ACADEMIC CURRICULA

POSTGRADUATE DEGREE PROGRAMMES

Master of Science in Biostatistics and Epidemiology

M.Sc. (Biostatistics and Epidemiology)

Two Years (Full-Time)

Learning Outcome Based Education

Choice Based Flexible Credit System

Academic Year

2021 - 2022

FACULTY OF MEDICINE AND HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)
Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

M.Sc Biostatistics and Epidemiology

1. Department Vision Statement	
Stmt - 1	***Leadership for equitable, sustainable and holistic health***

2. Department Mission Statement	
Stmt - 1	*Create thought leaders and change makers for public health*
Stmt - 2	*Design appropriate holistic and sustainable programs*
Stmt - 3	*Converge multi-disciplinary efforts to make a difference*
Stmt –4	*Be guided by the values of LEAPS (Leadership, Ethics, Accountability, Perseverance and Sensitivity)*

3. Program Education Objectives (PEO)	
PEO - 1	*Development in chosen profession and or progress towards an advance degree*
PEO - 2	*To approach a problem with appropriate scientific methods*
PEO - 3	*Analytical skills for collecting , interpreting health care information*
PEO - 4	*Evaluation of medical research / community based data and national health programs*
PEO - 5	*To build leadership skills*

4. Consistency of PEO's with Mission of the Department					
	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	
PEO - 1	H	H	H	H	
PEO - 2	H	H	H	H	
PEO - 3	H	H	H	H	
PEO - 4	H	H	H	H	
PEO - 5	H	H	H	H	

H – High Correlation, M – Medium Correlation, L – Low Correlation

5. Consistency of PEO's with Program Learning Outcomes (PLO)														
	Program Learning Outcomes (PLO)													
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
PEO - 1	H	H	H	H	H	M	H	H	M	m	M	L	H	H	M
PEO - 2	H	H	H	H	H	M	H	H	M	M	M	L	H	M	M
PEO - 3	H	H	H	H	H	M	H	H	M	M	M	L	H	M	M
PEO - 4	H	H	H	H	H	M	H	H	M	M	M	L	H	M	M
PEO - 5	H	H	H	H	H	M	H	H	M	M	M	L	H	M	M

H – High Correlation, M – Medium Correlation, L – Low Correlation

6. Programme Structure (95 Total Credits)

1. Professional Core Courses (C)
(4 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
MBE21101	Infectious and Non-Communicable Diseases Epidemiology	3	1	0	4
MBE21102	Epidemiology	3	1	0	4
MBE21103	Fundamentals of Biostatistics	3	1	0	4
MBE21106	Statistical Inference	3	1	0	4
MBE21204	Clinical Epidemiology	2	1	0	3
MBE21205	Case Control Study Design	2	1	0	3
MBE21206	Cohort Study Designs	2	1	0	3
MBE21303	Regression Analysis	3	1	0	4
MBE21304	Categorical Data and Survival Analysis	3	1	0	4
MBE21305	Applied Multivariate analysis	3	1	0	4

2. Professional Elective Courses (E)
(5 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
MBE21104	Population Science	3	1	0	4
MBE21307	Systematic Review and Meta-Analysis	1	1	0	2

3. Skill Enhancement Courses (S)
(2 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
MBE21105	Sampling Methods	2	1	0	3
MBE21202	R Programming*	1	1	0	2
MBE21203	Design of Experiments	2	2	0	4
MBE21207	Applied & Field epidemiology	2	1	0	3
MBE21208	Clinical Trials	2	1	0	3
MBE21301	Results Based Project Management	1	1	0	2
MBE21302	Public Health Informatics	1	1	0	2
MBE21306	Nonparametric Methods	1	1	0	2
MBE21308	Spatial statistics	2	1	0	3

4. Mandatory Courses (M)
(3 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
MBE21107	Computer skills (SPSS)	0	2	0	2
MBE21201	Research Methodology	3	1	0	4
MBE21309	Data Analytics using SAS	1	1	0	2

5. Project Work, Internship In Industry / Higher Technical Institutions (P)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
MBE21401	Research study (Summer internship study)	0	0	10	5
MBE21402	Internship/ Project work	0	0	30	15

7. Implementation Plan (90 Credits)

Semester - I					
Code	Course Title	Hours/ Week			C
		L	T	P	
MBE21101	*Infectious and Non-Communicable Diseases Epidemiology*	*3*	*1*	*0*	*4*
MBE21102	*Epidemiology*	*3*	*1*	*0*	*4*
MBE21103	*Fundamentals of Biostatistics*	*3*	*1*	*0*	*4*
MBE21104	*Population Science*	*3*	*1*	*0*	*4*
MBE21105	*Sampling Methods*	*2*	*1*	*0*	*3*
MBE21106	*Statistical Inference*	*3*	*1*	*0*	*4*
MBE21107	*Computer skills (SPSS)*	*0*	*2*	*0*	*2*
	Total Learning Credits				25

Semester - II					
Code	Course Title	Hours/ Week			C
		L	T	P	
MBE21201	*Research Methodology*	*3*	*1*	*0*	*4*
MBE21202	*R Programming**	*1*	*1*	*0*	*2*
MBE21203	*Design of Experiments*	*2*	*2*	*0*	*4*
MBE21204	*Clinical Epidemiology*	*2*	*1*	*0*	*3*
MBE21205	*Case Control Study Design*	*2*	*1*	*0*	*3*
MBE21206	*Cohort Study Designs*	*2*	*1*	*0*	*3*
MBE21207	*Applied & Field epidemiology*	*2*	*1*	*0*	*3*
MBE21208	*Clinical Trials*	*2*	*1*	*0*	*3*
	Total Learning Credits				25

Semester - III					
Code	Course Title	Hours/ Week			C
		L	T	P	
MBE21301	*Results Based Project Management*	*1*	*1*	*0*	*2*
MBE21302	*Public Health Informatics*	*1*	*1*	*0*	*2*
MBE21303	*Regression Analysis*	*3*	*1*	*0*	*4*
MBE21304	*Categorical Data and Survival Analysis*	*3*	*1*	*0*	*4*
MBE21305	*Applied Multivariate analysis*	*3*	*1*	*0*	*4*
MBE21306	*Nonparametric Methods*	*1*	*1*	*0*	*2*
MBE21307	*Systematic Review and Meta-Analysis*	*1*	*1*	*0*	*2*
MBE21308	*Spatial statistics*	*2*	*1*	*0*	*3*
MBE21309	*Data Analytics using SAS*	*1*	*1*	*0*	*2*
	Total Learning Credits				25

Semester - IV					
Course Code	Course Title	Hours/ Week			C
		L	T	P	
MBE21401	*Research study (Summer internship study)*	*0*	*0*	*10*	*5*
MBE21402	*Internship/ Project work*	*0*	*0*	*30*	*15*
Total Learning Credits					**20**

8. Program Articulation Matrix																
Course Code	Course Name	Programme Learning Outcomes														
		Disciplinary	Critical Thinking	Problem Solving	Analytical	Research Skills	Team Work	Scientific	Reflective Thinking	Self-Directed	Multicultural	Ethical Reasoning	Community	ICT Skills	Leadership Skills	Life Long Learning
MBE21101	*Infectious and Non-Communicable Diseases Epidemiology*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21102	*Epidemiology*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21103	*Fundamentals of Biostatistics*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21104	*Population Science*	H	L	M	H	H	L	L	M	M	H	M	H	L	M	M
MBE21105	*Sampling Methods*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21106	*Statistical Inference*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21107	*Computer skills (SPSS)*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21201	*Research Methodology*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21202	*R Programming**	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21203	*Design of Experiments*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21204	*Clinical Epidemiology*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21205	*Case Control Study Design*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21206	*Cohort Study Designs*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21207	*Applied & Field epidemiology*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21208	*Clinical Trials*	H	H	M	H	H	H	H	M	M	H	H	H	L	H	M
MBE21301	*Results Based Project Management*	H	L	M	H	H	L	L	M	M	H	M	H	L	M	M
MBE21302	*Public Health Informatics*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21303	*Regression Analysis*	H	H	H	H	H	M	H	M	H	M	L	H	H	M	M
MBE21304	*Categorical Data and Survival Analysis*	H	H	H	H	H	M	H	M	H	M	L	H	H	M	M
MBE21305	*Applied Multivariate analysis*	H	H	H	H	H	M	H	M	H	M	L	H	H	M	M
MBE21306	*Nonparametric Methods*	H	H	H	H	H	M	H	M	H	M	L	H	H	M	M
MBE21307	*Systematic Review and Meta-Analysis*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21308	*Spatial statistics*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21309	*Data Analytics using SAS*	H	H	H	H	H	L	H	M	H	M	L	H	H	M	M
MBE21401	*Research study*	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
MBE21402	*Internship/ Project work*	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
	Program Average															

H – High Correlation, M – Medium Correlation, L – Low Correlation

Course Code	MBE18101 / MBE21101	Course Name	INFECTIOUS AND NON-COMMUNICABLE DISEASES EPIDEMIOLOGY	Course Category	C	Professional Core	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcome (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CLR-1 :	Align theory and practice of Public health per the principles of Epidemiology	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
CLR-2 :	Acquire proficiency in Epidemiological measurement of Infectious and non- communicable disease																	
CLR-3 :	Design Case control, Cohort and interventional research studies																	
CLR-4 :	Gain expertise in clinical epidemiology for practice of evidence-based medicine in public health																	
CLR-5 :	Describe and design Disease surveillance methods																	
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																	
CLO-1 :	Promote Epidemiological thinking in public health practice	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-
CLO-2 :	Utilize Epidemiological enquiry for solving health care issues	3	85	75	M	H	L	M	L	-	-	-	M	L	M	H	-	-
CLO-3 :	Monitor and Evaluate national disease control programs on epidemiological indicators	3	75	70	M	H	M	H	M	-	-	-	M	L	-	H	-	-
CLO-4 :	Critique current disease control and prevention strategies for Infectious and non-communicable diseases	3	85	80	M	H	M	H	L	-	-	-	M	L	M	H	-	-
CLO-5 :	Undertake Risk factor surveillance, control and prevention programme	3	85	75	H	H	M	L	L	-	-	-	M	L	-	H	-	-

Duration (hour)		Public Health Burden of Diseases 12	Infectious Disease Epidemiology 12	Disease Control Programmes 12	Principles of non communicable disease control 12	Risk factor epidemiology of important NCD 12
S-1	SLO	Introduction to disease burden and classification of diseases	To learn Concept of infection, virulence, pathogenicity,	To enumerate Biological and epidemiological basics of Malaria, TB, STI, HIV-AIDS	To understand Epidemiology of non-communicable diseases	To learn Modifiable risk factors
S-2	SLO	To discuss Public health prioritization of diseases	To learn Concept for routes and modes of transmission	To discuss National health program need and importance	To understand Challenges of Non-communicable disease	To learn non-modifiable risk factors
S-3	SLO	To define Public health prioritization of diseases	To explain Interrupting chain of infection in epidemiological triad	To discuss National and global health programmes	To describe Iceberg phenomenon and screening of disease and quaternary prevention	Evaluation of risk factors for chronic disease

Duration (hour)		Public Health Burden of Diseases 12	Infectious Disease Epidemiology 12	Disease Control Programmes 12	Principles of non communicable disease control 12	Risk factor epidemiology of important NCD 12
S-4	SLO	Criteria for setting public health priority for disease control	Enumerate Levels of prevention	Case studies of various national programs in India	To understand Concept and application of non-communicable disease	To explain Road traffic accidents
S-9	SLO	Criteria for setting public health priority for disease prevention	Review on Disease elimination and education	To explain National vector borne disease control programme	To describe Lifestyle diseases	To understand Holistic approach to control of common risk factors
S-10	SLO	To learn Concept of epidemiological transition	To define Public health approach to control of infectious diseases	Overview on Revised national tuberculosis control programme	To discuss WHO action plan on communicable disease	To discuss Cancer control programme and blindness control programme
S-11	SLO	To learn Concept of epidemiological transition	To understand Attack rate and secondary attack rate	Review on National AIDS control programme	To discuss WHO action plan on Non-communicable disease	To define Epidemiology and prevention of injuries
S-12	SLO	To understand Morbidity	To define One health concept	To discuss National leprosy control programme	To understand Injury epidemiology and prevention	Review on infectious and non-infectious epidemiology

Learning Resources

1. Park's Textbook of Preventive and Social Medicine by K Park. 22nd Edition. Bhanot (January 1, 2011)
2. Textbook of Public Health and Community Medicine By RajVir Bhalwar. First edition, 2009. Published by AFMC & WHO.
3. Oxford Text Book of Public Health.5th Edition. Oxford university press, 2009.
4. WHO. Global status report on non communicable diseases 2010. Chapter 2,3 &4
5. Burden of Disease in India. National Commission on Macroeconomic on Health, Equitable development and health future. Chapter on Disease Burden in India estimation and Causal. Analysis. MOFW, GOI, 2005
6. Communicable disease Epidemiology and control A global perspective. Roger Weber: CABI Publisher Chapter 1-4.
7. Epidemiology, Biostatistics, Preventive Medicine, and Public Health, Katz DL, Wild D, Elmore JG, Lucan SC. Jekel's 4th Edition. Saunders: 2013 .

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember / Understand	15%	20%	10%	15%	20%	
Level 2	Apply / Analyze	20%	20%	20%	20%	20%	
Level 3	Evaluate / Create	15%	15%	20%	15%	10%	
	Total	100 %		100 %		-	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee , jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST 2. Dr. Alex Joseph, SRMIST

Course Code	MBE18102 / MBE21102	Course Name	EPIDEMIOLOGY	Course Category	C	Professional Core	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Identify key sources of data for epidemiological purposes			
CLR-2 :	Identify the principles and limitations of public health screening programs			
CLR-3 :	Describe a public health problem in terms of magnitude, person, time and place			
CLR-4 :	Explain the importance of epidemiology for informing scientific, ethical and economic discussion of health issues			
CLR-5 :	Comprehend basic ethical and legal principles pertaining to the collection, maintenance use and dissemination of epidemiologic data			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Apply the basic terminology and definitions of epidemiology	3	80	70
CLO-2 :	Calculate epidemiologic measures	3	85	75
CLO-3 :	Communicate epidemiologic information to lay and professional audiences	3	75	70
CLO-4 :	Draw appropriate inferences form epidemiologic data	3	85	80
CLO-5 :	Evaluate the strengths and limitations of epidemiologic reports.	3	85	75

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
L	H	-	H	L	-	-	-	L	L	-	H	-	-
M	H	L	M	L	-	-	-	M	L	-	H	-	-
M	H	M	H	L	-	-	-	M	L	-	H	-	-
M	H	M	H	L	-	-	-	M	L	-	H	-	-
H	H	M	H	L	-	-	-	M	L	-	H	-	-

Duration (hour)		Introduction and Principles of Epidemiology 12	Epidemiological measures and public health impact 12	Epidemiological study designs 12	Principles of Clinical Epidemiology 12	Disease surveillance and Field Epidemiology 12
S-1	SLO	Introduction to principles of epidemiology	To learn Incidence and prevalence measures	Introduction to study designs	Concepts in clinical epidemiology	Introduction to disease surveillance and field epidemiology
S-2	SLO	To discuss History of epidemiology	To understand Relationship between prevalence and incidence measures	To explain Cross sectional studies	To learn Application of clinical epidemiology	To enumerate Epidemic investigation
S-3	SLO	To elaborate Evolution of epidemiology	To understand Relative risk and odds ratio	To define Observational studies	To describe Precision, accuracy and validity of tests	To learn Steps in epidemic investigation
S-4	SLO	To understand Landmark epidemiological achievements	To explain Attributable risk and excess risk	To understand Experimental studies	To explain Precision, accuracy and validity of tests	Case study on outbreak investigation

Duration (hour)		Introduction and Principles of Epidemiology 12	Epidemiological measures and public health impact 12	Epidemiological study designs 12	Principles of Clinical Epidemiology 12	Disease surveillance and Field Epidemiology 12
S-5	SLO	To discuss Historical contribution of epidemiology in making public health evidence based practice	To understand Attributable fraction and population attributable risk	To explain Case control design	To enumerate Types of validity	Case study on outbreak investigation
S-6	SLO	To learn Implementation of evidence based practice	To define Confounding	To describe Cohort design	Elaborate Diagnostic test (sensitivity, specificity, positive and negative predictive value)	To learn Principles of disease surveillance
S-7	SLO	To explain Association	Enumerate Types of bias	To describe Prospective and retrospective cohort studies	To understand Type one and type two errors	To learn Types of surveillance
S-7	SLO	To understand Causation	Enumerate Measurement of bias	To understand Randomized control trial	Define Strategies to reduce false rates	To explain Epidemic preparedness and response
S-8	SLO	To discuss Bradford hill criteria for causal evaluation	To understand Effects of bias	To describe Ecological studies	To explain Serial testing and parallel testing	To discuss Pandemic preparedness and response
S-8	SLO	Implementation of Bradford hill criteria for causal evaluation	To understand Confounding	To explain Advantages of various study designs	To learn Concepts of screening, difference between screening and diagnosis	To define Zoonotic diseases
S-9	SLO	Evaluation of Bradford hill criteria	To understand Confounding and chance	To discuss limitations of various study designs	To understand Natural course of disease	To describe Emerging diseases
S-10	SLO	Application of epidemiological logic	Enumerate Type of errors	To learn Rationale of each study designs	Application of Natural course of disease	To describe Remerging diseases
S-11	SLO	To understand Bias	To explain Strategies to control of bias	Practical application of each study designs	To learn Data handling using EPI INFO	To understand Field assessment of health
S-12	SLO	To define Chance	To describe Public health impact	Review on study designs and its advantages	To learn Data analysis using EPI INFO	To discuss Morbidity and risk factors

Learning Resources	1. Epidemiology Leon Godris, 5th Ed. Saunders Philadelphia 2014 2. Basics of Epidemiology, Bonita & Beaglehole. 2nd Edition -WHO, 2007 3. Clinical epidemiology the essentials. -Fletcher, Robert H., Suzanne W. Fletcher, Edward H. Wagner.LWW; Fifth edition-Lippincott Williams & Wilkins, 2014	4. An Introduction to Public Health and Epidemiology -Susan Carr, Nigel Unwin, Tanja Pless-Mulloli, Second Edition. -Open University Press, 2007 5. Epidemiology, Bio statistics & Preventive medicine -James F. Jekal, David L Katz, Joann G Elmore, Dorothea Wild, 4th edition. -W.B. Saunders company publishers, 2013

Learning Assessment						
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)
		CLA – 1 (25%)		CLA – 2 (25%)		
		Theory	Practice	Theory	Practice	Theory
Level 1	Remember	20%	15%	15%	15%	15%
	Understand					
Level 2	Apply	20%	20%	20%	20%	20%
	Analyze					
Level 3	Evaluate	10%	15%	15%	15%	15%
	Create					
	Total	100 %		100 %		-

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee, jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST
		2. Dr. Alex Joseph, SRMIST

Course Code	MBE 18103 / MBE21103	Course Name	FUNDAMENTALS OF BIOSTATISTICS	Course Category	C	*Professional Core*	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understand the importance of Biostatistics in health care research*			
CLR-2 :	*Learn basic concepts of Descriptive analysis such as central tendency, dispersion*			
CLR-3 :	*Learn different inferential analysis techniques*			
CLR-4 :	*Presenting the data in the form of graphs, charts and tables*			
CLR-5 :	*Use statistical packages for data analysis*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Compute measures of central tendency (Mean, Median, and Mode) and variability (Variance, Standard Deviation).*	*3*	*95*	*75*
CLO-2 :	*Calculate and interpret confidence intervals and P – value for population means and proportions*	*3*	*90*	*80*
CLO-3 :	*Perform and interpret one-sample, two-sample, and paired t tests on means*	*3*	*90*	*75*
CLO-4 :	*Presenting the graphs, charts and tables to communicate the results of statistical analyses for decision making purpose.*	*2*	*90*	*85*
CLO-5 :	*Perform, present, and interpret basic statistical analyses using SPSS*	*2*	*90*	*80*

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
H	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*L*
H	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*L*
H	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*L*
H	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*L*

Duration (hour)		**Fundamentals of Biostatistics (12)**	**Probability and Sampling (12)**	**Statistical Inference I (12)**	**Statistical Inference II (12)**	**Correlation and Regression (12)**
S-1	SLO-1	Understand definition of statistics and its uses	Explain Probability concepts	Restate concepts of statistical inference	Illustrate Parametric tests and its assumptions	Able to classify Correlation and types
S-2	SLO-1	List types of Statistical Methods	Able to define mutually exclusive, equally likely, exhaustive, independence events	Able to restate Point and interval estimation	To analyses tests on single proportion	Prepare a Scatter plot
S-3	SLO-1	concepts of Populations and Samples and sampling procedures	Able to explain and evaluate laws of probability, problems	Construct and evaluate confidence intervals for single mean	testing on two proportions test	Able to calculate and interpret pearson correlation

Duration (hour)		Fundamentals of Biostatistics (12)	Probability and Sampling (12)	Statistical Inference I (12)	Statistical Inference II (12)	Correlation and Regression (12)
S-4	SLO-1	Explain Sources and collection of data	Describe Bayes theorem, and its applications	fitting confidence intervals for single group proportion	simple applications of sigle mean & proportion	calculate and interpret spearman rank correlation
S-5	SLO-1	Recall Types and Classification of Data, Measurement Scales	Reciprocated various Probability distributions and types	Reproduce and develop Hypothesis and its types	Able to test two mean comparison	problem solving exercises
S-6	SLO-1	List types of variables and recall Organization of Data	Explain Binominal and Poisson distribution	Define Type of errors (α, β)	Able to test two proportion comparison	test of significance of correlation
S-7	SLO-1	Prepare Frequency Distribution and dramatise Graphic Methods	Explain and evaluate Normal distribution, its properties	Distinguish and define one tail, two tail test, p value	Describe ratio of two variances	Able to test simple linear regression
S-8	SLO-1	Explain various descriptive Statistics, define, uses and its types	Evaluate central limit theorem applications	Explore and generalize statistical tables and interpretations	Able to test on attributes	fitting line and properties, assumptions
S-9	SLO-1	Estimate Measures of Central tendency, types, advantage and disadvantages	Differentiate sampling distributions	Able to understand large & sample test of significance	problem solving exercises	Restate regression coefficients and its properties
S-10	SLO-1	Estimate -Measures of Dispersion, types, advantage and disadvantages	Evalute various Standard errors	Able to construct all the steps of test of hypothesis	Understand concepts of Analysis of more than 2 groups	test of significance of regression
S-11	SLO-1	Estimate - Measures of Skewedness, Kurtosis, concepts and interpretation	Create sampling distributions of two groups mean	Explain various test of significance methods	calculate and interpret One way ANOVA	calculate and interpret other types of correlations
S-12	SLO-1	Express Measures of concepts and interpretation	Evaluate sampling distributions of two groups proportion	Define and validate power, statistical& clinical inference	calculate and interpret Two way Anova	Predict and interpret multiple linear regressions

Learning Resources	1. Biostatistics Student solutions manual: A foundation for analysis in the health sciences; Wanye W Daniel, 9th Ed, Wiley Series,2011. 2. Introduction to Biostatistics and Research Methods; PSS Sundar Rao, Richard J, PHIV Learning Ltd 2006	3. Essentials of Biostatistics in Public Health, Lisa M Sullivan 2nd Ed, 2009. 4. High yield Biostatistics, Epidemiology and Public Health, Anthony N Glaster, 4th Ed, Lippincott Williams and Wilkins, 2013.

Learning Assessment							
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mrs. Thilagavathy, Scientist B, ICMR, Bangalore	*1. Dr. Thenmozhi, Lecturer,Dept of Biostatistics, CMC, Vellore*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE18104 / MBE21104	Course Name	POPULATION SCIENCE	Course Category	PE	Professional Elective	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil

Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Learn Population Science to understand public health issues in macro frame work that consists of concepts, population composition, change measures and population theories*
CLR-2 :	*Familiarize with public health related data for demographic research and its sources*
CLR-3 :	*Understand and practice of data analysis techniques, demographic measures of fertility and mortality, methods of data standardization, construction of life tables and population projections*
CLR-4 :	*Provide knowledge on demographic transition, theories of fertility, mortality, migration and urbanization concepts and theories*
CLR-5 :	*Enhance the skill of analyzing public health issues and assessment, intervention, monitoring and evaluation as well as study the global health and development indicators in terms of its context of formation, definition, data source and interpretation*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcome (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	Leadership Skills	Life Long Learning
CLO-1 :	*Analyze the demographic composition of population as well as the causes and consequences of population change*	*3*	*85*	*80*	*H*	*H*	*M*	*M*	*M*	*L*	*M*	*H*	*H*	*L*	*M*	*L*	*M*	*L*
CLO-2 :	*Identification of appropriate data sources, the availability of data, it features including advantages and limitations*	*3*	*85*	*80*	*M*	*H*	*H*	*M*	*H*	*L*	*M*	*H*	*H*	*L*	*M*	*L*	*H*	*L*
CLO-3 :	*Analyze data quality and perform various demographic analysis with/without software*	*3*	*85*	*80*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*H*	*H*	*L*	*L*	*L*	*H*	*L*
CLO-4 :	*Project the populations with assumptions, construct and analyze the life tables and also estimate other demographic indicators*	*3*	*85*	*80*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*H*	*M*	*L*	*L*	*L*	*H*	*L*
CLO-5 :	*Identify the public health issues, problem assessment, give suggestions for intervention and consequent monitoring and evaluation as well as able to understand the relevance of global health and development indicators, its data availability, estimation and interpretation*	*3*	*85*	*80*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*H*	*M*	*L*	*M*	*M*	*H*	*M*

Duration (hour)		Introduction to Population Science and Theories	Population Data and sources	Mortality and Fertility Concepts	Demographic Transition, Aging and Development	Population Projections and Estimations
		12	12	12	12	12
S-1	SLO-1	To understand Scope of Demography	To know the types of secondary data	To understand the concept and definitions of –Fecundity - fertility	To outline the demographic transition - concepts and theory	To define and apply the population estimation - population projections
	SLO-2		To familiarize with population Census	To know the measures of fertility		
S-2	SLO-1	To know Population growth - implications of rapid population growth	Class Presentation about Census India; History, Operation and organogram, Schedules, Data series, Use and limitations of Census data	To outline the determinants for fertility	To know the demographic dividend or disaster	To construct the small area projections - micro planning
	SLO-2					
S-3	SLO-1	To Recognise Population structure	To define registration of vital events	To explain the fertility reduction strategies	Class presentation: To illustrate the demographic transition in India (i) Change in birth and death rates (2) Change in population growth (3) Change in the shape of age pyramid (4) Change in health and healthcare requirement (1/2)	To do the demonstration of population projections using various methods
	SLO-2					
S-4	SLO-1	Practical Session: To construct age pyramid (1/2)	To understand the sample surveys - Sample registration system	Class Presentation: To demonstrate (1) Determinants of fertility in India (2) Fertility reduction strategies – (3) Fertility trends – (4) Fertility disparities	To understand the concept of labor force	Practical Session: To practice the population projection (1/2)
	SLO-2					
S-5	SLO-1	Practical Session: To construct age pyramid (2/2)	To know the quality of data- (Age heaping)	To know the Mortality - measures and methods	To know the concept of urbanization	Practical Session: To practice the population projection (2/2)
	SLO-2					
S-6	SLO-1	To review the factors affecting population	To familiarize with Whipple's Index, Myers Index	To estimate Life tables (1/2)	To understand the measurements of urbanization	To understand the demographic analysis in the Planning Process
	SLO-2					
S-7	SLO-1	Class Presentation: To present the factors affecting population in India	To understand the re sampling – bootstrapping – jack-knifing - cross-validation	To estimate Life tables (2/2)	Class Presentation: To illustrate (1) Changes in labour force in India (2) Type of laborers (3) Historical trends in urbanization in India (4) Differences in migration pattern	To know the concept of development of indicators
	SLO-2					
S-8	SLO-1	To understand the components of population change	To know – the Case studies	Practical Session: To Construct life tables (1/2)	To define the migration - concepts	Class presentation: To illustrate the Sustainable Development Goals
	SLO-2					
S-9	SLO-1	To know the world population trends and forecasts	Practical session: To estimate the Whipple Index and Myer's Index (1/2)	Practical Session: To Construct life tables (2/2)	To realize the migration theories	To recognize the concepts of indices - human development index
	SLO-2					
S-10	SLO-1	Class Presentation: To demonstrate the Population change and forecast for India	Practical session: To estimate the Whipple Index and Myer's Index (2/2)	To familiarize with the mortality surveillance – strategies	To recognize the conceptual frame work on migration and health (1/2)	To understand the Child Status Index, physical quality life index
	SLO-2					
S-11	SLO-1	To understand the population theories (1/2)	To know the DHS, SRS, NFHS, RCH, NSSO (1/2)	Class presentation: To present the mortality in India, (1) Mortality transition (2) Factors of mortality reduction (3) Mortality difference (4) Mortality related data	To recognize the conceptual frame work on migration and health (2/2)	To know Global Health Gap index
	SLO-2					

Duration (hour)		Introduction to Population Science and Theories	Population Data and sources	Mortality and Fertility Concepts	Demographic Transition, Aging and Development	Population Projections and Estimations
		12	12	12	12	12
S-12	SLO-1	To understand the population theories (2/2)	Class Presentation: Students will be presenting each data from its sources, contents as well as merits and limitations	To know the standardization methods	Class Presentation: To explain (1) Migration trends in India (2) Composition and disparities in current migration (3) Migrants and health in India (4) Factors of migration (5) Migrants, employment and remittance	Class test/Internal assignment submission
	SLO-2					
	SLO-2					

Learning Resources	1. Asha A. Bhenda and Tara Kanitkar, "Principles of Population Studies", 21st edition. -Himalaya Publishing House, 2011 2. Srinivasan, K, "Demographic Techniques"-Registrar General of India (RGI), Census of India and UNFPA, 2011 3. Kathryn Dean, "Population Health Research: Linking theory and methods", Second Edition-Sage, 2003	4. Registrar General of India, "Census of India 2001and 2011", (RGI) - RGI-Online 5. Registrar General of India, Population projections for India and states-RGI, 2006 RGI 6. Mishra B. D, An Introduction to the Study of Population. -Second edition, -South Asian Publishers Pvt. Ltd, 1995

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
1. Dr. U.V. Somayajulu, Sigma Research and Consulting	*1. Prof. K S James, IIPS, Mumbai, ksjames@iips.net*	*1. Dr. Benson Thomas, Associate Professor, SRMIST*
2. Dr. Francis Zavier, Population Council, fzavier@popcouncil.org	*2. Dr. Srinivas Goli, JNU, New Delhi, srinivasgoli@mail.jnu.ac.in*	*2. Dr. Unnikrishnan Payyapalli, unnipm@gmail.com*

Course Code	MBE 18105 / MBE21105	Course Name	SAMPLING METHODS	Course Category	S	*Skill Enhancement*	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understand the importance of various sampling methods*			
CLR-2 :	*Learn basic concepts of probability and non probability techniques*			
CLR-3 :	*Learn different types of estimates in surveys*			
CLR-4 :	*Able to calculate sample size and plan sampling strtergy*			
CLR-5 :	*Able to use statistical packages for sample size estimations*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Calculate to determine population to be sampled*	*1*	*85*	*80*
CLO-2 :	*Calculate sample size and interpret Probability sampling techniques*	*2*	*90*	*80*
CLO-3 :	*Perform stratification, sample frame preparation separatly for strata*	*3*	*85*	*80*
CLO-4 :	*calculate expected values of Mean and variance for each sampling methods*	*3*	*80*	*80*
CLO-5 :	*understand and handling non response data by imputation techniques*	*3*	*80*	*80*

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*M*	*M*	*H*	*L*	*H*	*H*	*M*	*L*	*H*	*L*	*M*	*L*	*M*
H	*M*	*M*	*H*	*H*	*H*	*H*	*M*	*H*	*H*	*L*	*M*	*M*	*M*
H	*M*	*M*	*H*	*H*	*H*	*H*	*M*	*M*	*H*	*L*	*M*	*L*	*M*
H	*M*	*M*	*H*	*M*	*H*	*H*	*M*	*L*	*H*	*L*	*M*	*L*	*M*
H	*H*	*M*	*H*	*H*	*H*	*H*	*M*	*M*	*H*	*L*	*M*	*L*	*M*

Duration (hour)		Basic Concepts (9)	Simple Random sampling and Systematic Random Sampling (9)	Stratified Random Sampling (9)	Cluster Sampling (9)	Ratio and Regression Estimator (9)
S-1	SLO-1	Illustrate concepts and definitions of f sample survey	introduction of simple Random sampling	Introduction and uses S_tRS	introduction, Advantages &D is advantages	Define Ratio estimators
S-2	SLO-1	Designing and planning steps survey	Estimation of population characteristics	Describe procedures for sample selection	Differentiate single stage sampling	Discuss Bias of ratio estimators
S-3	SLO-1	Define Population, types, parameters	Understand sampling distribution of estimated parameters	Understand reasons for stratification	Explain sampling procedures	approximate variance of ratio estimators
S-4	SLO-1	Review the concepts of Sample, sample size, frame, sampling unit	Able to Calculate coefficient of variation	Constructing Sampling frame for subgroups	Estimation of population parameters	Ratio estimators in stratified sampling

Duration (hour)		Basic Concepts (9)	Simple Random sampling and Systematic Random Sampling (9)	Stratified Random Sampling (9)	Cluster Sampling (9)	Ratio and Regression Estimator (9)
S-5	SLO-1	Explain concepts of sampling measurements	Restate reliability of estimates	Restate population parameters for strata	Illustrate sampling distribution of estimates	Calculate Regression estimators
S-6	SLO-1	Restate summary statistics	sample size calculation, advantages & disadvantages of sampling	Estimating Standard Errors	Calculate Sample size	Restate Bias of ratio estimators
S-7	SLO-1	Distinguish various sampling distributions	Apprise systematic random sampling	Illustrate Equal allocation	Explain Two stage sampling	approximate variance of ratio estimators
S-8	SLO-1	characteristics of estimates of parameters	procedure, estimations of parameters	Understand Proportional allocations	Estimation of population parameters	Reproduce concepts of Ratio estimators in stratified sampling
S-8	SLO-2	Understand Probability distribution and its types	Discuss variance estimation	Restate optimum allocation	Discuss probability proportional to size	Create Estimators in stratified sampling
S-9	SLO-1	Illustrate Non probability distribution and its types	Explain repeated systematic sampling	Explain stratification after sampling	Understand Lahiri method	Handle non response data in survey
S-9	SLO-1	State reasons of sampling errors, Restate concepts of nonsampling errors	sample size calculation, advantages & disadvantages of sampling	Define Sample size, units	Illustrate cumulative total method	Discuss various Methods of imputation

Learning Resources	*1. Sampling of Populations: Methods and Applications, Paul S Levy, Stanley Lemeshow, Wiley 4th Ed.* *2. Sample Size determination in health studies: A practical manual, S.K.Lwanga, S. Lemeshow, WHO 1991*	*3. Sampling essentials: Practical guidelines for making sampling choices, Johnnie Daniel, Sage 2012.* *4. Sampling Techniques William G Cochran, John Wiley & sons, 3rd Ed, 1997* *5. Theory and analysis of sample survey designs, Daroga Singh, FS Chaudhary, John Wiley & sons,1986.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Kannan T, Scientist B, NIE, ICMR, Chennai.	*1. Dr. M. Bagavandas, HOD, Centre for statistics, SRMIST*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE 18106 / MBE21106	Course Name	STATSTICAL INFERENCE	Course Category	C	Professional Core	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*To introduce statistical methods that address statistical inference using multiple variables*
CLR-2 :	*Learn the various sampling distribution along with their assumptions*
CLR-3 :	*Understand different methods of estimation theories*
CLR-4 :	*Learn the concepts of hypothesis and test of hypothesis*
CLR-5 :	*Perform test of significance using statistical soft wares*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Recognize variables and probability functions*	*3*	*95*	*85*
CLO-2 :	*Appropriate sampling distributions to address research questions and hypotheses*	*3*	*90*	*80*
CLO-3 :	*Testing whether the assumptions of the model are met*	*3*	*90*	*80*
CLO-4 :	*Communicate results clearly and effectively*	*3*	*90*	*80*
CLO-5 :	*Use SPSS and SAS for test of significance and interpret findings*	*3*	*90*	*80*

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*M*	*M*

Duration (hour)		Random Variable and Expectation (12)	Sampling Distribution (12)	Estimation Theory (12)	Test of Hypothesis (12)	Test of Significance (12)
S-1	SLO-1	Identify Random variable, types of variables	continuous distribution functions	Define Point estimation	State the logic of hypothesis	Hypothesis testing on population proportion
S-2	SLO-1	List elementary properties of random variable	Explain t distribution	Recall properties of estimators	Diffentiate simple and composite hypotheses	Population mean, Difference between two population means
S-3	SLO-1	Memorize discrete variable cumulative distribution function	Evaluate t distribution	List method of estimations	Sketch null and alternative hypothesis	Population Variance, Ratio of two population variances means
S-4	SLO-1	Relate discrete variable cumulative density function	Explain F distribution	Restate consistency Restate unbiasedness	Classify various types of errors	Type of Errors, power of a test
S-5	SLO-1	Expected value of random variable	Evaluate F distribution	Restate Effectiveness	Restate critical region and level of significance	Sample size calculation

Duration (hour)		Random Variable and Expectation (12)	Sampling Distribution (12)	Estimation Theory (12)	Test of Hypothesis (12)	Test of Significance (12)
S-6	SLO-1	moments generating functions	Calculate chi square distribution	Restate Sufficiency, Restate Bias of estimator	Explain one tailed and two tailed test	Hypothesis test on population mean for small samples
S-7	SLO-1	Create probability generating function	Interpret chi square distribution	Learn concepts of Interval estimation	Illustrate large and small samples, List large sample tests	Difference between two population means for small samples
S-8	SLO-1	Learn concepts of Continuous variable cumulative distribution function	Describe distribution of sample mean	Construct confidence interval of mean	Steps involved in test of hypothesis	Ratio of two variances of normally distributed population and on correlation
S-9	SLO-1	Remember moments generating functions	Able to test difference between two sample mean	Construct confidence interval of two mean	Restate region of rejection with examples	Explain Paired t test, Evaluate Paired t test
S-10	SLO-1	Create moments characterizing function	Able to test difference between two sample mean	Construct confidence interval of single proportion	Define power of test	Execute Tests on Independence
S-11	SLO-1	Evaluate probability generating function	Calculate and interpret sample proportion	Calculate confidence interval of two proportions test	Demonstrate various tables with degrees of freedom and error values	Reproduce Test of Homogeneity
S-12	SLO-1	Problem solving exercise	Evaluate difference between two sample proportion	Determination of sample size for estimating means, Proportion	Problem solving exercise	Evaluate Homogeneity of variances

Learning Resources		
	1. *Biostatistics: A foundation for analysis in the health sciences by Wayne W Daniel, Chad L Cross, Wiley Series, 10th Ed, 2011.* 2. *Biostatistical Analysis by Jerrald H Zar, Pearson Education, 5th Ed, 2009.*	3. *Introduction to Biostatistics and Research Methods by PSS Sudar Rao, Ricard J, PHI learning Pvt Ltd, 2nd Ed, 2008.* 4. *Basic Biostatitcs: Statistics for Public Health practice by Burt Gerstman, Jones and Bartlett Publishers, 2nd Ed, 2008.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Devika, Scientist B, ICMR, Chennai.	*1. Dr. Bagavandas, HOD, Center for statistics, SRMIST*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE 18107 / MBE21107	Course Name	COMPUTER SKILLS (SPSS)	Course Category	*M*	*Mandatory Course*	L	T	P	C
							0	2	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	**Data Book / Codes/Standards**	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**			**Program Learning Outcome (PLO)**												
CLR-1 :	*To introduce variables entry and explore listing in SPSS*	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CLR-2 :	*Learn to work with descriptive statistics in SPSS*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
CLR-3 :	*Able to analyse univariate analysis in SPSS*																	
CLR-4 :	*Analyze correlation between variables and interpret output*																	
CLR-5 :	*Perform regression analysis using SPSS*																	
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*																	
CLO-1 :	*Manipulate data and variables in SPSS*	*3*	*95*	*85*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
CLO-2 :	*Compute various descriptive statistics in SPSS*	*3*	*90*	*80*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
CLO-3 :	*Relate normality assumptions using SPSS*	*3*	*90*	*80*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
CLO-4 :	*Discrimnate univariate analysis in SPSS*	*3*	*90*	*80*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*H*	*M*	*M*
CLO-5 :	*Predict the relationship between variables using SPSS*	*3*	*90*	*80*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*H*	*M*	*M*

Duration (hour)		**Developing the familiarity with SPSS processer (6)**	**Working with descriptive statistics (6)**	**Hypothesis testing (6)**	**Correlation analysis (6)**	**Regression analysis (6)**
S-1	SLO-1	Introduction to SPSS	Construction of Frequency tables	Test the normality assumptions	Data entry for correlation analysis	Overview of various methods of regression analysis
S-2	SLO-1	Entering data in SPSS Editor	Analyze and interpret simple tables for quantitative data	Fit confidence interval and p	Choice of a suitable correlation coefficient	The method of least squares
S-3	SLO-1	Inserting and defining variables	Draw Line, Bar, Pie diagram and interpret	Student t test and Paired t test with interpretation	Pearson Correlation analysis and interpret the output	Regression line in scatter plot
S-4	SLO-1	Missing value analysis	Draw Scatter diagram and interpret	Chi square test and its interpretation	Spearman rank Correlation analysis and interpret the output	Estimating simple linear regression model

Duration (hour)		Developing the familiarity with SPSS processer (6)	Working with descriptive statistics (6)	Hypothesis testing (6)	Correlation analysis (6)	Regression analysis (6)
S-5	SLO-1	Sorting and transposing	Measures of Central Tendency and interpretation	Mann Whitney U test and interpret the output	Kendals rank Correlation analysis and interpret the output	Demonstration of Multivariate analysis
S-6	SLO-1	Splitting and Merging	Measures of Variation and interpretation	Wilcoxson signed rank test and interpret the output	Practice with databases	Overview of other types of regression models in spss

Learning Resources	1. Field, Andy. Discovering statistics using SPSS, 3rd Ed, Sage Publishers, 2009. 2. Pallant, Julie. SPSS survival manual, 4th Ed, McGraw Hill, 2010.	3. Vronk, Brain. How to use SPSS: A step by step guide to interpretation, 5th Ed, 2008.

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Thenmozhi, Christian Medical College, Vellore.	*1. Dr. M. Bagavandas, HOD, Centre for statisitcs, SRMIST*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE18201 / MBE21201	Course Name	RESEARCH METHODOLOGY	Course Category	*M*	*Manditory Course*	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	**School of Public Health**	**Data Book / Codes/Standards**	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To learn and understand the scientific bases of public health			
CLR-2 :	To understand the fundamentals of infectious and non-communicable diseases			
CLR-3 :	To understand the multidisciplinary nature of public health			
CLR-4 :	To study the role of nutrition and lifestyle in maintaining good health			
CLR-5 :	To develop critical thinking for managing conditions of public health importance			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcome (PLO)													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14
					Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
CLO-1 :	Describe the various dimensions and determinants of health and diseases	*3*	*85*	*80*	*H*	*M*	*L*	*M*	*H*	*H*	*L*	*L*	*M*	*M*	*L*	*M*	*L*	*M*
CLO-2 :	Demonstrate an understanding of the epidemiology of diseases	*3*	*80*	*80*	*H*	*H*	*H*	*M*	*H*	*H*	*M*	*H*	*H*	*H*	*M*	*H*	*M*	*M*
CLO-3 :	Apply multidisciplinary approaches in Public Health practice	*3*	*85*	*80*	*M*	*M*	*H*	*L*	*M*	*H*	*M*	*L*	*M*	*M*	*L*	*H*	*M*	*M*
CLO-4 :	Apply concepts of nutrition and lifestyle to prevent and manage diseases	*2*	*75*	*80*	*H*	*H*	*M*	*M*	*M*	*H*	*L*	*H*	*M*	*M*	*H*	*H*	*M*	*H*
CLO-5 :	Develop practical solutions for managing conditions of public health importance	*2*	*80*	*80*	*H*	*H*	*M*	*H*	*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*

Duration (hour)		**Research Preparation and Planning 12**	**Data Collection, Analysis and Inference 12**	**Sampling and Sampling Methods 12**	**Qualitative Research Methods and Participative Rural Appraisal (PRA) 12**	**Research Communication 12**
S-1	**SLO-1**	To develop objectives of research	To understand the tools and measurements used in research	To learn the definition of sampling	To understand concepts of qualitative research	To understand the criteria for Proposal writing
S-2	**SLO-1**	To learn public health surveillance	Developing a questionnaire	To understand the principles of sampling and sample size	To apply concepts of qualitative research	Manuscript preparation for publication
S-3	**SLO-1**	To provide research justification	To understand quantitative data	To learn probability sampling methods	To understand concepts of mixed methods	To learn different referencing styles

Duration (hour)		Research Preparation and Planning 12	Data Collection, Analysis and Inference 12	Sampling and Sampling Methods 12	Qualitative Research Methods and Participative Rural Appraisal (PRA) 12	Research Communication 12
S-4	**SLO-1**	Able to rationalize study	To understand quantitative research	To learn non probability sampling methods	To apply concepts of mixed methods	To present research results
S-5	**SLO-1**	Conceptualizing the research design	Recognizing different data entry formats	Application of probability sampling methods	To learn the different types of qualitative research	To practice preparing for IEC
S-6	**SLO-1**	To understand and implement the concepts of research design	To learn data entry soft wares	Application of non- probability sampling methods	To learn different interview techniques	Understanding the peer review process
S-7	**SLO-1**	To formulate a hypothesis	To apply concepts into data entry soft wares	To learn the concepts to determine the sample size	To understand analysis paradigms	To learn the communication for science
S-8	**SLO-1**	To write a research proposal	Cleaning Data	To learn, understand and apply the concepts of sampling weights	To analyze analysis paradigms	Learning Various types of presentation skills like oral & posters presentation
S-8	**SLO-2**	To learn different sources of information	Leaning concepts of data management	To choose appropriate sampling methods for research	To understand the types of qualitative analysis	Restate IMRAD concepts of writing the manuscripts
S-9	**SLO-1**	To use different sources of information	To apply concepts with basic statistical analysis	Applying the concepts of different sampling methods	Learning the different types of soft wares used for qualitative data analysis	Developing a logic model
S-9	**SLO-2**	To write a literature review	To develop a logistic regression model	To determine the appropriate sampling method for project	Understanding the importance and application of Participative Rural Appraisal	To develop a critical appraisal
S-10	**SLO-1**	To understand the ethics of research planning and preparation	To analyze a Logistic regression model	To determine the sample size	To practice the concepts of Participative Rural Appraisal through field visit	Discuss about impact factor, ISSN , CIF
S-10	**SLO-2**	To understand the ethics of research planning and preparation	To analyze a Logistic regression model	To determine the sample size	To practice the concepts of Participative Rural Appraisal through field visit	Discuss about impact factor, ISSN , CIF
S-11	**SLO-1**	To implement the ethics of research planning and preparation	To interpret a logistic regression model	Preparing Sample frame and selecting samples	To visualize a social and resource map	Micro seminar on Journal discussion
S-11	**SLO-2**	To implement the ethics of research planning and preparation	To interpret a logistic regression model	Preparing Sample frame and selecting samples	To visualize a social and resource map	Micro seminar on Journal discussion
S-12	**SLO-1**	To develop a research question based on topic given	To practice data cleaning and management	Assessing nonresponses and controlling errors	Exploring ethical issues in qualitative research	Understand STROBE guidelines
S-12	**SLO-2**	To develop a research question based on topic given	Analysis and Interpretation of small data set	Discussion on data collection of required sampling subjects	Choice of mixed design concepts, Decide about their project to choose the study designs	Understand CONSORT guidelines, Presenting Micro project proposal

Learning Resources	1. World Health Organization. Health Research Methodology A guide for training in research methods-World Health Organization -World Health Organization, 2011	2. Public Health Research Methods. Greg Guest & Emily E.Namey, 2015, Sage Publications

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Nirmala Murthy, Bangalore	*1. Dr. Kanthadevi Arunachalam, HOD, Environmental Sciences, SRMIST*	*1. Dr.H. Gladius Jennifer, SRMIST* *2. Dr.K.S.Vignesh, SRMIST*

Course Code	MBE 18202 / MBE21202	Course Name	R PROGRAMMING	Course Category	S	*Skill Enhancement*	L	T	P	C
							1	1	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
CLR-1 :	*Obtain basic understanding on R programming*			
CLR-2 :	*Secure familiarizstion about various Environments in R software*			
CLR-3 :	*Understand basic concepts of statistics*			
CLR-4 :	*Understand the functions for hypothesis testing and prediction*			
CLR-5 :	*Utilize understanding of various R functions and implement it*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Understand the Basic functions in R*	*1*	*85*	*75*
CLO-2 :	*Familiarize various environments in R programming*	*2*	*90*	*80*
CLO-3 :	*Familiarize with basic concepts of Statistics*	*3*	*85*	*75*
CLO-4 :	*Approaches and functions to do hypothesis testing and prediction*	*2*	*80*	*70*
CLO-5 :	*Familiarize with Advanced functions of R for doing predictive analysis*	*2*	*80*	*70*

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*L*	*L*	*-*	*L*	*-*	*L*	*L*	*L*	*L*	*L*	*L*	*L*	*L*
M	*L*	*L*	*L*	*H*	*M*	*L*	*M*	*H*	*M*	*L*	*M*	*M*	*H*
M	*M*	*M*	*M*	*H*	*H*	*L*	*M*	*M*	*L*	*L*	*H*	*L*	*M*
H	*M*	*M*	*L*	*M*	*H*	*L*	*H*	*L*	*L*	*L*	*H*	*L*	*M*
M	*H*	*M*	*M*	*H*	*H*	*L*	*H*	*M*	*L*	*L*	*H*	*L*	*H*

Duration (hour)		**Introduction (6)**	**R Environment (6)**	**Basic statistical concepts (6)**	**Testing of hypothesis using R (6)**	**Advanced functions of R (6)**
S-1	SLO-1	Understanding the History of R and S	Understanding the basics of R Environment	Understanding the basics of Statistics	Recall the Basic Concept of Hypothesis testing	Understand Advanced functions of R
S-2	SLO-1	Obtaining and installing R	Overview of Graphic subsystem in R	Overview of the Probability and distributions	Explain One sample and Two sample T Test using R functions	Explain the Loop functions in R
S-3	SLO-1	Explaining Different Data types in R	Understanding Flow control and cases	Recall the concept of Descriptive and	Explain paired T Test and ANOVA using R functions	Understanding Debugging functions

Duration (hour)		Introduction (6)	R Environment (6)	Basic statistical concepts (6)	Testing of hypothesis using R (6)	Advanced functions of R (6)
S-4	SLO-1	Introducing the basic function and arguments of R	Clarifying basic concepts of generic function in R	Recall the concept of summary statistics	Explain Pearson's and Spearman's Correlation and Kenduls Tau using R functions	Recall Simulation Concepts and ts function in R
S-5	SLO-1	Understanding Vector and List usage in R	Understanding the Libraries in R and its usage	Recall the concept of Descriptive and summary statistics for multiple groups	Explain Regression models using R functions	Demonstrate Random number generator in R
S-6	SLO-1	In depth understanding of Data frame and sub setting function in R	Demonstrate Data entry in R	Demonstration on generating tables	Demonstrate Simple and Multiple Regression functions in R	Demonstrate Random model R

Learning Resources	1. R programming for Data science, Roger D Peng, Lean publishing, 2015 2. The art of R Programming, Norman Matloff, No starch press, San Francisco, 2011	3. The R book, Michael J crawley, 2007, John Wiley and sons 4. Software for Data Analysis, Programming with R, John chambers, Springer New York, 2010

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr Dhivya Karmegham	*1. Prof Bagawandas Head, Centre for Statistics*	*1. Dr.M Prakash Asst Prof SRMIST*

Course Code	MBE 18203 / MBE21203	Course Name	DESIGN OF EXPERIMENTS	Course Category	S	*Skill Enhancement*	L	T	P	C
							2	2	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*To introduce and recall the study designs*			
CLR-2 :	*Learn the different designs in experimental research*			
CLR-3 :	*Understand different methods to detect the variations between the study groups*			
CLR-4 :	*Learn the concepts of Multivariate and factorial experiments*			
CLR-5 :	*Perform and predict variations and interpret the results*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Recognize strengths and weaknesses in various designs in experiments*	*3*	*95*	*85*
CLO-2 :	*Identify appropriate designs to address research questions and hypotheses*	*3*	*90*	*80*
CLO-3 :	*Testing whether the assumptions of the model are met*	*3*	*90*	*80*
CLO-4 :	*Communicate results clearly and effectively*	*3*	*90*	*80*
CLO-5 :	*Able to analyze, Predict and interpret findings*	*3*	*90*	*80*

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*

Duration (hour)		Introduction 12	Basic Designs 12	Design of Clinical Trials 12	Factorial Experiments 12	Fractional Factorial Experiments 12
S-1	SLO-1	Introduction to Design of experiments	Completely Randomized Design (CRD)	Over view of types of clinical trials	Understand Factorial structure, Main and interaction effects	Complete and confounding concepts
S-2	SLO-1	Descriptive and correlational studies	Explain Completely Randomized Design	Remember Single, double and triple blinding	Develop Hypothesis in factorial designs	Evaluate Confounding - 2^3 Factorial Experiments
S-3	SLO-1	Explore Observational studies	Problem solving Exercises	List Types of local controls	Types, Advantages and disadvantages of factorial designs	Evaluate Confounding – 2^4 Factorial Experiments
S-4	SLO-1	Discussion on analytical studies	Discuss Randomized Block Design (RBD) – Structure and Hypothesis	Restate Cross over design	Constructing 2^2 Factorial Experiment	Remember Basic Fractional

Duration (hour)		Introduction 12	Basic Designs 12	Design of Clinical Trials 12	Factorial Experiments 12	Fractional Factorial Experiments 12
S-5	SLO-1	Illustrate on Experimental studies	Calculate Randomized Block Design (RBD) – Mechanics of ANOVA and Analysis	Differentiate Parallel design	Evaluate 2^2 Factorial Experiment	Construction of ½ replicate of 2k design with k=3, 4 and 5
S-6	SLO-1	List the various components of experiments	Evaluate Randomized Block Design (RBD) – one Missing observation	Understand Equalance and bioequalance designs	Problem solving Exercises	Problem solving Exercises
S-7	SLO-1	Define Terms, Concepts, Principles of experiments	Randomized Block Design (RBD) – two Missing observations	Study on Inferiority, superiority trials	Evaluate 2^3 Factorial Experiment	Construct Split plot design, definition and concepts
S-8	SLO-1	Define Replication and Manipulation	Problem solving Exercises	Illustrate on Non inferiority trial	Evaluate 2^3 Factorial Experiment	Apply and Analyse of spilt plot
S-9	SLO-1	Understand local control	Latin Square Design (LSD) – Structure and Hypothesis	Learn about Sequential trials and types	Problem solving Exercises	Create Split - split plots
S-10	SLO-1	Remember concepts of Randomization	Latin Square Design (LSD) – Mechanics of ANOVA and Analysis	Practice	Explain 3^2 Factorial Experiment	Calculate Repeated Measures
S-11	SLO-1	Describes types of Randomization	Latin Square Design (LSD) – one / two Missing observations	Discuss other designs and structures	Explin 3^2 Factorial Experiment	Mechanics of ANOVA in split plot design
S-12	SLO-1	Practice	Problem solving Exercises	Distinguish matched control studies	Problem solving Exercises	Problem solving Exercises

Learning Resources	1. Design and analysis of Experiments in the health sciences Gerald Van Belle, Kathleen F Kerr, Wiley 2012 2. Design and analysis of experiments Montgomery D, Wiley 5th Ed, 2001	3. Statistics for Experiments: Design, Innovation, Discovery. Box G Hunter, Hunter J, Wiley 2nd Ed, 1978

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Total	100 %		100 %		100%	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Kalaivani, Scientist C	*1. Dr. M. Bagavandas, HOD, Centre for Statistics, SRMIST*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE18204 / MBE21204	Course Name	CLINICAL EPIDEMIOLOGY	Course Category	C	Professional Core	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Importance of epidemiology for informing scientific, ethical, economic discussion of health issues
CLR-2 :	Concepts of reliability and validity of diagnostic test
CLR-3 :	Identify key sources of data for epidemiologic purposes
CLR-4 :	Modern methods for monitoring events in public health
CLR-5 :	The role of public health system in promoting health of population

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Assessment of causal relationships based on available data	3	80	70
CLO-2 :	Evaluate the strengths and limitations of epidemiologic reports	3	85	75
CLO-3 :	Application of health status measurement	3	75	70
CLO-4 :	Apply concepts, methods and tools of public health	3	85	80
CLO-5 :	Draw appropriate inferences from epidemiologic data	3	85	75

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
L	H	-	H	L	M	-	-	L	L	-	H	-	-
M	H	L	M	L	L	-	-	M	L	-	H	-	-
M	H	M	H	L	M	-	-	M	L	-	H	-	-
M	H	M	H	L	M	-	-	M	L	-	H	-	-
H	H	M	H	L	M	-	-	M	L	-	H	-	-

Duration (hour)		Diagnosis (9)	Screening (9)	Strategies in testing serial testing (9)	Prognosis (9)	Risk benefit analysis (9)
S-1	SLO	Introduction to concepts of reliability and validity of diagnostic test	Introduction to Potential biases and odds	Application of Bayes' theorem	Introduction to Clinical epidemiology	To learn Bias in clinical observation
S-2	SLO	To define Sensitivity	To learn Conceptual influencing probability	Case study on Bayes theorem	Enumerate Methods of clinical epidemiology	To understand Techniques to control confounding
S-3	SLO	To understand Sensitivity and specificity	To describe Screening advantages & disadvantages	To discuss Natural history of illness	To explain Health outcomes of clinical epidemiological studies	To describe Techniques for risk assessment and prevention
S-4	SLO	To learn likelihood ratio and these measures are related	To Assess the effectiveness of screening procedures	Application of Natural history of illness	To learn Interpretation of diagnostic data	Introduction to risk benefit analysis

Duration (hour)		Diagnosis (9)	Screening (9)	Strategies in testing serial testing (9)	Prognosis (9)	Risk benefit analysis (9)
S-5	SLO	To describe ROC curve	Evaluation of screening procedures	To define Lead period and prognosis	Evaluation of diagnostic test	To describe Efficacy of therapeutic and preventive interventions
S-6	SLO	How to interpret these measures	To understand Strategies in combine testing	To discuss Lead time and length time bias	To understand Techniques for evaluation of diagnostic test	To enumerate Types of risk benefit analysis
S-7	SLO	To learn Characteristics on good diagnostic test	To understand Overall sensitivity and specificity of combined tests	To define Health status measurement	To learn Attributes for defining the limits of normality	Evaluation of future risk
S-8	SLO	To learn Concepts and principles of screening	To understand PPV and NPV	Application of Health status measurement	Application of Gaussian distribution	To understand Risk management
S-9	SLO	To discuss Statistical considerations pertinent to screening	Consideration of monetary and human costs	Case study on health status measurement	To understand Clinical study designs	To explain Number needed to treat and number needed to harm

Learning Resources	1. Clinical Biostatistics and Epidemiology Made Ridiculously Simple by Ann Weaver and Stephen Goldberg. MedMaster Inc; 1 edition (April 1, 2011) (Apr 1, 2011) 2. Clinical Epidemiology: How to Do Clinical Practice by R. Brian Haynes David L. Sackett &Gordon H. Guyatt. LWW; Third edition (September 13, 2005)	3. Primer of Epidemiology by Gary Friedman and Gary D. FriedmanMcGraw-Hill Medical; 5 edition (September 25, 2003)

Learning Assessment						
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**
		CLA – 1 (25%)		**CLA – 2 (25%)**		
		Theory	**Practice**	**Theory**	**Practice**	**Theory**
Level 1	Remember	20%	15%	20%	15%	15%
	Understand					
Level 2	Apply	20%	20%	15%	20%	20%
	Analyze					
Level 3	Evaluate	10%	15%	15%	15%	15%
	Create					
	Total	100 %		100 %		-

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee, jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST 2. Dr. Alex Joseph, SRMIST

Course Code	MBE18205 / MBE21205	Course Name	CASE CONTROL STUDY DESIGNS	Course Category	C	Professional Core	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To describe the design of case-control studies, including selection of cases and controls.			
CLR-2 :	To discuss potential selection biases in case-control studies.			
CLR-3 :	To discuss information biases in case-control studies, including limitations in recall and recall bias			
CLR-4 :	To describe other issues in case-control studies, including matching and the use of multiple controls.			
CLR-5 :	To introduce other study designs, including nested designs, case cross-over, ecologic, and cross-sectional studies.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Define and explain the distinguishing features of a case-control study	3	80	70
CLO-2 :	Describe the purpose of controls in a case-control study	3	85	75
CLO-3 :	Describe the principles of valid control selection	3	75	70
CLO-4 :	Explain the importance of using specific diagnostic criteria and explicit case definitions in case-control studies.	3	85	80
CLO-5 :	Estimate and interpret the odds ratio from a case-control study.	3	85	75

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
L	H	-	H	L	M	-	-	L	L	-	H	-	-
M	H	L	M	L	M	-	-	M	L	-	H	-	-
M	H	M	H	L	M	-	-	M	L	-	H	-	-
M	H	M	H	L	M	-	-	M	L	-	H	-	-
H	H	M	H	L	M	-	-	M	L	-	H	-	-

Duration (hour)		Design of case control studies (9)	Bias (9)	Types of case control studies (9)	Measures of association (9)	Critical appraisal case control studies (9)
S-1	SLO	To understand Case control studies, To understand Design of case control studies	To learn Bias due to confounding, To define Selection bias, To explain Survivorship bias	To define Density case control, Application of Density case control, Assessment on density case control	To describe Prevalence ratio	To discuss Using incident and prevalent cases
S-2	SLO	To describe Selection of cases, Review on Selection of cases	To define Healthy worker effect	To explain Case cohort studies, Application of Case cohort studies, Assessment on case cohort studies	To elaborate Types of measures of association used in analytic epidemiological studies	To discuss Sources of controls, To describe Problems in control selection
S-3	SLO	To describe Selection of controls	To discuss Memory or recall bias, To discuss Berkesonian bias	Introduction to measures of association	To define Attributable risk	To define Use of non-hospitalized people as controls, To define Use of hospitalized patients as controls
S-4	SLO	To explain Study base, To understand Multiple controls	To describe Matched and unmatched case control study designs	To define Association, To enumerate Types of association	To understand Mathematical relationship between OR and RR	To understand Information bias, To understand Recall bias

Duration (hour)		Design of case control studies (9)	Bias (9)	Types of case control studies (9)	Measures of association (9)	Critical appraisal case control studies (9)
S-5	SLO	To describe Features of case control study	To explain Interviewers bias, To describe Neyman bias	To learn Measures of association – Ratio measures, difference measures	To understand Efficacy and causation	To define Matching, To understand Individual matching
S-6	SLO	To enumerate Matching and its types, To define Confounding factor in study design	To explain Effect modification, To discuss Effect interactions	To define Odds ratio, Application of odds ratio	To define Bradford hills views, Application of Bradford hill criteria	To understand Use of multiple controls, To describe Controls of the same type, To describe Multiple controls of different types
S-7	SLO	To elaborate Measurement of exposure, To describe Exposure rates	To explain Differential diagnosis	To understand Relationship between OR and RR	Introduction to critical appraisal, Critical appraisal of research papers	To describe Case control studies based in a defined cohort
S-8	SLO	To define Analysis, To describe Interpretation	To discuss Advantages, Disadvantages of case control study	Review on nested case control study	To define Potential biases in case-control studies	To understand Case-cohort studies, To describe Case-crossover design
S-9	SLO	Case study on exposure rates	To discuss of case control study, To understand Health outcomes for case control studies	Review on association	To understand Selection bias	To elaborate Advantages of embedding a case-control study in a defined cohort

Learning Resources	1. Case-control studies. By Schlesselman, James J.Oxford University Press, New York, 1982. WA950 S342x. Oxford University Press; 1 edition (January 21, 1982) 2. Epidemiology. By Leon Gordis, Elsevier Publications. 2004, Third Edition	3. Epidemiology: Beyond the Basics by Moyses Szklo. Jones & Bartlett Learning; 3 edition (October 24, 2012) 4. An Introduction to Public Health and Epidemiology -Susan Carr, Nigel Unwin, Tanja Pless- Mulloli, Second Edition. -Open University Press, 2007

Learning Assessment						
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**
		CLA – 1 (25%)		**CLA – 2 (25%)**		
		Theory	**Practice**	**Theory**	**Practice**	**Theory**
Level 1	Remember	20%	15%	15%	15%	15%
	Understand					
Level 2	Apply	20%	20%	20%	20%	15%
	Analyze					
Level 3	Evaluate	10%	15%	15%	15%	20%
	Create					
	Total	100 %		100 %		-

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee , jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST 2. Dr. Alex Joseph, SRMIST

Course Code	MBE18206 / MBE21206	Course Name	COHORT STUDY DESIGNS	Course Category	C	Professional Core	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	To formulate research hypothesis	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To illustrate the cohort study design with two important examples.			
CLR-3 :	To discuss some potential biases in cohort studies.			
CLR-4 :	To introduce other study designs, including nested designs, case cross-over, ecologic, and cross-sectional studies.			
CLR-5 :	Describe methods for selecting cases and controls			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcome (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
CLO-1 :	Define cohort study design and its key features	3	80	70	L	H	-	H	L	M	-	-	L	L	-	H	-	-
CLO-2 :	Explain the advantage and disadvantages of the cohort study design	3	85	75	M	H	L	M	L	M	-	-	M	L	-	H	-	-
CLO-3 :	Describe strengths and weakness of retrospective and prospective cohort studies.	3	75	70	M	H	M	H	L	L	-	-	M	L	-	H	-	-
CLO-4 :	Differentiate between a specific/special exposure cohort and a general cohort.	3	85	80	M	H	M	H	L	L	-	-	M	L	-	H	-	-
CLO-5 :	Explain the factors that should be considered in selecting subjects for a cohort study.	3	85	75	H	H	M	H	L	L	-	-	M	L	-	H	-	-

Duration (hour)		Design of cohort study (9)	Selection of exposure and comparison group (9)	Measures of risk (9)	Measures of impact (9)	Critical appraisal (9)
S-1	SLO	To learn Concept of cohort study, To define Principles of cohort study	To explain Design of Mixed cohort, Application of mixed cohort study design	To define Concept of risk, Application of concept of risk	To understand Measures of impact	To explain Design of a cohort study
S-2	SLO	To elaborate Framework of cohort study, Indications of cohort study	To understand Selection of follow up, To learn Selection of follow up	To understand Person time concept incidence rate	To describe Attributable risk	Comparing cohort studies with other designs
S-3	SLO	To explain consideration during selection of cohort	To describe Attrition	To define Cumulative incidence	Application of attributable risk	Comparing cohort studies with randomized trials
S-4	SLO	To describe Prospective cohort study, To understand Design of prospective cohort study	To explain Exposure group	To learn Measures of risk	To describe Population attributable risk	To describe Selection of study populations

Duration (hour)		Design of cohort study (9)	Selection of exposure and comparison group (9)	Measures of risk (9)	Measures of impact (9)	Critical appraisal (9)
S-5	SLO	To elaborate Design of retrospective cohort study	To understand Source of exposure group	Application of Measures of risk	Application of population attributable risk	Enumerate Types of cohort studies, Example of cohort study – the Framingham study
S-6	SLO	To describe Ambi-directional cohort study	To define Selection of exposure group	To explain Relative risk and attributable risk with 95% CI	To understand and discuss Public health impact	Example of cohort study : incidence of breast cancer and progesterone deficiency
S-7	SLO	To understand Design of ambi-directional cohort study	To discuss Comparison group	To discuss Relationship between RR & AR	To learn criteria of Public health impact	To describe Cohort studies for investigating childhood health and disease
S-8	SLO	Review on Ambi-directional cohort study	To describe Exposure assessment	Application of relationship between RR & AR	Evaluation and assessing the quality of the presentation	To understand Potential biases in cohort studies, To define Selection and information biases
S-9	SLO	To describe Mixed cohort	To understand Adjustment in exposure assessment	Review on measures of risk	To discuss Critical appraisal of research papers	To describe Interpretation the results

Learning Resources	1. Epidemiology: Beyond the Basics by Moyses Szklo. Jones & Bartlett Learning; 3 edition (October 24, 2012) 2. Epidemiology. By Leon Gordis, Elsevier Publications. 2004, Third Edition	3. An Introduction to Public Health and Epidemiology -Susan Carr, Nigel Unwin, TanjaPless-Mulloli, Second Edition. -Open University Press, 2007

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)
		CLA – 1 (25%)		CLA – 2 (25%)		
		Theory	Practice	Theory	Practice	Theory Practice
Level 1	Remember Understand	15%	15%	15%	15%ev	15%
Level 2	Apply Analyze	15%	20%	20%	20%	20%
Level 3	Evaluate Create	20%	15%	15%	15%	10%
	Total	100 %		100 %		-

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee , jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST 2. Dr. Alex Joseph, SRMIST

Course Code	MBE18207 / MBE21207	Course Name	APPLIED AND FIELD EPIDEMIOLOGY	Course Category	S	Skill Course	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	To learn and understand the scientific bases of public health	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To understand the role of social epidemiology in public health			
CLR-3 :	To understand the multidisciplinary nature of public health			
CLR-4 :	Describe surveillance in public health practice			
CLR-5 :	To develop critical thinking for managing conditions of public health importance			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Describe the various dimensions and determinants of health and diseases	3	80	70
CLO-2 :	Demonstrate an understanding of the epidemiology of diseases	3	85	75
CLO-3 :	Apply multidisciplinary approaches in Public Health practice	3	75	70
CLO-4 :	Apply concepts to establish a surveillance system	3	85	80
CLO-5 :	Develop practical solutions for managing outbreak investigations	3	85	75

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
L	H	-	H	L	-	-	-	L	L	-	H	-	-
M	H	L	M	L	-	-	-	M	L	-	H	-	-
M	H	M	H	L	-	-	-	M	L	-	H	-	-
M	H	M	H	L	-	-	-	M	L	-	H	-	-
H	H	M	H	L	-	-	-	M	L	-	H	-	-

Duration (hour)		Social epidemiology (9)	Veterinary epidemiology (9)	Environment epidemiology (9)	Disease surveillance (9)	Outbreak investigation (9)
S-1	SLO	Introduction to Social determinants of health	Introduction to Zoonosis	Introduction to Environmental epidemiology	Introduction to Disease surveillance	Introduction to Outbreak investigation
S-2	SLO	To describe Social epidemiology	To describe Fundamentals of Zoonosis	To learn Principles of environmental epidemiology	To learn Principles of disease surveillance	To explain Steps in outbreak investigation
S-3	SLO	Enumerate Social epidemiology methods	To understand Classification of zoonotic disease	To describe Environmental epidemiology methods of investigation	To understand components of disease surveillance	Application of Steps in outbreak investigation
S-4	SLO	To describe Role of social epidemiology in public health	To discuss WHOs pandemic levels	To describe Environmental evaluation	Enumerate Types of surveillance	To describe Process of line listing cases
S-5	SLO	To understand Socio-economic status	Application of WHOs pandemic levels	To describe Risk assessments	Describe surveillance in public health practice	To understand Spot mapping

Duration (hour)		Social epidemiology (9)	Veterinary epidemiology (9)	Environment epidemiology (9)	Disease surveillance (9)	Outbreak investigation (9)
S-6	SLO	To describe Caste discrimination	To explain Preventive measures in veterinary public health	Application of exposure assessment	To understand Data collection	Interpretation recognizing clustering of cases
S-7	SLO	To describe Health equites	To discuss Control of emerging diseases	To learn Vulnerability assessment	To describe Syndrome surveillance	To understand Safety approaches to outbreak investigation with case study on food poisoning
S-8	SLO	Introduction to Veterinary epidemiology	To define One health concept	Application of vulnerability assessment	Operate a surveillance system	To elaborate Outbreak investigation using cohort study design
S-9	SLO	Principles of Veterinary epidemiology	To learn Principles of One health concept	To describe Environmental disasters	Evaluate a surveillance system	To elaborate Outbreak investigation using case control approaches

Learning Resources	1. Methods In Social Epidemiology. J. Michael Oakes, Jay S. Kaufman. Jossey-Bass; 1 edition (May 12, 2006) A Willey print. 989 Market Street, San Francisco, CA 94103-1741 2. Topics in Environmental Epidemiology by Steen and Kyle. Oxford, New York. 1997	3. An Introduction to Veterinary Epidemiology. Mark Stevenson. Wiley-Blackwell; 1 edition (January 11, 2010) IVABS, Massey University, Palmerston North.New Zealand

Learning Assessment						
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**
		CLA – 1 (25%)		**CLA – 2 (25%)**		
		Theory	**Practice**	**Theory**	**Practice**	**Theory Practice**
Level 1	Remember	20%	20%	15%	20%	20%
	Understand					
Level 2	Apply	20%	10%	15%	20%	15%
	Analyze					
Level 3	Evaluate	10%	20%	20%	10%	15%
	Create					
	Total	100 %		100 %		-

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee , jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST 2. Dr. Alex Joseph, SRMIST

Course Code	MBE18208 / MBE21208	Course Name	CLINICAL TRIALS	Course Category	S	Skill Enhancement	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	To understand the drug discovery process and its stages	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To understand the history of clinical trials			
CLR-3 :	Roles and responsibilities of clinical trial			
CLR-4 :	Describe sources of potential bias in clinical studies			
CLR-5 :	To understand the role of biostatics in pharmacovigilance			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
CLO-1 :	Describe the stages of drug discovery	3	80	70
CLO-2 :	Apply the basic terminology and definitions used in clinical trials	3	85	75
CLO-3 :	Communicate epidemiologic information to lay and professional audiences	3	75	70
CLO-4 :	Draw appropriate inferences from clinical data management	3	85	80
CLO-5 :	Evaluate the strengths and limitations of drug safety	3	85	75

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
L	H	-	H	L	M	-	-	L	L	-	H	-	-
M	H	L	M	L	M	-	-	M	L	-	H	-	-
M	H	M	H	L	M	-	-	M	L	-	H	-	-
M	H	M	H	L	M	-	-	M	L	-	H	-	-
H	H	M	H	L	M	-	-	M	L	-	H	-	-

Duration (hour)		Introduction to drug discovery and development (9)	Basics of clinical research (9)	Clinical trials operation (9)	Clinical data management (9)	Pharmacovigilance (9)
S-1	SLO	Introduction to Drug discovery	Introduction to clinical trials	To describe ICH E6 (GCP) E3 guideline	To discuss Investigator brochure,	Introduction to pharmacovigilance
S-2	SLO	To describe Drug development, To enumerate Drug discovery process	To discuss History of clinical trials	To understand GCP, To describe Indian GCP	To understand Informed consent form, To describe Design of consent form	Definition of AE & ADR
S-3	SLO	To learn General principles in drug discovery process	Definition used in clinical trials	To understand Role of sponsor	Introduction to clinical data management	To understand Guidelines related to safety
S-4	SLO	To enumerate Stages of drug discovery	To understand Terminology used in clinical trials	To understand Responsibilities of sponsor	To describe Standard operating procedure preparation related to sampling and analysis	To describe Individual case safety report

Duration (hour)		Introduction to drug discovery and development (9)	Basics of clinical research (9)	Clinical trials operation (9)	Clinical data management (9)	Pharmacovigilance (9)
S-5	SLO	To discuss Nature of drug development	To discuss Phases of clinical trial	To understand Role of investigator, To explain Responsibilities of investigator	To describe Standard operating procedure preparation related to clinical data management	To describe Aggregate drug safety report
S-6	SLO	Component of drug development	Overview of US-FDA	To understand Roles of IRB/ IEC	To understand clinical data management	To describe Signal detection
S-7	SLO	To understand Design of drug discovery	To describe Indian DCGI-EU-EMEA	To understand Responsibilities of IRB/ IEC	To describe clinical data management process flow	Overview of aggregate drug safety report and signal detection
S-8	SLO	To describe Design of drug development	To explain Ethics in clinical trail	To describe Clinical trial documents	To understand CRF preparation	To understand Role of Bio-statician in pharma, Biotech
S-9	sSLO	To describe Clinical trial	To define ICH, To discuss Composition of ICH, To define Components in ICH	To discuss Protocol	To define med DRA coding, To discuss AE & SAE reporting	To understand Role of Bio-statician in CRO industry

Learning Resources	1. Clinical Research from proposal to implementation by Michael J, Mcphaw, Robert D. Toto. 1st edition, Lippincott Williams & Wilkins, 2010 2. Food and Drug Administration of USA guidance 3. European Medicines Agency and EU Regulatory Agency guidance	4. Guidance for Industry on Submission of Clinical Trial Application for Evaluating Safety and Efficacy by CDSCO (Central Drug Standard Control Organization). 5. Guidance for Industry on Requirement of Chemical & Pharmaceutical Information including stability Study Data before approval of clinical trials / BE studies by CDSCO 6. Guidelines for import and manufacture of medical devices by CDSCO.

Learning Assessment						
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**
		CLA – 1 (25%)		**CLA – 2 (25%)**		
		Theory	**Practice**	**Theory**	**Practice**	**Theory**
Level 1	Remember	20%	20%	20%	10%	15%
	Understand					
Level 2	Apply	20%	15%	20%	20%	20%
	Analyze					
Level 3	Evaluate	10%	15%	10%	20%	15%
	Create					
	Total	100 %		100 %		-

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Jayaprakash Muliyil, ICMR scientific advisory committee , jpmuliyil@gmail.com	1. Dr. Vijay Gopichandran. ESIC Medical College and PGIMSR, vijay.gopichandran@gmail.com	1. Dr. Rajan Patil, SRMIST 2. Dr. Alex Joseph, SRMIST

Course Code	MBE18301 / MBE21301	Course Name	RESULTS BASED PROJECT MANAGEMENT	Course Category	S	*Skill Enhancement*	L	T	P	C
							1	1	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	**Data Book / Codes/Standards**	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Identify the fundamentals of Project management in public health			
CLR-2 :	Identify the importance of Problem and strategy analysis			
CLR-3 :	Identify the significance of Log frame approach and its tools in Public Health			
CLR-4 :	Create insights to Performance Measurement framework			
CLR-5 :	Analyze the concepts of Results based reporting system in Public Health			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Importance of Project Management in Public Health	*1*	*85*	*75*
CLO-2 :	Apply knowledge to Problem analysis & Strategy analysis	*2*	*90*	*80*
CLO-3 :	Apply techniques in Log frame approach and discussing the theory of change	*3*	*85*	*75*
CLO-4 :	Apply Performance measurement framework with significance to developing Performance measurement framework at each level in Public Health	*2*	*80*	*70*
CLO-5 :	Utilize the concepts of Results based reporting system and dissemination of reports in Public Health	*2*	*80*	*70*

Program Learning Outcome (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Soving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
CLO-1 :	*H*	*M*	*M*	*M*	*L*	*M*	*M*	*-*	*M*	*H*	*M*	*-*	*H*	*M*
CLO-2 :	*H*	*M*	*M*	*M*	*H*	*H*	*M*	*-*	*H*	*H*	*M*	*-*	*H*	*H*
CLO-3 :	*M*	*M*	*M*	*M*	*H*	*H*	*M*	*-*	*M*	*L*	*M*	*-*	*H*	*M*
CLO-4 :	*H*	*M*	*M*	*L*	*M*	*M*	*M*	*-*	*M*	*M*	*M*	*-*	*M*	*H*
CLO-5 :	*M*	*H*	*M*	*M*	*H*	*H*	*M*	*-*	*M*	*H*	*H*	*-*	*M*	*M*

Duration (hour)		**Introduction to basic concept of project management 6**	**Problem analysis, objective analysis & strategy analysis 6**	**Logical framework approach and tools 6**	**Performance measurement framework 6**	**Results based reporting system 6**
S-1	SLO-1	Discussing the overview of project life cycle	Enriching the concepts of problem tree	To infer about introduction on log frame approach	Overview of performance measurement	Paraphrasing about the reporting format
S-1	SLO-2	Discussing in detail about the phases of project life cycle	To paraphrase steps to undertake problem tree	Predicting Log frame approach	To enrich the importance of performance measurement	Enlisting the reporting format to monitor the results at each level
S-2	SLO-1	To review the overview of project management process	Developing a problem tree	Reviewing tools in log frame approach	Learning the elements of performance measurement	Enlisting the reporting format to monitor the results at each level
S-2	SLO-2	Summarizing the project management plan	Discussion on developing solution tree	Describing logical framework matrix	Learning the importance of performance measurement	To construct discussion on dissemination of reports to different audiences
S-3	SLO-1	To understand Project management knowledge areas	Formulating the components of objective tree	Listing the conceptual clarity of the forma	Enriching the benefits of performance measurement	Describing about the report system at different level

Duration (hour)		Introduction to basic concept of project management 6	Problem analysis, objective analysis & strategy analysis 6	Logical framework approach and tools 6	Performance measurement framework 6	Results based reporting system 6
S-3	SLO-2	Defining the definition and terminologies in project management	Explaining stakeholder analysis	Listing the hierarchy of the objectives in log frame approach	Understanding the activity scheduling	Listing the characteristics of results based project management
S-4	SLO-1	To understand about the needs assessment	To express about stakeholder analysis process	Explaining the results chain	To review the performance evaluation	Explaining the paradigm shift in results based management
S-4	SLO-2	Explaining the basics of stakeholder identification	Summarizing the advantages and disadvantages of stakeholder analysis	Arguing the means of verification in log frame approach	Explaining the performance standards approach	Listing the principles of results based management
S-5	SLO-1	Discussion on resource mapping	Discussing about stakeholder mapping	Narrating the assumptions and risk in log frame approach	Describing about the evaluation model	Listing the benefits of results of results based reporting system
S-5	SLO-2	Reviewing the concepts of RBM	Paraphrasing about scoping	Describing the theory of change	To explain about the methods of performance evaluation	Enlisting the disadvantages of results based reporting system
S-6	SLO-1	Arguing about the case study on project ;life cycle	Discussing on the case study about problem analysis	Exploring the case study on logical framework approach	Summarizing about traditional methods of performance evaluation	Seminar on Results based management
S-6	SLO-2	Discussing about the case study on needs assessment	Seminar about problem tree and solution tree by means of case study	Arguing the case study on results based management	Understanding about modern methods of performance evaluation	Arguing the case study on dissemination of reports

Learning Resources	1. The project management life cycle, Jason Westland, First Published in Great	2. Handbook on Project cycle management, European Commission Version 2.0, 2002

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember	20	15	15	10	20	15
	Understand						
Level 2	Apply	20	25	20	20	15	20
	Analyze						
Level 3	Evaluate	10	10	15	20	15	15
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr .Nirmala Murthy, FRHS, Bangalore	*1. Dr.Kanthadevi Arunachalam, HOD, Environmental Science, SRMIST*	*1. Dr.Kalpana B, Asso Professor,SRM IST*

Course Code	MBE 18302 / MBE21302	Course Name	PUBLIC HEALTH INFORMATICS	Course Category	S	*Skill Course*	L	T	P	C
							1	1	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	**Data Book / Codes/Standards**	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Obtain basic understanding about physical principles and sensing process in remote sensing.*
CLR-2 :	*Utilize various GIS and navigation tools and techniques to handle spatial and non-spatial database*
CLR-3 :	*Obtain understating about datums, coordinate systems, differential positioning concepts and associated techniques.*
CLR-4 :	*Utilize knowledge to differentiate type of sensors, characteristics and different data acquisition techniques.*
CLR-5 :	*Utilize geospatial techniques for disaster management and disaster risk reduction*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning** Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Explain the physical principles and sensing process in remote sensing.*	*1*	*90*	*80*
CLO-2 :	*Describe various GIS and Navigation tools and techniques within spatial analytical framework and handle spatial and non-spatial database.*	*3*	*85*	*75*
CLO-3 :	*Explain various datums, coordinate systems, differential positioning concepts and associated techniques.*	*2*	*70*	*65*
CLO-4 :	*Differentiate the type of sensors, characteristics and different data acquisition techniques.*	*2*	*85*	*75*
CLO-5 :	*Apply integrated geospatial techniques in disaster management and disaster risk reduction.*	*3*	*85*	*75*

Program Learning Outcome (PLO)	1 Fundamental Knowledge	2 Application of Concepts	3 Link with Related Disciplines	4 Procedural Knowledge	5 Skills in Specialization	6 Ability to Utilize Knowledge	7 Skills in Modeling	8 Analyze, Interpret Data	9 Investigative Skills	10 Problem Solving Skills	11 Communication Skills	12 Analytical Skills	13 Professional Behavior	14 Life Long Learning
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CLO-1	*H*	*L*	*M*	*L*	*L*	-	*L*	-	*L*	*L*	-	-	-	*H*
CLO-2	*M*	*H*	*M*	*M*	*H*	*M*	*L*	*M*	*H*	*M*	-	*H*	-	*M*
CLO-3	*M*	*H*	*M*	*H*	*L*	-	*L*	-	*M*	*L*	-	*M*	-	-
CLO-4	*H*	*M*	*H*	*M*	*M*	*L*	*L*	-	*L*	*L*	-	*M*	-	-
CLO-5	*H*	*H*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*L*	-	*H*	-	*H*

Duration (hour)		Introduction to Public Health Informatics (6)	Surveillance data handling (6)	Public Health Informatics systems Development (6)	Evaluation for Public Health Informatics (6)	Information Technology Systems Topics (6)
S-1	SLO-1	Understanding the Basic concepts of Informatics	Understanding the basics of surveillance system	Understanding the basics of Statistics	Understanding the basic need for Evaluating Public helath informatics	Understanding the need for AI in informatics
S-2	SLO-1	Explaining Different Information systems and its purpose	Overview of EHR	Overview of the Probability and distributions	Overview of **Standards and Benchmarks in Public Health Informatics**	Understanding current trend inHealth informatics

Duration (hour)		Introduction to Public Health Informatics (6)	Surveillance data handling (6)	Public Health Informatics systems Development (6)	Evaluation for Public Health Informatics (6)	Information Technology Systems Topics (6)
S-3	SLO-1	Understanding Components of information system	Understanding different sources of data and data tools available	Recall the concept of Descriptive and	Understanding types of evaluation in PHI	Demonstrate surveillance system in India
S-4	SLO-1	Understanding Managemnt information systems (MIS)	Clarifying basic concepts of database management	Recall the concept of summary statistics	Demonstrating Protocol development for evaluation of informatics	Explain the need of AI in addressing the Gaps in Surveillance system
S-5	SLO-1	Understanding Levels of MIS	Understanding the Privacy , security and Ethical issues with Health data	Recall the concept of Descriptive and summary statistics for multiple groups	Developing the indicator for the evaluation framework	Practical session on Developing information system
S-6	SLO-1	In depth understanding MIS	Clarifying Ethical issues for data and interpretation	Demonstration on generating tables	Demonstarte the Outcome assessment and tools for it	Practical session on Developing information system

Learning Resources	1. Public Health Informatics and Information Systems Magnuson, J.A., Fu, Jr., Paul C. (Eds.) 2nd ed. 2014, XVIII, 666 p. 114 illus., 35 illus. in color. 2. Fried, A. and O'Carroll, P.W. (1998) "Public Health Informatics." In Last, J.M.(ed) Maxcey-Rosenau- Last Public Health & Preventive Medicine, 14th ed. Pp. 59-65. Appleton and Lange, Norwalk, CT.	3. Stair, R.M., & Reynolds, G.W. (2001). Principles of Information Systems 7th Edition Cambridge, MA: Course Technologies

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	**Remember**	***20%***	***20%***	***15%***	***15%***	***15%***	***15%***
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr.Suresh Mariaselvam, Independent Consultant, Chennai	*1. Dr.Ganesh Kumar Parasuraman, Scientist C, ICMR-NIE*	*1. Dr.M Prakash , Asst prof , SRMIST*

Course Code	MBE 18303 / MBE21303	Course Name	REGRESSION ANALYSIS	Course Category	C	Professional Core	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	To introduce statistical methods that address statistical inference using multiple variables	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Learn the different linear regression models available along with their assumptions			
CLR-3 :	Understand different methods to detect and address violations			
CLR-4 :	Learn the concepts of Multicollinearity, Heteroscadascity			
CLR-5 :	Perform regression analysis using SPSS and SAS			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Recognize strengths and weaknesses in analyses and formulate constructive critiques	3	95	85
CLO-2 :	Appropriate regression techniques to address research questions and hypotheses	3	90	80
CLO-3 :	Testing whether the assumptions of the model are met	3	90	80
CLO-4 :	Communicate results clearly and effectively	3	90	80
CLO-5 :	Use SPSS and SAS for regression analyses and interpret findings	3	90	80

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H

Duration (hour)		Simple Linear Regression Model (12)	Multiple Regression Model (12)	Regression Diagnostics (12)	Autocorrelation and Multicollinearity (12)	Variable selection procedures (12)
S-1	SLO-1	Description of Data types introcudction	Description of Data and Model	Effect of Outliers in Simple Regression	Autocorrelation	Introduction to variable selection procedures
S-2	SLO-1	Define Estimation	Interpretation of Coefficients	Understand Model Adequacy	Problem of Correlated Errors	Understand Formulation of Problem
S-3	SLO-1	Learn steps Test of Hypotheses	Properties of Least Square Estimators	Draw Residual Plots	Durbin-Watson Statistics	Consequences of Variable Deletion;
S-4	SLO-1	Inderstand Index of Fit	Test of Hypothesis on the Linear Model	Deletion of Data Points	Detection and Correction of Auto correlation Forecasting	Restate Procedures
S-5	SLO-1	Able to learn Predicted Values	Qualitative Predictor Variables and their uses.	Transformations of Variables	Detection and Correction of Auto correlation Forecasting	Understand Forward Selection Procedure

Duration (hour)		Simple Linear Regression Model (12)	Multiple Regression Model (12)	Regression Diagnostics (12)	Autocorrelation and Multicollinearity (12)	Variable selection procedures (12)
S-6	SLO-1	Calculate Standard Errors	Qualitative Predictor Variables and their uses.	Transformation to Achieve Linearity	Autoregressive integrated moving average (ARIMA) model fit	Evaluate Forward Selection Procedure
S-7	SLO-1	Interpret Standard Errors	Fitting Multiple Linear Model	Transformation to Stabilize Variance	Autoregressive integrated moving average (ARIMA) model fit	Understand Backward Elimination Procedure
S-8	SLO-1	Fitting Simple Linear Model	Fitting Multiple Linear Model	Removal of Heteroscedasticity	Concepts of Multicollinearity	Evaluate Backward Elimination Procedure
S-9	SLO-1	Fitting Simple Linear Model	Fitting nonlinear models	Principle of ordinary Least Squares	Concepts of Multicollinearity effects	Understand Stepwise Method
S-10	SLO-1	Understand Analysis of Residuals	Fitting Curvilinear models	Principle of ordinary Least Squares	Define Forecasting	Evaluate Stepwise Method
S-11	SLO-1	Evaluation of Fit	Problem Solving Exercises	Principle of Weighted Least Squares	Detection and Correction of Multicollinearity	Problem Solving Exercises
S-12	SLO-1	Problem Solving Exercises	Problem Solving Exercises	Problem Solving Exercises	Problem Solving Exercises	Problem Solving Exercises

Learning Resources	1. Regression analysis by example by S. Chaterjee and Ali S Hadi, John Wiley & Sons, New York, 4th Ed, 2006. 2. Applied Regression Analysis by Norman R Draper, harry Smith, Wiley Blackwell, 3rd Ed, 1998	3. Regression methods in biostatistics, Linear, Logistic, Survival, repeated measures models by Vittinghoff CE, Springer, 2nd Ed, 2012.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mrs. Anita Cecelia, Biostatistician, CTS, Chennai	*1. Dr. L. Jeyseelan, Dept of Biostatisitcs, CMC, Vellore*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE 18304 / MBE21304	Course Name	CATEGORICAL DATA ANALYSIS AND SURVIVAL ANALYSIS	Course Category	C	Professional Core	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the basic concepts, measures and inferences for categorical Data
CLR-2 :	Learn the descriptive analysis of categorical data
CLR-3 :	Understand the different Categorical Data Models along with their inference
CLR-4 :	Learn basic concepts, models, methods, and applications in survival analysis
CLR-5 :	Develop adequate quantitative skills to solve real-world problems in Survival Analysis using SPSS and SAS

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Perform analysis of Categorical Data using Two way and Three way contingency tables	3	95	85
CLO-2 :	Perform different logistic regression analyses with multiple predictors using SPSS and SAS.	3	90	80
CLO-3 :	Use log-linear models to analyze contingency tables, use visual and other methods for assessing the adequacy of the fitted model	3	90	80
CLO-4 :	Analyze survival data using SPSS and be able to interpret the corresponding results	3	90	80
CLO-5 :	Model the Survival Data and calculate the Hazard Ratio's using SPSS	3	90	80

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H

Duration (hour)		Introduction to Categorical data analysis (12)	Log linear models for contingency tables (12)	Logistic Regression (12)	Multi category Logit models (12)	Introduction to survival analysis (12)
S-1	SLO -1	Define Response and explonatory variables	Basic Uses of log linear models	Definitions and Setup of logistic functions	Understand Logit Models for Nominal Responses,	Understand Survival analysis concepts
S-2	SLO -1	Choose Variable Measurements, Sampling frame work	Learn Loglinear Models for Two-Way Tables	Dramatice Logit Transformation	Logit Models for Nominal Responses	Definition of Survival Time and rate
S-3	SLO -1	Review of Discrete distributions	Modify Loglinear Models for Three-Way Tables	Execute Logistic Regression Fit	Learn Logit Models for ordinal Responses	Evaluate Hazard Rate, Censoring, Truncation and Types of Censoring
S-4	SLO -1	Discover Inference of single population proportion	Understand Loglinear Connections concepts	Interpretation of the Logistic Curve	Learn Logit Models for ordinal Responses	Show Graphical representations

Duration (hour)		Introduction to Categorical data analysis (12)	Log linear models for contingency tables (12)	Logistic Regression (12)	Multi category Logit models (12)	Introduction to survival analysis (12)
S-5	SLO -1	Employ 2 way contingency table – sampling distribution	Sketch Logit Connections concepts	Inference for Logistic Regression	Identify Cumulative Logit Models for Ordinal Responses	Dramatice Weibull distribution
S-6	SLO -1	Modify 2 way contingency table – attributes of sampling design	Show Independence Graphs	Learn Logit Models with Qualitative Predictors	Dramtice Paired Ordinal Logits	Estimate Survival Time by Life Table
S-7	SLO -1	Produce Risk estimates (OR,RR,AR)	Practice with examples	Apply Multiple Logistic Regression	Compute Nominal logistic regression	Learn Nonparametric: KM Methods..
S-8	SLO -1	Relate 2x2 Measures of association, Schedule 2x2 Invariance properties	Restate Collapsibility	Building and Applying Logistic Regression Models	Learn Multinominal Logistic Regression	Comparison of Survival Time between subgroups using Log-Rank Test
S-9	SLO -1	Predict 2x2 Test of independence	Types of variables withcausal association	Learn Other link functions	Interpret Ordinal Logistic Regression	Employ Modeling for Survival using Poisson Regression
S-10	SLO -1	Operate 3 way contingency table	Interpret Nomial Association	Discriminant Analysis - concepts	Practice with examples	Learn Cox Models - Hypothesis
S-11	SLO -1	Relate Simpson paradox Choose Marginal, conditional independence	Interpret Ordinal Association Employ Simple Log Linear Models	Discriminant Analysis - interpret	Problem solving Exercises	Evaluating the proportional hazards assumption
S-12	SLO -1	Discover Cochran Mantel Haenszel methods	Problem solving Exercises	Practice with examples	Reproduce Multivariate Ordinal Logistic Regression	Cox Proportional Hazards Model Fit

Learning Resources	1. Categorical data analysis, Alan Agresti. Wiley 2nd Ed, 2007. 2. 2.Survival analysis techniques for censored and truncated data, Klein JP, Moeschberger. Springer, 2003. 3. 3.Analysing categorical data. Jeffrey SS, Springer 2003.	4. Survival analysis: A self learning text, David GK, Mitchel K. Springer, 2nd Ed, 2008. 5. Introduction to the statistical analysis of categorical data. Anderson EB, Springer,1997 6. Modeling survival data in medical research, Collett D. Chapman & Hall, 2nd Ed, 2003.

Learning Assessment							
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Create						
	Total	100 %		100 %		*20%*	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mrs. Anita Cecelia, Biostatistician, CTS, Chennai	*1. Dr. L. Jeyseelan, Dept of Biostatisitcs, CMC, Vellore*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE 18305 / MBE21305	Course Name	APPLIED MULTIVARIATE ANALYSIS	Course Category	C	Professional Core	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Gain basic (not necessarily advanced) understanding of the theoretical rationale for multivariate statistics
CLR-2 :	Gain an understanding of why and when one would use multivariate statistical methods.
CLR-3 :	Develop skills in using statistical software to analyze multivariate data
CLR-4 :	Able to interpret results, and communicate the results for a journal article
CLR-5 :	Develop skills in reading journal articles that present applications of multivariate methods or advances in multivariate methods

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Identify and understand the structure of multivariate data	3	95	85
CLO-2 :	Able to phrase the appropriate scientific questions in terms of parameters of interest.	3	90	80
CLO-3 :	Understand the various assumptions needed for the various methodologies covered in the class as well as their implementation	3	90	80
CLO-4 :	Implement analyses of these methods in a statistical software package	3	90	80
CLO-5 :	Read the scientific literature and comprehend the use (and misuse) of multivariate analysis methodologies reported by study authors	3	90	80

Program Learning Outcomes (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H

Duration (hour)		Introduction to Multivariate Data (12)	Test on Mean Vector (12)	Exploratory Analysis (12)	Classification and Clustering (12)	Advance Techniques (12)
S-1	SLO -1	Introduction to Multivariate approach	MANOVA,, Repeated measures as a multivariate problem	Learn Principal components analysis	concepts of Distance, Concepts of Similarity	Categorize Path analysis, Concepts of path analysis, Assumption of path analysis
S-2	SLO -1	difference between univariate and multivariate analysis, Learn Multivariate Problems	Evaluate Completely randomised design	Understand Rotation	Evaluate K-Means cluster analysis, Compute K mean centroid	Properties, calculation
S-3	SLO -1	Restate various types of designs, duration of study	Employ Oneway Manova	Learn correlation matrix	Demonstrate Two-Step cluster analysis	Understand Structural Equation Modeling

Duration (hour)		Introduction to Multivariate Data (12)	Test on Mean Vector (12)	Exploratory Analysis (12)	Classification and Clustering (12)	Advance Techniques (12)
S-4	SLO -1	Methodologies of Data Cleaning, missing data handling	Compute Randomized block design	Interpret Eigen value	Produce Hierarchical Clustering Techniques	learning assumption, properties
S-5	SLO -1	Understand imputations, transformations	Demonstrate Twoway Manova	Evaluate Factor analysis	Learning Regression tree concept	Model fit of MLM
S-6	SLO -1	List Normality Test, assumptions	Compute Latin square design	Predict Correspondence analysis	Produce Hierarchical Clustering Techniques	Evalute Multilevel Analysis
S-7	SLO -1	Understand Various methods of representation of data with descriptives	Evaluate BIBD, Evaluate BIBD -II	Assess Correlation Analysis	Judge Regression Tree Technique	Practice on Two level analysis with data
S-8	SLO -1	Methods of representation of data with descriptives-II	Illustrate Factorial design	Assess Correlation Analysis -II	Compute Nearest Neighbor Analysis, Compute Nearest Neighbor Analysis-II	Problem Solving Exercises
S-9	SLO -1	show graphical Representations of Multivariate Data	Types of Factorial design - II	Problem Solving Exercises	Problem Solving Exercises	Practice on more thanTwo level analysis with data
S-10	SLO -1	F distribution	Understand 2^2 Factorial analysis	Compare Multidimensional Scaling	Construct Discriminant Analysis	List Assumption, properties
S-11	SLO -1	Relate Distribution of F for more than two group comparisons	Infer 2^2 Factorial analysis - II	Micro teaching	Problem Solving Exercises	Practice on multilevel analysis with data
S-12	SLO -1	Produce other continuous distributions for multivariate approach	Infer 2^3 Factorial analysis, Analyze 3^2 Factorial analysis	Problem Solving Exercises	Seminar on discriminant analysis	Problem Solving Exercises

Learning Resources	1. Applied multivariate statistical analysis by Johnson RA, Wichern DW, Pearson Prentice hall, NY, 6th Ed, 2007.	2. Multivariate data analysis by Joseph FH, William CB, Prentice Hall pub, 7th ED, 2010 3. Multivariate data reduction and discrimination with SAS software, Khattree RN, Naik DN, SAS institute inc, 2000.

Learning Assessment							
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1.Mrs. Kanimozhi, Biostatistics Manager,Agati Clinical,Bangalore	*1.Dr.Antonysamy, Professor, CMC, Vellore*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE 18306 / MBE21306	Course Name	NON PARAMETRIC METHODS	Course Category	S	*Skill Enhancement*	L	T	P	C
							1	1	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	**Data Book / Codes/Standards**	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understand the difference between Parametric and Non Parametric methods*			
CLR-2 :	*Learn and test the assumptions and Data Requirements for Non Parametric analysis*			
CLR-3 :	*Learn different Methods available for Single and two sample scenarios*			
CLR-4 :	*Learn Non Parametric Regression analysis*			
CLR-5 :	*Analyzing the data using SPSS*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Differentiate parametric and non parametric methods*	*3*	*95*	*85*
CLO-2 :	*Apply the different methods available to test the assumptions and eligibility of the data for non parametric analysis*	*3*	*90*	*80*
CLO-3 :	*Choose the appropriate method of analysis based on the objective*	*3*	*90*	*80*
CLO-4 :	*Perform Non parametric regression*	*3*	*90*	*80*
CLO-5 :	*Use SPSS for the various analysis techniques discussed*	*3*	*90*	*80*

Program Learning Outcomes (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*
H	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*	*H*

Duration (hour)		**Contingency Tables (6)**	**Median Test (6)**	**Methods based on Ranks (6)**	**Measures of Rank correlation(6)**	**Several related samples(6)**
S-1	SLO-1	Understand 2 x 2 Contingency Tables	Differentiate Median Test	Compare Mann- Whitney test	Analyze Spearman's Rho	Identify Friedman Test
S-2	SLO-1	Analyze Chi-square Test	Assess Pearson's Contingency Coefficient	Problem solving Exercises	Apprise Kendall's Tau	Compose Quade Test
S-3	SLO-1	Apprise Fisher's Exact Test	Evaluate Cramer's Contingency Coefficient	Assess Wilcoxon signed rank test	Kendall's Partial Correlation Coefficient	Problem solving Exercises
S-4	SLO-1	Calculate Chi-square for Independence	Problem solving Exercises	Problem solving Exercises	Calculate Daniel's Test for Trend	Assess Page Test for Ordered Alternatives
S-5	SLO-1	Criticize Chi-square Test for homogeneity	Assess Phi-coefficient	Evaluate Kruskal – Walli's Test	Discriminate Jonckere – Terpstra Test	Apprise Kolmogorov Goodness-of-fit Test

Duration (hour)		Contingency Tables (6)	Median Test (6)	Methods based on Ranks (6)	Measures of Rank correlation(6)	Several related samples(6)
S-6	SLO-1	Identify Mcnemar Chi sq, Likelihood ratio	Cochran's Test for Related Observations	Problem solving Exercises	Problem solving Exercises	Problem solving Exercises

Learning Resources	1. Nonparametric statistics for health care research, majorie A Pett, Sage 1997.	2. Practical nonparametric statitics WJ Conover, John wiley & Sons, NY, 3rd Ed, 2006.

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%
Level 3	Evaluate Create	10%	10%	15%	15%	15%	15%
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mrs. Anita Cecelia, Biostatistician, CTS, Chennai	1. Dr. L. Jeyseelan, Dept of Biostatisitcs, CMC, Vellore	1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST

Course Code	MBE 18307 / MBE21307	Course Name	SYSTEMATIC REVIEW AND META ANALYSIS	Course Category	E	Professional Elective	L	T	P	C
							1	1	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	*The purpose of learning this course is to:*
CLR-2 :	
CLR-3 :	*To introduce methods to perform systematic reviews and meta-analysis of observational studies and clinical trials.*
CLR-4 :	*To do Literature search using softwares (Zotero)*
CLR-5 :	*To formulate an answerable research question, define inclusion and exclusion criteria, search for the evidence*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning				Program Learning Outcomes (PLO)													
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
CLO-1 :	*To describe the steps in conducting a systematic review*		*3*	*95*	*85*		*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*
CLO-2 :	*To develop an answerable question using the "Participants Interventions Comparisons Outcomes" (PICO) framework*		*3*	*90*	*80*		*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*
CLO-3 :	*To describe the process used to collect and extract data from reports*		*3*	*90*	*80*		*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*
CLO-4 :	*To describe methods to critically assess the risk of bias*		*3*	*90*	*80*		*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*
CLO-5 :	*To describe and interpret the results of meta-analyses*		*3*	*90*	*80*		*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*H*	*M*

Duration (hour)		Introduction to Systematic Review (6)	Planning process and synthesis of systematic reviews (6)	Introduction and process of Meta - analysis (6)	Application of meta- analysis in systematic reviews - I (6)	Application of meta- analysis in systematic reviews - II (6)
S-1	SLO-1	Evidence based health care, role of EBP	Employ Planning a review, searching for studies	Introduction to Meta-analysis	Understand concept of Systematic review and meta- analysis	Construct Fixed effect model
S-2	SLO-1	List Introduction, Rationale, Potential and promise of systematic reviews	Construct Protocol writing	List stages in Meta-analysis	Statistical methods for combining results from several studies	Evaluate random effect model
S-3	SLO-1	Understand Principles and procedures of Systematic reviews	Compare search strategy, locating and selecting studies	Understand Minimizing error and bias	Define weighted average, Forest Plot	Illustrate Diversity and Heterogeneity
S-4	SLO-1	List Advantages , Problems and limitations in conducting Systematic reviews	Assessing the quality of studies	Criticisms of Meta-analysis	Examine effect size based on means	Assess Sensitivity analyses

Duration (hour)		Introduction to Systematic Review (6)	Planning process and synthesis of systematic reviews (6)	Introduction and process of Meta - analysis (6)	Application of meta- analysis in systematic reviews - I (6)	Application of meta- analysis in systematic reviews - II (6)
S-5	SLO-1	Types of systematic reviews — systematic review of observational studies, clinical trials and diagnostic studies	assessing the risk of bias in included studies	List advantages and limitations in Meta-analysis	Explain effect size based on correlations	Conclude Publication bias,Funnel Plot
S-6	SLO-1	Differences between narrative and systematic reviews	Introduction to Review Manager (RevMan) software for systematic reviews	Problem solving	Identify effect based on binary data	Discuss Critical review of systematic reviews

Learning Resources	1. Cochrane handbook for systematic reviews of interventions. Julian PT Higgins, Sally Green, Oxford: Cochrane collaboration, 2011 2. Practical meta analysis. Mark W Lipsey, David B Wilson, Sage Publications 2001.	3. The handbook of research synthesis harris cooper, Larry V Hedges, Russel sage 1994. 4. Systematic reviews and meta analysis pocket guide to social work research methods. Julia H Littell, Oxford Univ Press, 2008.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mrs.Devika, Scientist B, NIE, ICMR, Chennai	*1. Mr. Richard, Cochrane Asia, CMC, Vellore*	*1. Dr.H. Gladius Jennifer, Asso.Prof, SRMIST* *2. Dr.M. Prakash, Asst. Prof, SRMIST*

Course Code	MBE 18308 / MBE21308	Course Name	SPATIAL STATISTICS	Course Category	S	*Skill Enhansment*	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1 :	*Utilize various GIS and navigation tools and techniques to handle spatial and non-spatial database*			
CLR-2 :	*Understand concepts of data visualization of spatial data*			
CLR-3 :	*Able to conceptualize spatial autocorrelation*			
CLR-4 :	*Utilize knowledge to do spatial regression analysis*			
CLR-5 :	*Able to use knowledge to solve spatial problems*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Describe various GIS and Navigation tools and techniques within spatial analytical framework and handle spatial and non-spatial database.*	*1*	*90*	*80*
CLO-2 :	*Able to visualize spatial data for better understanding*	*3*	*85*	*75*
CLO-3 :	*Analyze spatial data for spatial autocorrelation*	*2*	*70*	*65*
CLO-4 :	*Predict using spatial regression models*	*2*	*85*	*75*
CLO-5 :	*Apply integrated geospatial techniques in health care problems.*	*3*	*85*	*75*

Program Learnig Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	*L*	*M*	*L*	*L*	-	*L*	-	*L*	*L*	-	-	-	*H*
M	*H*	*M*	*M*	*H*	*M*	*L*	*M*	*H*	*M*	-	*H*	-	*M*
M	*H*	*M*	*H*	*L*	-	*L*	-	*M*	*L*	-	*M*	-	-
H	*M*	*H*	*M*	*M*	*L*	*L*	-	*L*	*L*	-	*M*	-	-
H	*H*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*L*	-	*H*	-	*H*

Duration (hour)		Spatial Data (9)	Visualization of Spatial Data (9)	Spatial Auto Correlation Analysis (9)	Spatial Regression Analysis (9)	Project Work (9)
S-1	SLO-1	Understanding the Global Information System: Definition, Philosophy & Historical evolution of GIS	Understanding the basics of Visualization	Explain the concept of autocorrelation	Introduction to spatial regression concept	Discuss on spatial problem
S-2	SLO-1	Understanding the components of GIS	Explain different type of maps for point and areal features	Understand the assumptions and aims of autocorrelation	**Fitting of Regression Models for Independent and Spatially Auto Correlated Data**	Conceptualize the problem for spatial analysis

Duration (hour)		Spatial Data (9)	Visualization of Spatial Data (9)	Spatial Auto Correlation Analysis (9)	Spatial Regression Analysis (9)	Project Work (9)
S-3	SLO-1	Understanding basic concepts of spatial data from non-spatial data	Differentiate symbolization in Maps	Explain the statistics for autocorrelation	Recollect Estimation and Inference	Tools for spatial data collection
S-4	SLO-1	Differentiating spatial data from non-spatial data	Explain visual variables and color	Morans I and Geary's C	Interpretation of spatial data	Spatial Data collection
S-5	SLO-1	Understanding basic concepts of spatial data models – Raster and Vector data	Explain Smoothing probabilities and rates	Understanding **Local Indicators of Spatial Associations, Assumptions and Aim**	**Universal Kringing.Fitting of Simultaneous and Conditional Autoregressive Models**	Spatial Data collection
S-6	SLO-1	In depth understanding of Raster Data & its Representation	Understand weighting in spatial analysis	Understanding **Local Indicators of Spatial Associations**	Demonstrate Conditional Autoregressive models	Spatial Data analysis
S-7	SLO-1	Understanding data structures and file format	Illustrate Exploratory Data analysis in Spatial data	Explain Pearsons correlation for spatial data	Exercise	Spatial Data analysis
S-8	SLO-1	Understanding Geocoding Issues and Location uncertainty	Demonstrate univariate and multivariate analysis for spatial data	Understanding Tango index and Focused score test to trends	Demonstrate Spatial Autoregressive models	Spatial Data analysis
S-9	SLO-1	Illustrate Problems with spatial data	Problem solving exercise	Problem solving exercise	Problem solving exercise	Spatial Data analysis

Learning Resources	1. Applied spatial statistics for public health data by Walter LA, Gotway CA. Wiley Series,2004. 2. Applied spatial data analysis with R by Roger SB, Edzer JP. Springer Series, 2013.	3. Geoda User guide by Luc Anselin, Center for spatially integrated social science, 2003. 4. Interactice spatial data analysis by Trevor Bailey. Prentice Hall, 2nd Ed 2009. 5. Health Mapper, WHO manual.

Learning Assessment							
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)				University Examination (50% weightage)	
		CLA – 1 (25%)		CLA – 2 (25%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*
	Create						
	Total	100 %		100 %		100%	

CLA – 2 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr Vasna Josua , Scientist C , ICMR NIE , Chennai	*1. Dr.L.Jeyseelan, Professor, CMC, Vellore*	*1. Dr.M Prakash , Asst prof , SRMIST* *2. Dr.Vignesh, Asst Prof, SRMIST* *3. Dr Jennifer, Asso Prof, SRM IST*

Course Code	MBE 18309 / MBE21309	Course Name	DATA ANALYTICS USING SAS	Course Category	M	Manditory Course	L	T	P	C
							1	1	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Public Health	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To introduce various functions in SAS software
CLR-2 :	To introduce variables entry and manipulation of data in SAS
CLR-3 :	Learn to work with descriptive statistics in SAS
CLR-4 :	Able to analyze univariate analysis in SAS
CLR-5 :	Perform regression analysis using SAS

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Understand the basic concepts of SAS	3	95	85
CLO-2 :	Use functions to access data	3	90	80
CLO-3 :	Understand and execute data manipulation using SAS	3	90	80
CLO-4 :	Discriminate data processing and analysis in SAS	3	90	80
CLO-5 :	Utilize Reporting and Output delivery system in SAS	3	90	80

Program Learning Outcome (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	Professional Behavior	Life Long Learning
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H
H	H	M	H	H	H	H	H	H	H	M	H	M	H

Duration (hour)		Introduction to SAS (6)	Data Access and Data Importing (6)	Data Management in SAS (6)	Processing and Analysis (6)	Reporting Interface (6)
S-1	SLO-1	Introduction to SAS, Listing and Data formatting steps in SAS	Concept of format and lis input in SAS to process Raw data	Introduction to SAS libraries, Explain different sources of data	Understanding Data grid in SAS, Application of Standard formats in Data grid	Introduction to reporting interface in SAS, Creating simple list of Data
S-2	SLO-1	Dataset creation in SAS	In file statement for processing raw data	Data editing and sorting in SAS, Delimited Raw data and Formatting Data	Definition of own character and numeric formats, Application of user Defined formats	Frequency and cross tabulations
S-3	SLO-1	Exploring Data and Data Manipulation in SAS, Data management in SAS	Practical application of in file statement in SAS	Executing SAS statements for Sorting and formatting	Explain Query and Sorting,	Summary data set and Summary reports, Distribution and summary statistics

Duration (hour)		Introduction to SAS (6)	Data Access and Data Importing (6)	Data Management in SAS (6)	Processing and Analysis (6)	Reporting Interface (6)
S-4	SLO-1	Reporting and Analysis , Interpretation of data in SAS	Explore Raw data	Modifying variables attributes in SAS	Utilization of Mathematical operators	ANOVA, Correlation and Reression analysis
S-5	SLO-1	Writing and Running SAS code	Merging dataset using Row and Column	SAS function for Manipulating Character and Numerical data	Creating Summary data and using compound filters	Changing Outpt formats and syle, Generating Reports using ODS statement
S-6	SLO-1	Understanding data tables, Writing and Running SAS code	Import and exporting data in SAS	Explaining SAS date values and Do loops, Practice Array, validation of data	Recoding data of Character and numerical data	Identify and correct syntax error

Learning Resources	1. The Little SAS Book for Enterprises Guide 4.1, Susan J Slaughter Lara D Delviche SAS, 2006 Institute INC, NC, VSA, ISBN-978-1-59994-089-2	2. Health Care Data and SASMargeScerbo, Craig Dickstein, and Alan Wilson, 1st edition SAS Institute, 2000

Learning Assessment							
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**				**University Examination (50% weightage)**	
		CLA – 1 (25%)		**CLA – 2 (25%)**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Understand						
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze						
Level 3	Evaluate	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Create						
	Total	100 %		100 %		100%	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Ms.Subhashini, Consultant, SAS, NewDelhi.	*1. Dr. M. Bagavandas, HOD, Centre for statisitcs, SRMIST*	*1. Dr.M. Prakash, Asst. Prof, SRMIST*