xaminat	ion
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 Examinatio	n 1	*	*				
Sessional Examinatio	n 2			*	*		
Assignment/Presentat	tion						*
End Semester Examin	nation	*	*	*	*		*
Feedback Process	• End	d-Semes	ter Feedback				
Reference Material	McGraw Hi [2] "Princij Benjamin M [3] "Digita Pianykh, Sp [4] "HIMS	 McGraw Hill. [2] "Principles of Medical Imaging" by K. Kirk Shung, Michael B. Smith, Benjamin M.W. Tsui [3] "Digital Imaging and Communication in Medicine(DICOM)" by Oleg S Pianykh, Springer. [4] "HIMSS Dictionary of Healthcare Information Technology Terms, Acronyms and Organizations", Second Edition, HIMSS, ISBN 13978-1- 					



[5] "Telemedicine and Telehealth 2.0: A Practical Guide for Medical Providers and Patients" by Victor Lyuboslavsky, Paperback.
[6] "The Biomedical Engineering: Handbook" by BRONZINO, J D. Volume1, 2. Boca Raton : CRC Press, 2000. ISBN 0-8493-0461-X.



Name	of the	the Program: Master of Engineering - ME (Healthcare Data Analytics)											
						Entrepreneurship							
Course Code: ENP-601						Course Instructor:							
Academic Year: 2020 - 2021						ester:	First Y	ear, Semes	ster 2				
No of	Credit	s: 3			Prer	equisite	es: -						
Synop	sis:	This course introduces students to the theory of entrepreneurship and its practical											
		implementation. It focuses on different stages related to the entrepreneurial											
		process	s, inclu	iding t	ousines	s mode	l inno	vation, mo	onetization	i, small t	ousiness		
		manag	ement	as well	l as str	ategies	that in	nprove per	formance	of new b	ousiness		
		venture	es. Cen	tered of	n a mix	ture of	theoret	ical explora	ation as w	ell as case	studies		
		of real-	-world	exampl	es and g	guest lea	ctures, s	students wi	ll develop	an unders	standing		
		of suce	cesses,	opport	unities	and ris	sks of	entreprene	urship. Th	nis course	has an		
		interdi	sciplina	ary app	roach a	nd is the	erefore	open to stu	udents from	m other M	lajors.		
Cours	e												
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, st	udents wil	l be able t	0:			
(COs)	:												
CO 1.		To imp	oart kno	owledge	e on the	e basics	of entr	epreneuria	l skills and	d compete	ncies to		
CO 1:		provide	e the pa	articipa	nts with	n necess	ary inp	outs for crea	ation of ne	ew venture	es.		
		To fam	iliarize	the par	rticipan	ts with	the con	cept and ov	verview of	entrepren	eurship		
CO 2:		with a	view to	enhan	ce entre	epreneu	rial tale	ent					
CO 3:		To app	raise th	e entre	preneu	rial proc	cess sta	rting with	pre-ventui	e stage			
CO 4:		To Cre	ate and	l exploi	t innov	ative bu	isiness	ideas and r	narket opp	portunities	5		
co 5		To Bu	ild a m	nind-set	t focusi	ing on	develoj	ping novel	and uniq	ue approa	iches to		
CO 5:		market	opport	unities									
000		To exp	plore n	new vis	stas of	entrep	reneurs	hip in 21	st century	environi	ment to		
CO 6:		genera	te inno	vative b	ousines	s ideas t	hrough	a case studi	es.				
Mappi	ing of (COs to]	POs										
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11		
CO 1	*												
CO 2				*									
CO 3			*										
CO 4						*							
		I											



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



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Indian and Internation	ional	1.	Perform	n self-a	ssessme	ent and	analyse	
Entrepreneurship		entrepro	eneurial	perso	nal trait	s and		
			compet	encies (C4	4)			
		2.	Evaluat	e oneself	and plai	n courses of	action to	
			help	develop	one	's entrep	reneurial	
			charact	eristics an	d comp	etencies. (C	5)	
Learning strategies, contact hour	s and s	studen	t learni	ng time				
Learning strategy		Con	tact hour	rs		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:						
Internal practical Test		Sessional examination						
Theory Assignments			End semester examination			amination		
Lab Assignment & Viva			Viva					
Mapping of assessment with Cos								
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	*	*		*	*	*	*	



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:					Mas	Master of Engineering - ME (Healthcare Data Analytics)							
						t Analyti	cs in Health	ncare					
		HDA	~		Cou	Course Instructor:							
		ears 20			An	exer:		Semeste		_			
No of													
Synop	SIS:		(Deemed to be University under Section 3 of the UGC Act, 1956) This Course provides insight on										
			1. Capable to extract transform and load text data										
		2. Per	rforms	text mi	ning fi	rom load	ed data						
		3. Ap	ply nat	ural pro	ocessii	ng langua	age knowled	lge to an	alyse text	;			
Course	e												
Outco	mes	On suc	cessful	compl	etion of	of this co	urse, studer	nts will b	e able to				
(COs):	:												
CO	1:	Demor	nstrate i	egular	expre	ssion, pa	rser, and Le	xical an	alyser.				
CO	2:	Illustra	ates leve	els of li	nguist	tic analys	sis in natura	l langua	ge process	sing			
CO	3:	Discov	ver sam	pler of	text m	ining ap	plications a	nd servio	ces				
СО	4:			Docum	ent Ir	naging &	& Optical (Characte	r Recogn	ition (C	DCR) in		
		Health											
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	*	*	*		*								
Course	e conte	ent and	outcon	nes:									
Conter	nt					Compete	encies						
Unit 1	: I	ntrodu	ction to	Text	Analy	tics							
Text D	Data — I	Mining	– Data	Minin	g vs	1. Desc	cribe fundar	nentals of	of data mi	ning(C1)		
Text M	lining	– Text a	as Data	- Text	_	 Discuss text mining terminologies (C2) 							
	-	nologies						U	U	~ /			
Unit 2	: ′	Text Pr	ocessin	g									
Introdu	uction	to regu	lar exp	oression	ns –	1. Expl	ain regular	expressi	ons and pa	arser in	text data		
parsers	s – lexi	cal anal	ysis.			(C2)							
		2. Explain lexical analysis (C2)											
Unit 3	: '	The tex	t minin	g pipe	line	r			、 /				
inform	ation	retriev	val, i	nforma	tion								
		d data m	,			text							
L													



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	2. Illustrates levels of linguistic analysis in natural
	language processing (C3)
Unit 4: Fundamentals of natural la	nguage processing
linguistic foundations, levels of	1. Demonstrate text extraction using python (C3)
linguistic analysis.	2. Practice natural language processing techniques
	(C3)
Unit 5: Approaches to text mining	
rule-based vs. machine learning based	1. Interpret different types of approaches for text
vs. hybrid; generic vs. domain specific;	mining (C3)
domain adaptation Dealing with real	2. Explain domain adaptation for types of real text
text: text types, document formats and	(C2)
conversion, character encodings,	3. Explain low level processing of text (C2)
markup, low-level processes (sentence	4. Explain information extraction from text (C2)
splitting, tokenisation, part of speech	
tagging, chunking).	
Unit 6: Information extraction	
term extraction, named entity recognition	, 1. Explain partial analysis and full analysis of
relation extraction, fact and event	extracted information (C2)
extraction; partial analysis vs. ful	1
analysis.	
Unit 7: Evaluation of text mining	g systems
evaluation measures, role of evaluation	1. Illustrate role of evaluation of mining system
challenges, usability evaluation.	(C2)
Unit 8: Resources for text mining	
annotated corpora, computational lexica	, 1. Discuss resources for text mining (C3)
ontologies, computational	
grammars; design, construction and use	2
issues.	
Unit 9: Issues in large scale proce	ssing of text
distributed text mining, scalable tex	t 1. Discuss computational grammars for text
mining systems.	mining (C3)



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

	2. Explain distribute	d text mining to overcome
	issues with large s	scale processing of text.(C2)
Unit 10:		
A sampler of text mining applications and	1. Employ sampler o	f text mining applications and
services; case studies.	services (C3)	
Unit 11: Document Imaging & Opt	tical Character Recog	nition (OCR) in Healthcare
Preprocessing – Character recognition -	1. Explain OCR in h	ealthcare (C2)
Postprocessing - OCR softwares and	2. Discuss OCR soft	ware and library (C2)
library – examples with PYTESSERACT	3. Explain deep learn	ning based text analysis (C2)
- Deep Learning		
based Text Recognition (OCR) using		
Tesseract and OpenCV		
Unit 11: Text Analysis for Healtho	care Algorithms	
ConText – cTakes	1. Explain algorith	ms for text analysis for
	healthcare data (C	22)
Learning strategies, contact hours and st	udent 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:	Su	immative:
Internal practical Test	Se	ssional examination



Theory Assignments		End semest	End semester examination						
Lab Assignment & V	iva	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	*	*	*	*				
Feedback Process	• End	d-Semest	er Feedback	L					
Reference Material	[1] Text m	nining ha	ndbook: adva	nced approaches in	n analyzing				
	unstructure	ed data F	Feldman, Ron	en and James Sang	er, 9780521836579,				
	CUP, 2008								
	[2] Linked	l Lexical	Knowledge I	Bases Iryna Gurev	ych, Judith Eckle-				
	Kohler, Mi	ichael M	atuschek,978	1627059749, Morg	an & Claypool,				
	2016								
	[3] Introdu	action to	information 1	retrieval Manning,	Christopher D. and				
	Prabhakar	Raghava	n and Hinricł	n Schutze, 9780521	865715, Cambridge				
	University	Press,20	08						
	[4] Text m	nining: cl	assification, o	clustering and appli	cations Srivastava,				
	Ashok and	Mehran	Sahami (eds.)., 9781420059403	, Chapman &				
	Hall,2009								
	[5] Weiss,	S. M., I	ndurkhya, N.,	Zhang, T. (2010).	Fundamentals of				
	Predictive	Text							
	[6] Mining	g. Spring	er: New York	. ISBN: 978-18499	962254				
	[7] Pustejo	ovsky, J.	and Stubbs, A	A. (2012). Natural I	Language				
	Annotation for Machine								
	[8] Learning. O'Reilly.								
	[9] Found	ations an	d Trends in I	nformation Retrieva	al, 2(1-2): 1–135.				
	Available of	online at:							
	http://www	.cs.corn	ell.edu/home/	llee/opinion-mining	g-sentiment-				
	analysis-survey.html.								



[10] Manning, C. D., Raghavan, P., and Schutze, H. (2008).
Introduction to Information Retrieval, Chapters 6 and 13-18, Cambridge
University Press. Available online at: http://nlp.stanford.edu/IR-book/
[11] Articles: https://www.healthcatalyst.com



Name	of the	Program	m:			Master of Engineering - ME (Healthcare Data							
~						Analytics))							
						Blockchain Technology							
				N 1		rse Inst		0	. 1				
		ear: 202	20 - 202	21	_			ear, Sem					
No of			ourso	provide		-		ic Netwo		1	ookohoin		
Synop	515:	This Course provides insight on understanding the working of blockchair											
		techno	logy ar	nd how	block	chain pl	atform	works.	The cour	rse discus	s on the		
		nuance	s invo	lved in	block	chain te	echnolo	gy and i	its imple	ementation	n on the		
		blockc	hain pla	atform.									
Course	e												
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, st	udents w	ill be ab	le to			
(COs):	:												
CO	1:	Ou	tline th	e chara	cteristi	cs of the	e blocka	chain eco	system.				
CO	2:	De	velop tl	he bloc	kchain	ecosyst	em usin	g Ethere	um.				
CO	3:	Ev	aluate t	he appl	ication	based of	on Ether	reum.					
CO	4:	Ex	amine t	he deve	elopme	nt proce	ess usin	g Hyperl	edger.				
CO	5:	De	monstra	ate the	blockcl	hain app	olicatior	n develop	ment pr	ocess.			
Mappi	ing of (COs to]	POs										
COs	<i>PO</i> 1	<i>PO 2</i>	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11		
CO 1	*	*		*									
CO 2	*				*								
CO 3	*	*	*		*								
CO 4	*	*											
CO 5	*	* * *											
Course	e conte	ent and	outcon	nes:									
Conten	ıt					Compet	encies						
Unit 1	:												



Introduction to Blockchain - Potential of	At the end of the topic student should be able to:
	-
Blockchain – Defining Blockchain –	L
Ownership – Understanding Ledger –	architecture. (C2)
Ledger Structure – Concepts of	2. To describe the relation between blockchain
Ownership – Centralized vs	and smart contracts. (C2)
Decentralized - Components of a	3. To describe the consensus and CAP theorem.
Blockchain -Characteristics of	(C2)
Blockchain - The growth of 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 working of the smart contracts
Contracts : Understand Ethereum	(C2)
,Define Smart Contracts,Identify	2. To illustrate the concepts involved in Ethereum
Cryptocurrency used in	and its development (C2)
Ethereum, Describe Transactions in	3. To describe the creation of applications using
Ethereum, Define Consensus	solidity. (C2)
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	



	be University under Section 3 of the UGC Act, 1936)
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 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:	1
Creating private Blockchain with	1. To define and describe the multichain
Multichain : Define Multichain ,	blockchain (C2)
Describe MultiChain Streams , Create	



& deploy private blockchain ,Explain	2. To explain the mining in multichain process
Connecting to a Blockchain ,Identify	(C3)
Multichain Interactive Mode ,List	3. To illustrate the deployment of multichain
Native assets ,Define Transaction	blockchain and its applications (C2)
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	36	72		
Seminar	-	-		
Quiz	-	-		
Small Group Discussion (SGD)	-	-		
Self-directed learning (SDL)	-	-		
Problem Based Learning (PBL)	-	-		
Case Based Learning (CBL)	-	-		
Clinic	-	-		
Practical	36	72		
Revision	-	-		
Assessment	6	-		
TOTAL	78	144		



Assessment Methods:							
Formative:	Summative:						
Internal practical Test	Sessional examination						
Theory Assignments				End seme	ster examination		
Lab Assignment & Viva				Viva			
Mapping of assessment with	Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examination 1	*	*	*				
Sessional Examination 2			*	*	*		
Assignment/Presentation	*	*	*	*	*		
End Semester Examination	*	*	*	*	*		
Laboratory examination	*	*	*	*	*		
Feedback Process End-Set	mester Fee	edback					
Step 2. Beg Blo Priy 3. Mas Edit 4. Han Ven Des 5. Soli title 6. Blo BPH	 Steps, Daniel Drescher, Apress; 1st Edition, 2017. Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions, Bikramaditya Singhal, Gautam Dhameja , Priyansu Sekhar Panda, Apress; 1st ed. Edition, 2018. Mastering Blockchain, Imran Bashir, Ingram short title, Second Edition, 2018. Hands-On Blockchain with Hyperledger, Petr Novotny Venkatraman Ramakrishna Nitin Gaur Anthony O'Dowd Luc Desrosiers, Ingram short title, 2018. Solidity Programming Essentials, Ritesh Modi, Ingram short title, 2018 BlockChain from Concept to Execution, Debajani Mohanty, BPB; 2nd revised and updated edition, 2018. 						



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; 1st edition, 2016.



Name of the	m:		Mas	Master of Engineering - ME (Healthcare Data Analytics)								
Course Title:					Responsive Web Application Development							
Course Code	e: IOT	605		Cou	Course Instructor:							
Academic Y	ear: 20	20-202	1	Sen	nester:	First Y	ear, Semest	er 2				
No of Credit	s: 3			Pre	requisite	s: B	asic Program	nming				
Synopsis:	This C	ourse p	orovides	s insig	t on							
	1. The front-end section includes working with HTML, CSS3 and Bootstra											
	des	ereas the	back-end	d section								
	consists of programming in PHP with MySQL, XML, and JSON.											
	2. Develop a platform friendly web application or a website using Bootstr											
		Angular JS, React JS, and Node JS.										
Course												
Outcomes	On suc	ccessful	compl	etion	of this co	urse, st	udents will	be able t	0			
(COs):												
CO 1:	Prepar	e a dyn	amic w	ebpag	ge by the	use of j	ava script. ((C3).				
CO 2:	Summ	arize a	well fo	rmed	/ valid X	ML doo	cument. (C2	()				
CO 3:	Schedu	ule web	applica	ation c	connect to	a DBN	AS to perfor	m insert,	update a	nd delete		
005.	operati	ions. (C	23)									
CO 4:	Practic	ce conv	erting t	he stri	ing and p	arse us	ing JSON ol	bjects (C	3)			
CO 5:	Apply	Bootst	rap, Aı	ngular	JS, Rea	et JS, I	Node JS to	construc	t modern	website		
0.0.5.	(C3)											
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		*	*									
CO 5 *		*	*	*								
Course cont	ent and	outcon	nes:		•					<u>.</u>		
Content					Compete	encies						
Unit 1: Introduction to Internet and Web Technology												



(Deemed to	be Unit	versity under Section 3 of the UGC Act, 1956)
Client Server Model, Tier Architecture,	1.	Explain Client Server Model, Tier Architecture
Types of Servers, Web Hosting,	2.	List out the types of Servers
Responsive Design	3.	Describe the importance of Web Hosting and
		Responsive Design
Unit 2: HTML		
Basic tags of HTML, Common Tags,	1.	Construct the Basic web page using tags of HTML
Formatting Tags, Images and Linking,		(C4).
List and Table Structure, Forms,	2.	Compare the difference between semantic and
and control: Text, Radio, Checkbox,		non-semantic tags (C5)
Select, Button, Input, HTML5: HTML	3.	Design web page using Common Tags,
Graphics, HTML Media, HTML		Formatting Tags, Images and Linking, List and
API .		Table Structure. (C5)
	4.	Forms and control Text, Radio, Checkbox, Select,
		Button, Input(C5)
	5.	Explain the importance of HTML Graphics,
		HTML Media, HTML API (C4)
Unit 3: CSS3		
Inline styles, internal style sheets,	1.	Design web pages using Inline styles, internal
linking external style sheets, positioning		style sheets, linking external style sheets(c5)
elements, backgrounds, element	2.	Differentiate between absolute and relative
dimensions, Box Model and text flow,		positioning elements(C4)
Media Types, Building a CSS drop-	3.	Apply backgrounds to web pages (c5).
down menu.		list out the different element dimensions (c1)
	4.	Importance of Box Model and text flow, Media
		Types (C2)
	5.	Building a CSS drop-down menu(c5)
Unit 4: Javascript		
Elements of Java Script - Variables,	1.	List out the applications of JavaScript (C1).
Data Types, Operators, Control	2.	Explain the elements of Java Script - Variables,
Statements, Functions, Dialog -		Data Types, and Operators (C3).
obtaining user input with prompt	3.	Develop web page by using conditional statement
dialogs, Document Object		to control the execution (C5).



	University under Section 5 of the UGC Act, 1					
Model(DOM) - Document, Form,	4. Create web page to	perform repetitive task using				
Event Handling, JQUERY, AJAX	looping statements (C5)					
	5. Develop web	page using Functions				
	Dialog - obtaining us	er input with prompt dialogs.				
	(C5)					
	6. Explain the importance of Document					
	Model – Document(C3)					
	7. Validate a Form using pattern matching oper					
	(C3).					
	8. Distinguish between	traditional web applications				
	and AJAX application	ons(C4).				
	9. Create web page with	h AJAX (C5).				
Unit 5: XML vs JSON vs YAM						
Introduction and Features, Use of XML,	, 1. Representation, YAML, YAML structure (C3)					
XML document, Creating XML, DTD,	2. Create JSON data (C3)					
Reading XML, Introduction to JSON,	3. Explain the importance of XML.(C3)					
JSON Structure, Object Representation,	4. List out the applications of XML,(C1)					
YAML, YAML structure, USE Case	5. Construct XML document and Reading XML					
	(C4)					
Unit 6						
PHP, MYSQL Connection, CRUI	1. Explain the conce	ept of server side scripting				
Operations, Handling JSON, XML data	language like PHP(C2).					
	2. Able to connect database using MYSQL(C5)					
	3. Create JSON, XM	3. Create JSON, XML data (C4)				
Unit 7	1					
BOOTSTRAP, ANGULAR JS, REAC	4. Create a Responsiv	ve web page using Bootstrap,				
JS, NODEJS	Angular JS, React JS and Node JS(C5)					
	5. Develop web page using the framework(C5)					
Learning strategies, contact hours and	student learning time					
Learning strategy	Contact hours	Student learning				
		time (Hrs)				
Lecture	30 60					
	1					



Quiz			02			04			
Small Group Discussi	02			-					
	02			02					
Self-directed learning	-			04					
Problem Based Learn	02			04					
Case Based Learning	-		-						
Revision	02		-						
Assessment			06			-			
TOTAL			44			74			
Assessment Methods	5:								
Formative:				Summa	tive:				
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	CO 4	CO 5	CO 6		
Sessional Examination 1		*	*						
Sessional Examinatio			*	*					
Assignment/Presentation		*	*	*	*	*	*		
End Semester Examin	nation	*	*	*	*	*	*		
Feedback Process	End-Semester Feedback								
Reference Material	1. Thomas A. Powell, Fritz Schneider," JavaScript: The Complete								
	Reference'	", McGra	w-Hill Osborn	ie, Second	l Edition	, 2004.			
	2. Jamsa Krishna, "Introduction to web development using HTML5",								
	2014.								
	3. Danny Goodman, "JavaScript bible", Wiley, Seventh Edition, 2010.								
	4. Azat Mardan, "Practical Node.js: Building Real-World Scalable Web								
	Apps", Apress Publications, 2014.								
	5. Krasimir Tsonev, "Node.js by Example", Packt Publications, 2015.								
	c. Hushim Isonet, Hodeljs by Example, Fack Fabilitations, 2015.								



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



Name	of the	Program	m:		Ma	ster of Eng	gineerii	ng - ME (He	althcare	Data Ana	alytics)			
				Project Ma										
Course Code: CSE 631 C			Co	urse Instr	uctor:									
Academic Year: 2020 – 2021 S			Sen	nester: I	First Ye	ear, Semeste	r 2							
No of Credits: 3 Pre			requisites	s: Fa	amiliarity in	develo	ping app	olication						
usir				using any high level language										
Synopsis: This Course provides insig						nsight on								
	1. The concept of softw						tware development process and project management							
		2. Illu	istrates	the dif	ferenc	ce between a lab assignment and group project								
		3. Help the students to understand the finer points of Project management							nt					
		4. Bring awareness about the processes, tools and techniques involved in the							d in the					
		field of IT project management												
Course														
Outco	mes	On successful completion of this course, students will be able to												
(COs)	:													
CO 1:		Illustrate the importance of project planning.												
CO 1		Discus	s and	demons	strate	various to	ools ap	plicable for	differe	nt phases	s of the			
CO 2:		software project.												
CO 3:Illustrate the importance of Change management.														
Mapp	ing of (COs to]	POs											
COs	PO 1	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	<i>PO</i> 9	PO 10	PO 11			
CO 1	*	*												
CO 2		*	*											
CO 3	*		*											
Cours	e conte	ent and	outcon	nes:				I						
Content					Competencies									
Unit 1	:	Softwar	e Proj	ect Pla	nning	5								
Understand the Project Needs, Create					e 1. Understand the project needs, necessity of plan,									
the Project Plan, Diagnosing Project				t Define the Project Plan, Diagnosing Project										
Planning Problems				Planning Problems (C1)										
Unit 2	Unit 2: Estimation													



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



versity under Section 3 of the UGC Act, 1956)				
1. Illustrate the necessity of Change management				
system – developing impact analysis				
document and its importance (C3).				
ip				
1. Understand the role of management in				
motivating the team, finer points of managing				
the team (C2)				
Project				
1. Describe the differences of managing the				
outsourced project, typical point of				
conflicts(C2)				
2. Review of the project management process				
(C2)				
1. Analyse the projects without process and				
continuous process improvements initiatives				
needed for success of the project (C4)				
Ident learning time				
Contact hours Student learning				
time (Hrs)				
30 60				
02 04				
02 02				
- 04				
02 04				
02 -				
06 -				



TOTAL			44		74		
Assessment Methods	:						
Formative:				Summative:			
Internal practical Test				Sessional exam	mination		
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/Presentati	on	*	*				
End Semester Examin	ation	*	*	*			
Feedback Process	End-Semester Feedback						
Reference Material	1. "Applied Software Project Management" By Jennifer Greene,						
	Andrew Stellman (O'Reilly Publications) 2005.						
	2. "The A	rt of Proje	ect Managem	ent" By Scott Be	erkun (O'Reilly		
		ations) 20	-	-	、 <u>-</u>		



Name of the 1		Master of Engineering - ME (Healthcare Data Analytics)										
					Machine Learning for Big Data Lab							
					se Insti		DIG Dui	u Luo				
Academic Ye							ar, Semes	ster 2				
No of Credits	Prere	equisite lizatior	s: Prog	,		Python a	nd Data					
Synopsis:	This Course provides insight on											
Course												
Outcomes	On suce	cessful	comple	etion of	this co	urse, stu	dents wil	l be ab	le to			
(COs):												
CO 1:	Demon neural r			on fund	ctions,	weights	and thr	eshold	units in	artificial		
CO 2:							istering, earning n		t Vector	Machine,		
CO 3:	Analyse Artificial Neural Network, Clustering, Support Vector Machine, Deep Neural Network and Reinforcement Learning models									nine, Deep		
CO 4:	Compare and contrast single layer, multilayer and deep neural networks in terms of accuracy in classification									ts in terms		
CO 5:							etwork m learning			ig models,		
Mapping of (COs to F	POs										
COs PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		
CO 1 *												
CO 2	*											
CO 3		*										
CO 4			*									
CO 5			*									
Course conte	nt and o	outcom	es:	1	1	1		1				
Content				C	Competencies							
Unit 1: A	rtificial	Neura	l Netwo	orks								



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



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



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

9. Neural Networks and Learning Machines, S. Haykin, Prentice Hall of India, 2010

Multidimensional Neural Networks Unified Theory, Rama Murthy
 G

11. F.Camastra and A.Vinciarelli, Machine Learning for Audio, Image and Video Analysis – Theory and Applications, Springer, 2008



Name	of the P	rogram	:		Mast	er of Eng	gineering	g - ME (H	ealthcare	Data Ana	lytics)
8											
						dvanced Applications of Probability and Statistics Lab ourse Instructor:					
		ar: 2020						Semester	2		
No of (-			equisites					
Synop	sis:	This c	ourse p	rovides		-			applicatio	ons of pr	obability
v I										data usin	
						5 manux	anac		series	uata usin	ig the K
		progra	mming	langua	ge.						
Cours	e										
Outco	mes	On suc	cessful	compl	etion o	f this co	urse, st	udents w	ill be abl	e to	
(COs)	:										
CO 1:		Comp	ute and	interpr	et desc	riptive s	tatistics	s for mult	ivariate o	data	
CO 2:		Build a	and ass	ess line	ar and	logistic	regress	ion mode	els for pra	actical pro	oblems
		Perfor	m prin	cipal c	ompon	ent ana	lysis (l	PCA) for	r dimens	sion redu	iction in
CO 3:		multiv	ariate d	ata							
CO 4:		Cluste	r multiv	ariate	data wi	th mixe	d data t	ypes			
CO 5:		Apply	time se	ries mo	odelling	g to real	-life pro	oblems			
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
				104		100	107	100	109	1010	1011
CO 1	*	*	*		*						
CO 2		*	*	*	*			*			
CO 3		*	*	*	*			*			
CO 4		*	*	*	*	*		*			
CO 5	*	*	*								
Course content and outcomes:											
Conter	ıt					Compete	encies				
Unit 1	: Mult	ivariate	Distri	bution	S						
Mean	vector,	covaria	nce and	correla	tion	1. Com	pute d	escriptive	e statistic	es of mu	ltivariate
– population vs. sample - The					The	data (C2).					
multivariate Gaussian – joint-,					oint-,						



TRED BY F (Deemed to	be University under Section 5 of the UGC Act, 1756
marginal-, and conditional distributions,	2. Perform exploratory data analysis of
Mahalanobis distance and outliers -	multivariate data (C4).
Properties of the multivariate Gaussian	3. Identify outliers in multivariate data (C3).
- Parameter estimation: maximum	4. Visualise and understand the properties of
likelihood estimation (MLE) and	multivariate Gaussian data (C3).
maximum aposteriori estimation	
(MAP).	
Unit 2: Linear and Logistic Regression	n
Simple linear regression - regression	1. Use in-built functions in R to build linear
model, estimating and interpreting	models for practical problem (C3).
coefficients, accuracy of coefficient	2. Compute different performance metrics to
estimates and model, ANOVA, R2	assess model performance (C6).
statistic - Multiple linear regression -	3. Interpret model coefficients and investigate the
estimating coefficients, qualitative	effect of input variables on output through
predictors, interaction effects, potential	sensitivity analysis (C6).
problems - Logistic regression – binary	4. Use in-built functions in R to build logistic
and multinomial logistic regression	regression models for practical binary
models, estimating and interpreting	classification problems and assess model
coefficients, assessing model	performance (C6).
calibration and discrimination, area	
under the ROC curve.	
Unit 3: Principal Component Analysis	s, Cluster Analysis
Geometric intuition of principal	1. Visualise the geometric interpretation of
components - Maximum variance	principal component analysis (PCA) (C3).
perspective – algebraic setup,	2. Use in-built functions in R to perform PCA on
eigenvectors and eigenvalues of sample	multivariate data (C3).
correlation matrix - Interpretation and	3. Compare and contrast PCA for variance
application of principal components for	maximization vs. clustering of multivariate data
dimension reduction.	(C6).
Dissimilarity measures for mixed data	4. Cluster multivariate data with mixed data types
types - Partition around medoids (PAM)	using in-built functions in R (C3).



vs. K-means algorithms - Selecting the			
number of clusters.			
Unit 4: Bootstrapping, Time Series Ana	llysis		
Time series concepts: stationarity,	1. Apply boots	strapping on a practical data set	
trend, seasonality, autocorrelation -	and assess p	performance (C3).	
Autoregressive moving average	2. Understand	and apply in-built functions in	
(ARMA) models - Resampling,	R for time s	eries modelling (C3).	
smoothing, windowing, and rolling	3. Apply time	e series modelling to practical	
average - First and second order	problems (C	23).	
differencing - Validating time series	4. Interpret the	e results of times series model	
predictions.	predictions	(C3).	
Learning strategies, contact hours and	student learning ti	me	
Learning strategy	Contact hours	Student learning	
		time (Hrs)	
Lecture	12	-	
Seminar	-	-	
Quiz	-	-	
Small Group Discussion (SGD)	-	-	
Self-directed learning (SDL)	-	-	
Problem Based Learning (PBL)	-	-	
Case Based Learning (CBL)	03	-	
Clinic	-	-	
Practical	24	-	
Revision	03	-	
Assessment	06		
TOTAL	48	-	
Assessment Methods:			
Formative:		Summative:	
Internal practical Test		Sessional examination	
Theory Assignments	End semester examination		



Lab Assignment & Vi	va		Viva					
Mapping of assessme	ent with Co	s						
Nature of assessment		CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examination	n 1	*	*					
Sessional Examination	n 2			*	*	*		
Assignment/Presentati	ion	*	*	*	*	*		
Laboratory examination	on	*	*	*	*	*		
Feedback Process	• Enc	l-Semes	ster Feed	back	_ I			
Reference Material	1. An Intr	oductio	n to Sta	tistical Le	earning with Ap	plications in R,		
	Gareth Jan	nes, Dai	niela Wi	tten, Trev	or Hastie and Ro	bert Tibshirani,		
	Springer; 1	st Editi	on, 2013	, Corr. 7th	printing 2017 E	dition.		
	2. An Intr	oductio	n to App	olied Mul	tivariate Analysi	s with R, Brian		
	Everitt and	Torster	n Hothor	n– Spring	er Publications,1	st Edition, 2011.		
	3. Machin	e Learn	ing - A P	robabilist	ic Perspective, K	evin P. Murphy,		
	The MIT P	ress; 1s	t Edition	, 2012.				
	4. Mathem	natics fo	or Machir	e Learnin	g, Marc Peter Dei	isenroth, A Aldo		
	Faisal, and Cheng Soon Ong, Cambridge University Press, 2020							
	Online res	source	from C	ambridge	University Pre	ss available at		
	https://mm	l-book.g	github.io	/book/mm	l-book.pdf			



Name	of the]	Program	m:		Maste	er of Er	gineeri	ng - ME (Health	are D	ata .	Analyti	cs)
Course Title: Big						Data in 1	Healthca	are Lab				•	
						ourse Instructor:							
			20-2021	l		ester:		ear, Seme					
	Credits					-		lab or py					
Synop	sis:	This (Course	provic	les ins	sight o	n distri	buted sy	stems	and o	com	puting	in
		healthc	care										
Course	e												
Outco	mes	On suc	cessful	compl	etion o	f this co	ourse, st	udents w	ill be at	ole to			
(COs):	:												
CO 1:		Experi	ment w	ith Hac	doop fr	amewo	rk						
CO 2:		Prepare	e distrib	outed fi	le syst	em for I	healthca	re data					
CO 3:		Design	map re	duce to	echniq	ue to co	mpute l	nealthcar	e data				
Mappi	ing of (COs to	POs										
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO.	10	PO 11	r
CO 1			*		*	*							
CO 2			*		*	*							
CO 3			*		*	*							
Course	e conte	nt and	outcom	nes:									
Conten	ıt				(Competencies							
Unit 1	•												
Big Da	ita					1. Implement hadoop framework (C3)							
Unit 2	•												
Distributed System						1. Build hadoop environment (C6)							
					2	2 Build Distributed file system for healthcare							
					d	data (C6)							
T T 1 / 2													
Unit 3	:												
Map R	educe 7	Fechniq	ue			1. I	mpleme	ent map r	educe te	echniq	ue t	0	
					compute healthcare data (C3)								



2.	Implement cluste	r set-up wi	th map reduce
	I I I I I I I I I I	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·

		technique (C3))		
Learning strategies, contact ho	urs and st	udent learning	time		
Learning strategy		Contact hours		Student learning time (Hrs)	
Lecture		12		-	
Seminar		-		-	
Quiz		-		-	
Small Group Discussion (SGD)		-		-	
Self-directed learning (SDL)		-		-	
Problem Based Learning (PBL)		-		-	
Case Based Learning (CBL)		03		-	
Clinic		-		-	
Practical		24		-	
Revision		03		-	
Assessment		06		-	
TOTAL		48		-	
Assessment Methods:					
Formative:			Summati	ive:	
Internal practical Test			Sessional	examination	
Theory Assignments			End seme	ester examination	
Lab Assignment & Viva			Viva		
Mapping of assessment with Co)S				
Nature of assessment	CO 1	CO 2	C	CO 3	
Sessional Examination 1	*	*			
Sessional Examination 2		*		*	
Assignment/Presentation	*	*		*	
Laboratory Examination	*	*		*	



Feedback Process	End-Semester Feedback			
Reference Material	4. Digital Image Processing- Gonzalez and Woods, Third edition,			
	Pearson Education, 2009			
	5. Pattern Classification, Richard O Duda, Peter E. Hart, David			
	G.Strok, Wiley-Inderscience Publication, Second edition, 2001.			
	6. Pattern recognition and Image analysis, Earl Gose, Richard,			
	Johnson Baugh and Steve Jost, Prentice Hall, 2002.			



Name of the Program:				Master of Engineering - ME (Healthcare Data Analytics)									
Course Title: Course Code:				Medical Imaging Systems Lab									
				Cours	se Instr	uctor:							
Academ	nic Yea	r: 2020)-2021		Seme	ster:	First Yea	r, Semes	ter 2				
No of C	redits:	1			Prere	quisites	: Matlat	o or pythe	on				
Synops	sis:		Course perabilit					os medio	cal imagi	ng moda	alities and		
Course Outcon (COs):		On suc	cessful	compl	etion o	f this c	ourse, si	tudents v	will be at	ble to			
CO 1:		Design	DICO	M view	ver								
CO 2:		Experi	mentin	g DICC	DM ope	en sour	ce simul	lators for	r various	functiona	alities		
CO 3:		Design	HL7 n	nessage	e for he	althcar	e data e	xchange					
Mappi	ng of (COs to	POs										
COs	PO 1	PO 2	<i>PO 3</i>	PO 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11		
CO 1	*				*								
CO 2		*			*	*							
CO 3		*			*	*							
Course	conte	nt and	outcon	nes:									
Conten					C	Compet	encies						
Unit 1:													
Medica	l Imag	ing Mo	dalities			1. Implement DICOM image read and Write							
				operations (C3)									
						2. 1	mpleme	ent DICC	OM anno	nymizati	on (C3)		
Unit 2:													
DICOM	1				1	1. Experiment with DVTK to perform ECHO (C3)							
					2	. Exp	eriment	with DV	TK to pe	erform D	ICOM		
					exchange and other simulators (C3)								



Unit 3:				
HL7	1	. Build HL7 n	nessages	to perform ADT
	0]	perations		
	2	. Build HL7 n	nessages	to build ORU/ORM
	Oj	perations		
Learning strategies, contact hour	rs and stud	ent learning ti	me	
Learning strategy	Сог	ntact hours		Student learning time
				(Hrs)
Lecture		12		-
Seminar		-		-
Quiz		-		-
Small Group Discussion (SGD)		-		-
Self-directed learning (SDL)		-	-	
Problem Based Learning (PBL)		-	-	
Case Based Learning (CBL)		03	-	
Clinic		-	-	
Practical		24	-	
Revision		03	-	
Assessment		06	-	
TOTAL		48		-
Assessment Methods:				
Formative:			Summa	tive:
Internal practical Test			Sessiona	l examination
Theory Assignments			End sem	ester examination
Lab Assignment & Viva				
Mapping of assessment with Cos			I	
Nature of assessment	CO 1	CO 2		CO 3



Sessional Examination	1	*	*				
Sessional Examination	2		*	*			
Assignment/Presentation	on	*	*	*			
Laboratory Examinatio	n	*	*	*			
Feedback Process	•	End-Sem	lester Feedback				
Reference Material	1. "Har	ndbookof Bi	omedical Instrumen	tation" by R.S.Khandpur,			
	Tata Mc	Graw Hill.					
	2. "Prir	nciples of M	edical Imaging" by	K. Kirk Shung, Michael			
	B. Smith	ith, Benjamin M.W. Tsui					
	3. "Dig	gital Imaging and Communication					
	in Medic	icine(DICOM)" by Oleg S Pianykh, Springer.					
	4. "HIN	IMSS Dictionary of Healthcare Information Technology					
	Terms, A	ns, Acronyms and Organizations", Second Edition, HIMSS,					
	ISBN 13	BN 13978-1-938904-03-5					
	5. "Te	"Telemedicine and Telehealth 2.0: A Practical Guide					
	for Medi	dical Providers and Patients" by Victor Lyuboslavsky,					
	Paperba	perback.					
	6. "The	e Biomedica	l Engineering: Hand	lbook" by BRONZINO, J			
	D. Volu	me 1, 2. Boo	ca Raton : CRC Pres	ss, 2000. ISBN 0-8493-			
	0461-X.						



Name of the Program:			Mast	Master of Engineering - ME (Healthcare Data Analytics)						
Course Title:			Entre	Entrepreneurship Lab						
Course Code	ENP-60	1L		Cour	se Instr	uctor:				
Academic Ye	ar: 2020	- 2021		Seme	ester:]	First Yea	ır, Semest	er 2		
No of Credits	: 1			Prer	equisites	5: -				
Synopsis:	This Co	ourse p	rovides	s insigh	nt on					
	This co	ourse i	introdu	ces stu	dents t	o the tl	neory of	entrepr	eneurship	and its
	practica	ıl imp	lement	ation.	It focu	uses on	differe	nt stage	s related	to the
	entrepre	eneuria	al proc	ess, inc	cluding	busines	s model	innovati	on, mone	etization
	small b	usines	s mana	gement	t as well	l as stra	tegies that	at improv	ve perform	nance of
	new bus	siness	venture	es. Cant	tered on	a mixtu	re of the	oretical e	xploratio	n as wel
	as case	studies	s of real	l-world	examp	les and g	guest lect	ures, stu	dents will	develop
	an unde	erstand	ling of	succes	sses, op	portunit	ties and	risks of	entreprei	neurship
	This co	urse ha	as an in	terdisc	iplinary	approa	ch and is	therefor	e open to	students
	from of	her Ma	ajors.							
Course										
Outcomes On successful comp			compl	etion of this course, students will be able to						
(COs):										
CO 1:	Understand the concept of entrepreneurship									
CO 2: To appraise the entrepreneurial process starting with pre-venture					ture stage	through				
CO 2.	group d	iscuss	ion							
	To Buil	ld a m	ind-set	focusi	ng on d	evelopii	ng novel	and unio	que appro	aches to
CO 3:	market opportunities by considering case studies and understand the complete									
flow of entrepreneurship										
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	PO 9	PO 10	PO 11
CO 1 *					*		*			
CO 2					*					
00.2			1		1	1	*	1	*	1
CO 3							*		Ť	

Course content and outcomes:



	be University under Section 3 of the UGC Act, 1956)
Content	Competencies
Unit 1: Introduction to Entrepreneu	rship
Meaning and Definition of	1. Discuss the theories of Entrepreneurship
Entrepreneurship-Employment vs	(C1)
Entrepreneurship, Theories of	2. Discuss the approaches to Entrepreneurship
Entrepreneurship, approach to	(C1)
entrepreneurship, Entrepreneurs VS	
Manager	
Unit 2: Process of Entrepreneurship	
Factors affecting Entrepreneurship	1. Exemplify one's capabilities in relation to
process	the rigors of successful ventures (C3)
	2. Identify and differentiates the different
	characteristics and competencies of an
	entrepreneurs (C2)
Unit 3: Business Plan writing	
Points to be considered, Model Business	1. Identify different business models (C3)
plan	Describe different parts of a business plan(C2)
Unit 4: Case studies	
Indian and International	1. Perform self-assessment and analyse
Entrepreneurship	entrepreneurial personal traits and
	competencies (C4)
	2. Evaluate oneself and plan courses of action
	to help develop one's entrepreneurial
	characteristics and competencies. (C5)
Learning strategies, contact hours and	student learning time
Learning strategy	Contact hours Student learning
	time (Hrs)
Lecture	12 -
Seminar	



	-		-	
			-	
	_	-		
	_		-	
	03		-	
	_		-	
	24		-	
	03		-	
	06		-	
	48		-	
			1	
		Summati	ve:	
		examination		
	End semester examination			
)S				
CO 1	CO 2		CO 3	
*	*			
			*	
	*		*	
*	*		*	
d-Semester I	Feedback			
/R Naidu	and T. Krisl	hna Rao,	"Management and	
			-	
08.				
00.				
	Sangram Ke	eshari, '	'Fundamentals of	
	CO 1 * d-Semester I /R Naidu trepreneursh	- 24 24 03 06 48 06 48 06 48 06 48 06 48 07 48 48 48 48 48 48 48 48 48 48 48 48 48	- - 24 03 06 48 48 48 Sessional End seme Viva Viva 05 CO 1 CO 2 * * * * * * * * * A * * * * * * * * * * * * * * * * * A-Semester Feedback ////////////////////////////////////	



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



-				Master of Engineering - ME (Healthcare Data Analytics)							
Course	e Title	,					cs in He	ealthcare	Lab		
		: HDA-	606 L				ructor:		Luo		
		ear: 202		1		ester:		ear, Sem	ester 1		
No of										nd data a	nalytics
Synop	sis:	This C	ourse p	rovides	s insigh	_					
		٠	Experi	ment w	vith NL	TK Lib	rary.				
		•	Text e	xtractio	on and a	analysis	techniq	ues.			
		•	Corpo	ra of sp	ecific d	lomain.					
		٠	Worki	ng and	usage o	of OCR					
Course Outcor (COs):	Itcomes On successful completion of this course, students will be able to										
CO 1:		1	ment L Librar		Analyse	er, toker	ization,	POS, tex	kt chunke	er, and NH	ER using
CO 2:		Genera	te corp	ora of a	a specif	ic dom	ain.				
CO 3:		Practic	e Optic	al Cha	racter R	Recogni	zer.				
Mappi	ing of (COs to]	POs								
COs	<i>PO</i> 1	<i>PO</i> 2	<i>PO3</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 content and outcomes:											
Content Competencies											
Unit 1	:										
Basics of Python : Data types, assigning and deleting values, String handling, IO1. Practice basic operations of Python (C4)											



handling, Python list, tuple and dictionary example Unit 2: Introduction NLTK, 1. Discover NLTK library (C3) to Lexical Analysis: tokenization, Stop word 2. Experiment Lexical Analyser and removal, Stemming, n-grams. tokenization (C4) Unit 3: Exploring Document 1. Generate corpora of a specific domain corpora, Classification (C5) Unit 4: Part-of-speech (POS) taggers: HMM 1. Experiment POS, text chunker, and NER. and CRF; Tree model and Text chunker (C4) for capturing; Named-entity recognition (NER). Unit 5: Optical Character Recognizer Exercises 1. Practice Optical Character Recognizer. (C3) Learning strategies, contact hours and student learning time Contact hours *Learning strategy* 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

TOTAL

06

48

-



Assessment Methods							
Formative:					Summa	tive:	
Continuous practical	Test				Sessiona	l examination	
					End sem	ester examination	
Lab Assignment & V	iva				Viva		
Mapping of assessm	ent with Co	s			I		
Nature of assessment		CO 1		CO 2		CO 3	
Sessional Examinatio	n 1	\$	k	ł	:		
Assignment/Presentat	tion					*	
Laboratory Examinat	ion	*	k	×	<	*	
Feedback Process	• Enc	l-Semeste	er Feedba	ick			
Reference Material	[1] Text m	ining har	ndbook: a	dvanced	approach	es	
	in analyzin	g unstruc	tured dat	a Feldm	an, Roner	and James Sanger,	
	978052183	6579, CU	JP, 2008				
	[2] Linked	Lexical	Knowled	ge Bases	s Iryna Gurevych, Judith Eckle-		
	Kohler, Mi	chael Ma	tuschek,	97816270	7059749, Morgan & Claypool,		
	2016						
	[3] Introdu	iction to i	ion to information retrieval Manning, Christopher D.				
	and Prabha	kar Ragh	avan and	Hinrich	Schutze,	9780521865715,	
	Cambridge	Universi	ity Press,	2008			
	[4] Text m	nining: cla	assificatio	on, cluste	ring and		
	application	s Srivast	tava, Ash	ok and N	Iehran Sal	hami (eds.).,	
	978142005	9403, Ch	apman 8	z Hall,20	09		
	[5] Weiss,	[5] Weiss, S. M., Indurkhya, N.,			, Zhang, T. (2010). Fundamentals of		
	Predictive	Text					
	[6] Mining	g. Springer: New York. ISBN: 978-1849962254					
	[7] Pustejo	ovsky, J. a	and Stub	os, A. (20)12). Natu	ral Language	
	Annotation	for Mac	hine				
	[8] Learni	ng. O'Rei	lly.				



[]	[9] Foundations and Trends in Information Retrieval, 2(1-2): 1–135.
A	Available online at:
h	http://www.cs.cornell.edu/home/llee/opinion-mining-sentiment-
a	analysis-survey.html.
]	[10] Manning, C. D., Raghavan, P., and Schutze, H. (2008).
I	Introduction to Information Retrieval, Chapters 6 and 13-18,
C	Cambridge University Press. Available online at:
h	http://nlp.stanford.edu/IR-book/
]	[11] Articles: https://www.healthcatalyst.com



Name of the Program:					Mast	ter of	Engine	ering -	ME (Healthca	re Data		
					Anal	Analytics)							
Course Title:					Bloc	Blockchain Technology Lab							
Course Code: HDA-607L						rse Insti	uctor:						
Acade	mic Y	ear: 20	20 - 20	21	Sem	ester:	First Y	ear, Sem	ester 1				
No of Credits: 3						equisite	s: Bas	ic Netwo	rk Conc	epts			
Synop	sis:	This C	Course	provide	es insig	ght on u	ndersta	anding th	e worki	ng of blo	ockchain		
		techno	logy ar	nd how	block	chain pl	atform	works. 7	The cour	rse discus	s on the		
		nuance	es invo	lved in	block	chain te	chnolo	gy and i	ts imple	mentatio	n on the		
		blockc	hain pl	atform.									
CourseOutcomesOn successful completion of this course, students will be able to													
(COs)	:												
CO	1:	Develo	op the b	lockch	ain eco	osystem	using E	Ethereum.					
CO	2:	Evalua	te the a	applicat	ion ba	ion based on Ethereum.							
CO	3:	Exami	ne the o	develop	ment p	ment process using Hyperledger.							
CO	4:	Demor	nstrate	the bloc	kchain application development process.								
Mappi	ing of	COs to	POs										
COs	<i>PO 1</i>	<i>PO</i> 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11		
CO 1	*		*		*								
CO 2	*	*	*		*								
CO 3	*	*			*								
CO 4	*	*			*								
Cours	e cont	ent and	outcor	nes:									
Conter	ıt 🗌				(Compete	ncies						
Unit 1	:												
	Introduction to Blockchain - Potential of Blockchain – Defining Blockchain –					At the en	nd of th	e topic st	udent sh	nould be a	ible to:		



$SPI_{RED} BY V$ (Deemed t	o be University under Section 3 of the UGC Act, 1956)
Ownership – Understanding Ledger –	1. To identify the required programming
Ledger Structure – Concepts of	environment and operating systems.
Ownership – Centralized vs	2. To write simple examples and constructs of the
Decentralized - Components of a	chosen programming languages
Blockchain -Characteristics of	(python/solidity)
Blockchain - The growth of	
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.
Contracts : Understand Ethereum	2. To illustrate and build blockchain examples
,Define Smart Contracts,Identify	with Ethereum platform.
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	
	1



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:	1



^{(Deemed to}	o be University under Section 3 of the UGC Act, 1956)
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	36	72
Seminar	-	-
Quiz	-	-
Small Group Discussion (SGD)	-	-
Self-directed learning (SDL)	-	-
Problem Based Learning (PBL)	-	-
Case Based Learning (CBL)	-	-
Clinic	-	-
Practical	36	72
Revision	-	-



Assessment						6		-
TOTAL					78			144
Assessment Method	s:							
Formative:						Summat		
Internal practical Tes	st					Sessional	l exami	nation
Theory Assignments						End seme	ester ex	amination
Lab Assignment & V	'iva					Viva		
Mapping of assessm	ent v	with Co	0S			1		
Nature of assessment	-		CO 1	CO 2	СО	3	CO 4	
				02		5		
Sessional Examination	on 1		*	*		*		
Sessional Examination	on 2					*		*
Assignment/Presenta	tion		*	*		*		*
End Semester Exami	natio	n	*	*	*			*
Laboratory examinat	ion		*	*	*			*
Feedback Process	End	l-Seme	ster Fee	dback				
Reference	1.	Blocke	chain l	Basics: A	No	n-Technic	al Int	roduction in 25
Material		Steps,	Daniel	Drescher,	Apre	ss; 1 st Edit	tion, 20)17.
	2.	Begini	ning B	lockchair	n: A	Beginner	r's Gu	ide to Building
		Blocke	chain So	olutions, 1	Bikrai	maditya Si	nghal, (Gautam Dhameja ,
		Priyans	su Sekh	ar Panda,	Apres	ss; 1st ed. 1	Edition	, 2018.
	3.	Maste	ring Blo	ockchain,	Imra	n Bashir, I	ngram	short title, Second
Edition, 2018.								
4. Hands-On Bl			Blockchain with Hyperledger, Petr Novotny					
Venkatraman R				atraman Ramakrishna Nitin Gaur Anthony O'Dowd Luc				
		Desrosiers, Ingram short title, 2018.						
	5.	Solidity Programming Essentials, Ritesh Modi, Ingram short						
		title, 2018						
	6.	Block	Chain f	from Con	icept	to Execut	tion, D	Debajani Mohanty,
		BPB; 2	2nd revi	sed and u	pdated	d edition, 2	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.



Name of the Program:						Master of Engineering - ME (Healthcare Data Analytics)						
					Responsive Web Application Development Lab							
Course Code: IOT 605L				-	rse Ins							
Acade	emic Y	ear: 20	20 - 20)21	Sem	ester:	Firs	t Year, S	Semester	2		
No of	Credi	ts: 1			Prer	equisit	es:	Basic I	Programn	ning		
Synop	osis:	This Co	ourse p	orovide	s insigl	nt on						
		•	The fr	ont-end	d sectio	n inclu	des w	orking	with HTN	ML, CSS3 ar	ıd	
			Bootst	trap to	design	interact	ive a	nd respo	onsive we	b pages whe	ereas the	
			back-e	end sec	tion co	nsists o	f prog	grammi	ng in PHI	P with MyS(QL,	
			XML,	and JS	SON.							
		•	Devel	op a pl	atform	friendly	y web	applica	ation or a	website usir	g	
			Bootst	trap, A	ngular .	JS, Rea	ct JS	, and No	ode JS.			
Cours	e											
Outco	mes	On suc	cessful	comp	letion o	of this co	ourse	, studen	ts will be	able to		
(COs)	:											
CO 1:		Develo	p A D	ynamic	Webpa	age By	The I	Use Of J	lava Scrij	pt.		
CO 2: Write A Well Formed / Valid XML						Doc	cument.					
CO 3:		Connect Operation		Applio	cation t	ation to A DBMS To Perform Insert, Update and Delete						
CO 4:		Conver	t the S	tring A	nd Par	d Parse Using JSON Objects.						
CO 5:		Use Bo	otstrap	, Angi	ılar JS,	React J	S, N	ode JS 7	Fo Constr	ruct Modern	Website	
COs	<i>PO 1</i>	PO 2	<i>PO 3</i>	<i>PO</i> 4	<i>PO</i> 5	PO 6	PO 2	7 PO 8	PO 9	PO 10	PO 11	
CO 1	*											
CO 2	*			*								
CO 3	*		*		*							
CO 4	*			*								
CO 5 * * * *												
Conte	nt											
Unit 1	:											



Introduction to Internet and We	b Find out the problem to	o provide the solution using				
Technology	• · ·					
	web development (C3).					
Unit 2:						
HTML	Develop a web page us	ing semantic tags (C4).				
	Create a web page usin	g form, add validation				
	using patterns(C4).					
Unit 3:						
CSS3	Develop different types Develop responsive we	s of layout using css (C4) b page (C4)				
	Develop web page usin	g drop down menu(C4)				
Unit 4:						
JavaScript	Validate form using Ja	vaScript pattern matching,				
	develop an application	develop an application using Ajax. (C3)				
Unit 5:						
XML vs JSON vs YAML	Create xml, YAML JSC (C3)	Create xml, YAML JSOM document able to parse. (C3)				
Unit 6:	1					
Database connection		Analyse and solve various database task using PHP Parse the sting using json (C5)				
Unit 7:						
BOOTSTRAP, ANGULAR J	S, Develop web page usin	g the framework (C5)				
REACT JS, NODEJS						
Learning strategy	Contact hours	Student learning time				
Learning strategy	Connect nours	(Hrs)				
Lecture	12	-				
Seminar	-	-				
Quiz	-	-				
Small Group Discussion (SGD)	-	-				
Self-directed learning (SDL)	-	-				
Problem Based Learning (PBL)	-	-				
Case Based Learning (CBL)	03	-				
Clinic	-	-				



Practical	2	24		-				
Revision			С	13		-		
Assessment			С	6		-		
TOTAL			4	8		-		
Formative:				Sumr	native:			
Internal practical Te	st			Sessio	onal examin	ation		
Theory Assignments	5			End s	emester exa	mination		
Lab Assignment & Viva				Viva				
				Sumr	native:			
Nature of assessmen	t	CO 1	CO 2	CO 3	CO 4	CO 5		
Sessional Examinati	on 1	*	*					
Sessional Examinati	on 2			*	*	*		
Assignment/Presenta	ation		*	*				
Laboratory Examina	tion	*	*	*		*		
Feedback Process	• Ei	nd-Semest	er Feedback					
Reference	1. Thon	nas A Por	well Fritz S	chneider "	JavaScript:	The Complete		
Material			w-Hill Osbo					
					,			
	2014.	,	rishna, "Introduction to web development using HTML5",					
	nan, "JavaSo	cript bible"	, Wiley, Se	eventh Edition,				
	5	,	I		,			
	Mardan, "	, " Practical Node.js: Building Real-World Scalable						
Web Apps", Apress Publications, 2014.								
	5. Krasin	nir Tsonev	, "Node.js b	y Example''	, Packt Pub	lications, 2015.		
	6. Luk	e Welling	g, Laura T	`homson, '	PHP and	MySQL Web		
Development (Developer's Library)", Addison Wesley Publicat						y Publications,		
	2008.							



7. Ben Laurie, Peter Laurie, "Apache: The Definitive Guide", 3rd
Edition, O'Reilly Media,2009.
8. Brian Totty, David Gourley, Marjorie Sayer, Anshu Aggarwal,
Sailu Reddy, "HTTP: The Definitive Guide", O'Reilly Media, 2009.



_	aster of Engineering - ME (Healthcare Data								
	Analytics)								
	Project Management Lab								
	ourse Instructor:								
	mester: First Year, Semester 2								
	erequisites: Familiarity in developing application ing any high level language								
Synopsis: This Course provides insi	This Course provides insight on								
1. The concept of sof	ftware development process and project management								
2. Illustrates the diffe	erence between a lab assignment and group project								
	nts to understand the finer points of Project								
	in the interview of the								
management									
	about the processes, tools and techniques involved in								
the field of IT project	management.								
Course									
Outcomes On successful completion	of this course, students will be able to								
(COs):									
CO 1: Practice the project develo	evelopment through project planning.								
CO 2: Understand the finer poin	oints of Project management.								
CO 3: Bring awareness about the of IT project management	t the processes, tools and techniques involved in the field nent.								
Mapping of COs to POs									
COs PO 1 PO 2 PO 3 PO 4 PO 3	5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11								
CO 1 * *									
CO 2 *	*								
CO 3 * *									
Course content and outcomes:									
Content	Competencies								
Unit 1: Software Project Planning									



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



ARED BY COLORED to be	e University under Section 3 of the UGC Act, 1956)
with Existing Projects, Diagnosing	2. Review of various artefacts generated by
Design and Programming Problems	project and revise the project management
	methodology to the team (C5)
Unit 7: Software Testing	
Test Plans and Test Cases, Test	1. Inter team testing set up based on
Execution, Defect Tracking and Triage,	requirement document(C5)
Test Environment and Performance	
Testing, Smoke Tests, Test	
Automation, Postmortem Reports,	
Using Software Testing Effectively,	
Diagnosing Software Testing Problems	
Unit 8: Understanding Change	
Why Change Fails, How to Make	1. Illustrate the necessity of Change
Change Succeed	management system – SVN hands on (C3).
	management system 5 viv nanes on (C3).
Unit 9: Management and Leader	•
Take Responsibility, Do Everything Out	1. Discussion on the topic with the help of
in the Open, Manage the Organization,	case study (C3)
Manage Your Team	
Unit 10: Managing an Outsourc	ced Project
Prevent Major Sources of Project	
Failure, Management Issues in	2. Discussion on the topic with the help of
Outsourced Projects, Collaborate with	case study (C3)
the Vendor	
Unit 11: Process Improvement	
Life Without a Software Process,	1. Post-mortem report generation of
Software Process Improvement,	respective project by each team – review of the
Moving Forward	report and suggest areas of improvement (C4)
Learning strategies, contact hours and	student learning time



PIRED BY LIFE	(Deemed to be University under Section 3 of the UGC Act, 1956)	
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Learning strategy		Contact hours	Student learning		
			time (Hrs)		
Lecture		12	12		
Seminar		-		-	
Quiz		-		-	
Small Group Discussion (S	GD)	-		-	
Self-directed learning (SDI	L)	-		-	
Problem Based Learning (F	PBL)	-		-	
Case Based Learning (CBL	.)	03		-	
Clinic		-		-	
Practical		24		-	
Revision		03		-	
Assessment		06		-	
TOTAL		48	•		
Assessment Methods:					
Formative:			Summat	ive:	
Internal practical Test			Sessional examination		
Theory Assignments			ester examination		
Lab Assignment & Viva					
Mapping of assessment w	ith Cos				
Nature of assessment	CO 1	CO 2	(CO 3	
Sessional Examination 1	*	*			
Sessional Examination 2				*	
Assignment/Presentation	*				
Laboratory Examination	*	*		*	
Feedback Process	End-Semest	ter Feedback			
		plied Software Pr v Stellman (O'Rei	-	agement" By Jennifer tions) 2005.	



2. "The Art of Project Management" By Scott Berkun (O'Reilly
Publications) 2005.



Name	of the	Program: Master of Engineering - ME (Healthcare Data												
					Anal	Analytics)								
Cours	e Title:	:			Mini	Mini Project - 2								
Cours	e Code	: HDA	696		Cour	rse Inst	ructor							
Acade	mic Ye	ear: 202	20 - 202	21	Sem	ester:	First Y	ear, Seme	ster 2					
No of	Credit	s: 4			Prer	equisite	es:	Any prog	grammi	ng langu	age and			
					circu	it basic	S							
Synop	sis:	Studen	ts are e	expecte	d to se	lect a p	roblem	in the area	a of the	eir interest	t and the			
		area of	their s	pecializ	zation t	hat wou	ıld requ	ire an imp	lementa	ation in ha	rdware /			
		softwa	re or bo	oth in a	semest	ter								
Course	e													
Outco		On suc	cessful	compl	etion of	f this co	ourse, st	udents wil	ll be ab	le to				
(COs):	•													
CO	1:		5			1 0	work a	nd provide	e an ade	equate bac	kground			
					ture sur									
CO	2:					ct into sub blocks with sufficient details to allow the work								
						n independent researcher								
CO	3:	_			oftware	oftware design, algorithms, flowchart, methodology, and								
			liagram											
<u>CO</u>			te the r		•	1 /								
CO				e work	carried	1 out								
марр	ing of (COs to 1	PUs											
COs	<i>PO 1</i>	PO 2	<i>PO 3</i>	PO 4	PO 5	PO 6	<i>PO</i> 7	PO 8	PO 9	PO 10	PO 11			
CO 1	101	102	105	*				100	107	1010				
CO 2					*			*						
CO 3							*			*				
CO 4														
CO5:														
Cours	e conte	ent and	outcon	nes:	1	1	1		L	1	1			
Conter	ıt					Compet	encies							
Phase	1													



 at the end of the topic student should be Identify the problem/specification (C Discuss the project (C2) Prepare the outline (C3) 				
Discuss the project (C2)Prepare the outline (C3)	1)			
. Prepare the outline (C3)				
. Describe the status of the project (C2)			
. Prepare a mid-term project presentat	ion report			
(C3)				
. Prepare and present mid-term	project			
presentation slides (C3, C5)				
. Develop project implementat	ion in			
hardware/software or both in chosen	platform			
(C5)				
. Prepare the progress report (C3)				
. Prepare the final project presentati	on report			
(C3)				
. Prepare and present final project presentation				
slides (C3, C5)				
. Modify and Develop implement	tation in			
hardware/software or both in chosen	platform			
(C3, C5)				
5. Justify the methods used and obtained results				
(C6)				
udent learning time				
Contact hours Student	learning			
time (Hrs)				
	-			
	-			
	-			
48	-			
	-			
	-			
	(C3) Prepare and present mid-term presentation slides (C3, C5) Develop project implementate hardware/software or both in chosen (C5) Prepare the progress report (C3) Prepare the final project presentatie (C3) Prepare and present final project presentatie (C3) Prepare and present final project presentatie (C3) Modify and Develop implement hardware/software or both in chosen (C3, C5) Justify the methods used and obtain (C6) udent learning time Contact hours Student time (Hrs) - -			



Case Based Learning (CBL)			-		-		
Clinic			-		-		
Practical			-		-		
Revision			-		-		
Assessment			03		-		
TOTAL			51		09		
Assessment Methods:							
Formative:				Summative:			
Project Problem Selection				Mid-Term Presentation			
Synopsys review				Second status review			
First status review				Demo & Final Presentation			
Mapping of assessment wit	h Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5		
Mid Presentation	*	*					
Presentation	*	*	*	*			
Feedback Process End-Semester Feedback							
Reference Material Partic	ular to the ch	nosen pro	ject				



Name of the Program:						er of	Engineeri	ng -	ME (Healthcar	e Data			
							Analytics)							
	e Title:					Seminar - 2								
		: HDA				se Inst		~						
		ear: 202	20 - 202	21			First Year	-		11				
No of			a a 1 a a 4	.		equisite			ion Skil					
Synop	SIS:	1. To select, search and learn technical literature.												
		2. To	Identif	y a cur	rent and	i releva	nt research	topic.						
		3. To	prepare	e a topi	c and d	eliver a	presentati	on.						
		4. To	develo	p the sl	cill to w	vrite a te	echnical re	port.						
		5. De	velop a	bility to	o work	in grou	ps to revie	w and 1	nodify t	technical	content.			
Cours	e													
Outco	mes	On suc	cessful	compl	etion of	f this co	urse, stude	ents wil	l be abl	e to				
(COs)	:													
CO 1		Show of	compet	ence in	identif	ying rel	evant infor	mation	, defini	ng and ex	plaining			
CO 1:		topics	under d	iscussi	on.									
		Show of	compet	ence in	workin	g with a	a methodo	logy, st	ructurin	g their or	al work,			
CO 2:		and sy	nthesizi	ing info	ormatio	n.								
		Use an	propria	te regi	sters ar	nd voca	bulary, and	d will d	lemonst	rate com	mand of			
CO 3:		-		-			and pacing							
					-		lose attent		what of	hers say	and can			
CO 4:					-	paid c	lose attent		what of	incis say				
		respon			•									
					-	-	ent inforn							
CO 5:		structu	red, and	d logica	al seque	ence, res	spond resp	ectfully	to opp	osing idea	as, show			
		depth	of kno	owledge	e of c	omplex	subjects,	and	develop	their at	oility to			
		synthe	size, ev	aluate	and refl	ect on i	nformation	n.						
Mappi	ing of (COs to 1	POs											
	-													
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	*							*	*		*			
0.04														



CO5:	*					* *			*		*	
Learning strategies, contact hours and student lear								ime	1		I	
Learning strategy						Contae	ct hours		St	Student learning		
									ti	ne (Hrs)		
Lecture	e						-			-		
Semina	ar						-			-		
Quiz							-			-		
Small (Group I	Discussi	ion (SC	iD)			14			-		
Self-di	rected 1	earning	(SDL)				-			-		
Problem	m Base	d Learn	ing (PE	BL)			-			-		
Case B	ased Lo	earning	(CBL)				-			-		
Clinic							-			-		
Practic	al						-		-			
Revisio	on					-				-		
Assess	ment					-				-		
ТОТА	L					14				-		
-												
Assess	ment N	lethods	5:									
Forma	tive:							Summative:				
Semina	ar Topio	e Select	ion									
Synops	sys revi	ew										
PPT Re	eview											
-												
Mappi	ng of a	ssessm	ent wit	h Cos								
Nature	of asse	ssment		(CO 1	CO 2	CO 3	CO 4		CO 5		
Present	tation			>	k	*	*	*		*		
Feedba	Feedback Process End-Semester Feedback											
Refere	eference Material Particular to the chosen Seminar											



Course Cod Academic Y			21			ructor: Second	Year, Se	mester	3, 4			
No of Credit				Prer	equisite nical ski	es: S			inication	Skills,		
Synopsis:	•	The p	roject v	work ai	ms to c	hallenge	analytic	al, creat	tive abilit	y and to		
		the co	re disci	pline.		, apply th	-		-			
	•					dence, d successfu			-			
Course												
Outcomes	On suc	ccessful	compl	etion of	f this co	ourse, stud	dents wi	ll be abl	e to			
(COs):												
CO 1:		acquair nt Indus		th work	ing env	ironment	and pro	cesses t	hat in pla	ce at the		
CO 2:	To fan	niliarize	e the ch	allenge	s as rele	evant pro	fessiona	ls.				
CO 3:	Review	w the lit	terature	and de	evelop s	olutions f	for real t	ime ont	oard pro	jects.		
CO 4:	Write	technic	al repor	rt and d	eliver p	resentatio	on.					
CO 5:	Apply	engine	ering a	nd man	agemen	t principl	es to acl	nieve pr	oject goa	1.		
Mapping of	COs to	POs										
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 *	*	*	*									
1					*	*	*	*	*	*		
CO5:		Course content and outcomes:										
	ent and	outcon	nes:									



$\mathcal{D}_{RED BY}$ (Deemed to b	e University under Section 3 of the UGC Act, 1956)						
Problem identification, synopsis	At the end of the topic student sl	hould be able to:					
submission, status submission, mid	1. Identify the problem/specific	cation (C1)					
evaluation.	2. Discuss the project (C2)						
	3. Prepare the outline (C3)						
	4. Prepare a mid-term project j	presentation report					
	(C3)						
	5. Prepare and present r	nid-term project					
	presentation slides (C3, C5)						
	6. Develop project imp	lementation in					
	hardware/software or both i	n chosen platform					
	(C5)						
Phase 2							
Status submission, final evaluation.	1. Prepare the progress report (C3)					
	2. Prepare the final project p	presentation report					
	(C3)						
	3. Prepare and present final project presentation						
	slides (C3, C5)						
	4. Modify and Develop implementation in						
	hardware/software or both i	n chosen platform					
	(C3, C5)						
	5. Justify the methods used an	d obtained results					
	(C6)						
Learning strategies, contact hours and	student learning time						
Learning strategy	Contact hours S	tudent learning					
	ti	ime (Hrs)					
Lecture	-	-					
Seminar	-	-					
Quiz	-	-					
Small Group Discussion (SGD)	14	-					
Self-directed learning (SDL)	-	-					
Problem Based Learning (PBL)	-	-					
Case Based Learning (CBL)	-	-					
۰							



Clinic				-		-					
Practical				-	-						
Revision				-	-						
Assessment				-	-						
TOTAL				14	-						
Assessment Methods	5:										
Formative:					Summativ	Presentation us review					
Project Problem Selec				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	1-Semes	ster Feedl	back		I					
Reference Material	al Particular to the chosen project										



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



SI No	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11
51.110	Course Coue		Cicuits	101	102	105	104	105	100	107	1 00	107	1010	
1	BDA 601	Fundamentals of Machine Learning	3	*	*	*	*							
2	MCL 601	Applied Probability and Statistics	3	*	*	*	*		*		*		*	
3	HDA 601	Healthcare Data Management	3	*	*	*	*	*	*	*				
4	HDA 602	Digital Image Processing	3	*	*	*								
5	BDA-610	Principles of Data Visualization	3	*	*	*	*	*	*		*			
6	HDA-605	Data Structures and Data Interpretation with Python (For electrical stream students)	3	*	*	*	*	*						
7	BDA 601L	Fundamentals of Machine Learning Lab	1	*	*	*	*							
8	MCL 601L	Applied Probability and Statistics Lab	1	*	*	*	*	*	*		*		*	
9	HAD 601L	Healthcare Data Management Lab	1			*		*	*	*				
10	HDA 602L	Digital Image Processing Lab	1		*	*		*						
11	BDA-610L	Principles of Data Visualization	1	*	*	*	*	*	*		*	*	*	
12	HDA-605L	Data Structures and Data Interpretation with Python (For electrical stream students)	1		*	*	*	*						
13	HDA 695	Mini Project - 1	4				*	*	*	*	*	*	*	*
14	HDA 697	Seminar - 1	1	*							*	*		*
15	BDA 605	Machine Learning for Big Data	3	*	*	*	*							
16	MCL 602	Advanced Applications of Probability and Statistics	3	*	*	*	*	*	*		*			



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17	HDA 603	Big Data in Healthcare	3	*	*	*	*							
18	HDA 604	Medical Imaging Systems	3	*	*	*	*							
19	ENP-601	Entrepreneurship	3	*		*	*		*		*		*	
20	HDA-606	Text Analytics in Healthcare	3	*	*	*		*						
21	HDA-607	Block chain Technology	3	*	*	*	*	*						
22	IOT-605	Responsive Web Application Development	3	*	*	*	*	*						
23	CSE-631	IT Project Management	3	*	*	*								
24	BDA 605L	Machine Learning for Big Data Lab	1	*	*	*	*							
25	MCL 602L	Advanced Applications of Probability and Statistics Lab	1	*	*	*	*	*	*		*			
26	HDA 603L	Big Data in Healthcare Lab	1			*		*	*					
27	HDA 604L	Medical Imaging Systems Lab	1	*	*			*	*					
28	ENP-601L	Entrepreneurship Lab	1	*					*		*		*	
29	HDA-606L	Text Analytics in Healthcare Lab	1		*	*	*	*						
30	HDA-607L	Block chain Technology Lab	1	*	*	*		*						
31	IOT-605L	Responsive Web Application Development Lab	1	*		*	*	*						
32	CSE-631L	IT Project Management Lab	1			*	*	*				*		
33	HDA 696	Mini Project - 2	4			*	*	*				*		
34	HAD 698	Seminar 2	1	*							*	*		*
35	HDA 799	Project Work	25	*	*	*	*	*	*	*	*	*	*	*

