SACRED HEART COLLEGE (AUTONOMOUS)

Department of Environmental Studies

Post Graduate Programme

(Environmental Science)

Course plan

Academic Year 2018 - 19

Semester 1

	Programme Outcome
PO 1	**Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO 2	**Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the word by connecting people, ideas, books, media and technology.
PO 3	**Effective Citizenship:** Demonstrate empathetic social concern and equity centered national development, and the ability to act an informed awareness of issues and participate in civic life through volunteering.
PO 4	**Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.
PO5	**Ethics**: Recognise different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO 6	**Global Perspective:** Understand the economic, social and ecological connections that link the world's nations and people.

PROGRAM SPECIFIC OUTCOMES	
PSO 1	Students become conscientious of the need for environmental protection and conservation and get moulded to be the future guardians of nature
PSO 2	Students get equipped to use various tools and techniques for the study of environment
PSO 3	Students become able to understand, think and evolve strategies for management and conservation of the environment.
PSO 4	Students get trained in understanding environmental disasters and develop strategies to mitigate them.

Course Code	Title Of The Course	No. Hrs./Week	Credits	Total Hrs./Sem
16P1EVST01	Fundamentals Of Environmental Studies	5	4	90
16P1EVST02	Research Methodology I	4	4	90
16P1EVST03	Research Methodology II	4	4	90
16P1EVST04	Information Technology Applications In Research	4	5	90

COURSE PLAN (COURSE 1)

PROGRAMME	**MSc ENVIRONMENTAL SCIENCE**	SEMESTER	1
COURSE CODE AND TITLE	**16P1EVST01 : FUNDAMENTALS OF ENVIRONMENTAL STUDIES**	CREDIT	4
HOURS/WEEK	**5**	HOURS/SEM	90
FACULTY NAME	**Dr. Anjana N S**		

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Interpret core concepts and methods from ecological sciences and their application in environmental problem-solving.	PO4, PO5, PSO1, PSO3	U
CO 2	Describe the transnational character of environmental problems and ways of addressing them.	PO1,PO4, PSO1, PSO3	U
CO 3	Analyse the primary environmental problems (e.g., invasive species, climate change, small populations, pollution) and the science behind those problems.	PO1,PO3, PO4, PSO1, PSO3	A
CO 4	Develop specific skills necessary to achieve understanding of and solutions to environmental problems, including those necessary for assessment of environmental impact of human activity, and for monitoring of the health of environmental systems.	PO3, PO4,PO6, PSO1, PSO3, PSO4	C
CO 5	Develop knowledge and skills needed to effectively manage human resources	PO3,PO4, PO6, PSO1, PSO3, PSO4	c
CO 6	Develop skills required to research and analyze environmental issues scientifically and learn how to use those skills in situations that may involve environmental problems and/or issues.	PO3, PO4, PSO1, PSO2, PSO3	C

CL* Cognitive Level: R- Remember, A-Apply, An- Analyze, E- Evaluate, Cr-Create

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	**0**	**0**	**0**	**3**	**1**	**0**	**3**	**0**	**3**	**0**
CO 2	**3**	**0**	**0**	**1**	**0**	**0**	**3**	**0**	**1**	**0**
CO 3	**2**	**0**	**1**	**3**	**0**	**0**	**2**	**0**	**3**	**2**
CO 4	**0**	**0**	**3**	**1**	**0**	**3**	**2**	**0**	**2**	**1**
CO 5	**0**	**0**	**1**	**3**	**0**	**3**	**3**	**0**	**3**	**3**
CO 6	**0**	**0**	**3**	**3**	**0**	**0**	**3**	**2**	**2**	**0**

Indicators: 0- No Mapping strength, 1. Low, 2. Medium, 3. High

Session	Topic	Learning Resources	Value Additions	Learning /Course Outcome
Module I Ecology and Environment				
1	**Physical Environment- biotic and abiotic interactions** -	Class room, Lecture, PPT Discussion. Photos diagrams of working shown	Video	(CO1), CO2)
2	**Concept of Homeostasis**			(CO1), CO2)
3	**Concept of habitats and niche,**	Outdoor study (observation)	E-Resource	(CO1), CO2)
4	**resource partitioning,**			(CO1), CO2)
5	**character displacement**			(CO1), CO2)
6	**Cybernetic nature of ecosystem, stability through feedback control and through redundancy of components;** .	Group Discussion videos of working shown	Exhibition of charts, models	(CO1), CO2)
7	**Resistance and resilience stability.**	PPT		(CO1), CO2)
8	**Gaia hypothesis**	PPT		(CO1), CO2)
9	**Concept of limiting factors- Liebig's law,**	Class room, Lecture, PPT Discussion. Photos diagrams of working	Seminar	(CO1), CO2)

		shown		
10	**Shelford's law. Ecological indicators**	PPT		(CO1), CO2)
Module II **Ecosystem - Structure and Function**				
11	**Landscapes, pathways in ecosystem**	Class room, Lecture, PPT Discussion. Photos diagrams of working shown	*Seminar*	(CO1), CO2)
12	**energy in the environment- Laws of thermodynamics,**	Class room, Lecture, PPT Discussion. Photos diagrams of working shown		(CO1), CO2)
13	**energy flow in the ecosystem.**	PPT		(CO1), CO2)
14	**Primary productivity, Biomass and productivity measurement**	Lab analysis, Group Discussion videos of working shown	*Exhibition of charts, models*	(CO1), CO2)
15	**Food chain, food web, trophic levels.**	Out door activity, making food chain and food web	*Group discussion*	(CO1), CO2)
16	**Ecological efficiencies**	PPT		(CO1), CO2)
17	**Biogeochemical cycles- patterns and types (CNP).**	PPT		CO1), CO2)
18	**Tropical versus Temperate Ecology.** -	Class room, Lecture, PPT Discussion. Photos diagrams of working	*Seminar*	(CO1), CO2)

		shown		
19	**Ecological pyramids**	Class room, Lecture, PPT Discussion. Photos diagrams of workingshown	*Demo video*	(CO1), CO2)
Module III Population Ecology				
20	**Population group properties, density and indices of relative abundance, Concept of rate**	Audiovisuals and PowerPoint presentation		(CO1), CO2) (CO6)
21	**Natality and mortality. Population age structure,**	Lecturing and PowerPoint presentation		(CO6)
22	**Growth forms and concept of carrying capacity**	PPT		(CO6)
23	**Population fluctuations, density dependent and density independent controls.**	Students presentation and group discussion	Exhibition of charts, models	(CO6)
24	**Life history strategies, r & k selection.**	PPT		(CO6)
25	**Population structure, aggregation,**	PPT		(CO6)
26	**Allee's principle, isolation, dispersal and territoriality**	Demonstration and Group discussion, Lecturing		(CO6)

27	**Population interactions- types, positive and negative,**	PPT		(CO6)
28	**interspecific and intraspecific interactions.**	Video		(CO6)
29	**Ecological and evolutionary effects of competition.**	Student presentation, audiovisuals, and collaborating	Group discussion	(CO6) .
30	**Concept of metapopulation**	PPT		(CO6)
31	**Levin's model of metapopulation.**	PPT		(CO6)
32	**Comparison of Metapopulation and Logistic population model.**	Lecturing and group discussion	Seminar	(CO6) (CO5), (CO6)
33	**Metapopulation structure**	PPT		(CO5), (CO6)
Module IV Community Ecology				
34	**Concept of community - community structure and attributes, ecotone and edge effect**	Class room, Lecture, PPT Discussion. Photos diagrams of working shown	Group discussion	(CO3), (CO6)
35	**Species diversity in community and it's measurement- Alpha diversity,**	Student presentation and discussion	Demo video	(CO5),(CO3), (CO6)
36	**Simpson's diversity index,**	PPT		(CO5),(CO3),

37	**Shannon index,**	PPT	Demo video	(CO5),(CO3),
38	**Fisher's alpha, rarefaction**	PPT		(CO5),(CO3),
39	**Beta diversity- Sorensen's similarity index**	Class room, Lecture, PPT Discussion. Photos diagrams of working shown	Group discussion	(CO3), (CO6)
40	**Whittaker's index,**	PPT		(CO3), (CO6)
41	**Evenness, Gamma diversity**	PPT		(CO3), (CO6)
42	**Guild and its functioning in the community.**	Class room, Lecture, PPT Discussion. Photos diagrams of working shown		(CO3), (CO6),
43	**Drivers of species diversity loss and conservation**	PPT		(CO3), (CO6),
Module V Resource Ecology and ecosystem monitoring				
44	**Soil-soil formation,**	Demonstration and Group discussion, Lecturing	*Exhibition of charts, models*	(CO3), (CO5)
45	**physical and chemical properties of soil,**	Demonstration and Group discussion, Lecturing		(CO3), (CO5)
46	**Significance of soil fertility.**	Demonstration and		(CO3), (CO5)

		Group discussion, Lecturing		
47	**Mineral resources with reference to India.**	Demonstration and Group discussion, Lecturing	*Exhibition of charts, models*	(CO3), (CO5)
48	**Impact of mining on environment;**	Student presentation and discussion	Group discussion	(CO3), (CO5)
49	**Forest resources deforestation, forest scenario of India**	PPT		(CO3), (CO5)
50	**Wetlands and its importance,**	PPT		(CO3), (CO5)
51	**International initiatives for wetland conservation -**	Student presentation and discussion	*Seminar*	(CO3), (CO5)
52	**Ramsar sites.**	Student presentation and discussion		(CO3), (CO5)
53	**Sand mining and its impacts.**	Student presentation and discussion	*Seminar*	(CO3), (CO5)
54	**Wetland reclamation- causes and consequences.**	Student presentation and discussion		(CO3), (CO5)
55	**Depletion of resources and impacts on quality of life**	Student presentation and discussion		(CO3), (CO5)
56	**Energy use pattern in different parts of the world, recent issues in energy** -	Class room, Lecture, PPT Discussion	*Demo video*	(CO3), (CO5)

57	**production and utilization;**	Class room, Lecture, PPT Discussion		(CO3), (CO5)
58	**Energy audit,**	Class room, Lecture, PPT Discussion	*Demo video*	(CO3), (CO5)
59	**Green technology and sustainable development**	Class room, Lecture, PPT Discussion		(CO3), (CO5)
60	**Ecosystem monitoring- GIS, Physics of remote sensing, role of remote sensing in ecology, GPS and its application**	Class room, Lecture, PPT Discussion	*Exhibition of charts, models*	(CO3), (CO5)
61	**EIA- tools and techniques, Concept of Ecosystem Modelling.**	Class room, Lecture, PPT Discussion	*Group discussion*	(CO3), (CO5)
Module VI **Impacts on environment and ecological manoeuvre**				
62	**Session Topic: Environmental Pollution-types, causes and consequences.**	Student presentation and discussion	*Group discussion*	(CO3)
63	**Concept of waste, types and sources of solid wastes including e-waste**	PPT		(CO3)

64	**Environmental biotechnology and solid waste management- aerobic and anaerobic systems.**	Class room, Lecture, PPT Discussion Student presentation and discussion	*Demo video*	(CO3)
65	**Concept of bioreactors in waste management**	PPT		(CO3)
66	**Liquid wastes and sewage.**	Class room, Lecture, PPT Discussion Student presentation and discussion	*Group discussion*	(CO3)
67	**Bioremediation- need and scope of bioremediation in cleaning up of environment**	PPT		(CO3)
68	**Phytoremediation, bio-augmentation**	Class room, Lecture, PPT Discussion	*Seminar*	(CO3)
69	**biofilms, biofilters, bioscrubbers and trickling filters**	Student presentation and discussion	*Group discussion*	(CO3)
70	**Radiation Biology - natural and man-made sources of radioactive pollution;**	Class room, Lecture, PPT Discussion	*Group discussion*	(CO3)

71	**Radioisotopes of ecological importance; effects of radioactive pollution**	PPT	*Group discussion*	(CO3)
72	**Nuclear disasters (two case studies), Disposal of radioactive wastes.**	Class room, Lecture, PPT Discussion Student presentation and discussion	*Group discussion*	(CO3)
73	**Toxicology- Principles, toxicants- types, dose and effects, toxicity of heavy metals**	Class room, Lecture, PPT Discussion Student presentation and discussion	*Exhibition of charts, models*	(CO3)
74	**Global environmental problems and debates - past and present**	Student presentation and discussion		(CO3)
Module VII Conservational Ecology				
75	**Principles and major approaches to conservation and environmental management.**	Class room, Lecture, PPT Discussion		(CO4)
76	**Role of UN-conventions, protocols**	PPT		(CO4)
77	**Climate change and the emerging discussions – mitigation and adaptation;**	Class room, Lecture, PPT Discussion	Group discussion	(CO4)

78	**Role of UNFCC and IPCC**	PPT		(CO4)
79	**Country specific laws- mention major environmental/ conservation laws and rules in India-Wildlife Protection Act 1972 amended 1991,**	Class room, Lecture, PPT Discussion		(CO4)
80	**Forest Conservation Act, 1980, Air (Prevention and Control of Pollution) Act 1981,**	Class room, Lecture, PPT Discussion	Group discussion	(CO4)
81	**Water (Prevention and Control of Pollution) Act 1974, amended 1988,**	PPT		(CO4)
82	**The Environment Seminar Protection Act, 1986 and Rules, 1991.**	PPT	Group discussion	(CO4)
83	**The Biological Diversity Act 2002, Rules 2004.**	Class room, Lecture, PPT Discussion		(CO4)
84	**Restoration Ecology- need and policies,**	Class room, Lecture, PPT Discussion	Group discussion	(CO4)
85	**case studies and success stories - global and national;**	PPT		(CO4)

86	**Participatory resource management,**	PPT		(CO4)
87	**community reserves, sacred groves, biovillages.**	PPT		(CO4)
88	**Role of Intergovernmental and Nongovernmental organizations in conservation- IUCN**	PPT		
89	**, WCMC, WRI,**	Student presentation and discussion		(CO4)
90	**WWF, CI and Green Peace.**	PPT		(CO4)
91	**National and Local NGOs**	Class room, Lecture, PPT Discussion	Group discussion	(CO4)

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Course Outcome
1	02/07/2018	Role of Intergovernmental and Nongovernmental organizations in conservation	CO 5

References

1. Abbasi, S.A. and Ramasami, E.V.1998.Biotechnological Methods of Pollution Control. Oxford University Press, Hyderabad.
2. Arvind, K., and Pashupati, K,R. (2008), Environmental resource management: (critical issues) Astral International.
3. Benton, A.H. and Werner, W.E. 1976. Field Biology and Ecology. Tata McGraw Hill, New Delhi.
4. Biswas, A., and Cline, S.: Global warming: Impacts onWater and Food Security, Dehra dun, 1982.

5. Holling C.S. 1973. Resilience and stability of ecological systems. Annual Review of ecology and systematic 4: 1-23.
6. Boitani, L and T.K.Fuller.2000.Research Techniques in Animal Ecology. Columbia University Press, USA
7. Daniel,C.D. 2010.Environmental Science.(8thedn).Jones and Bartlett Publishers.
8. Dasman, R.F: (1972). Environmental conservation, New York, Wiley,
9. EmbardHaque C (2005) Mitigation of Natural Hazards and DisastersNatural

COURSE PLAN

PROGRAMME	**MSc ENVIRONMENTAL SCIENCE**	SEMESTER	1
COURSE CODE AND TITLE	**16P1EVST02 : RESEARCH METHODOLOGY I**	CREDIT	4
HOURS/WEEK	**4**	HOURS/SEM	90
FACULTY NAME	**MS. RESHMI.A.N**		

	COURSE OUTCOMES	**PO/ PSO**	**CL**
CO 1	To tabulate statistical information given in descriptive form.	PO1, PO4, PSO1, PSO2	A
CO 2	To use graphical techniques and interpret	PO1, PO4, PSO1, PSO2	An
CO 3	To compute various measures of central tendency, dispersion.	PO1, PO4, PSO1, PSO2	A
CO 4	To compute correlation coefficient and Regression	PO1, PO4, PSO1, PSO2	A
CO 5	Compute probability of various events based on Binomial Poisson and Normal Distribution	PO1, PO4, PSO1, PSO2	A
CO 6	Do Large Sample Tests, Small Sample test , Chi square Test, Anova , Non Parameteric Test	PO1, PO4, PSO1, PSO2	E

CL* Cognitive Level: R- Remember, A-Apply, An- Analyze, E- Evaluate, Cr-Create

CO – PO /PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**2**			**2**			**3**	**3**		
CO 2	**1**			**2**			**3**	**3**		
CO 3	**1**			**3**			**2**	**3**		
CO 4	**2**			**2**			**3**	**3**		
CO 5	**2**			**2**			**3**	**3**		
CO 6	**2**			**2**			**2**	**3**	**2**	

Indicators: 0- No Mapping strength, 1. Low, 2. Medium, 3. High

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE I : Basics of Biostatistics				
1	Introduction to statistics	PPT	video	CO 1
2	Collection of data, Types of data	PPT/Lecture		CO 1
3	Sampling methods	PPT/Lecture		CO 1
4	Classification and Tabulation	PPT/Lecture	e-resource	CO 1
5	Diagrammatic representation of data	PPT/Lecture		CO 1
6	Graphical Representation of data			
7	Parametric and Non parametric tests			
8	Bivariate and Multivariate Analysis			
MODULE II : Measures of Central Tendency				
9	Mean	PPT/Lecture		CO 2
10	Median	Lecture		CO 2
11	Mode	Lecture	Quiz	CO 2
12	Geometric mean and Harmonic mean, problems	Lecture		CO 2
MODULE III : **Measures of Dispersion**				
13	Absolute and relative measures of dispersion	PPT/Lecture		CO 3
14	Range, Quartile Deviation	PPT/Lecture		CO 3
15	Mean Deviation	PPT/Lecture		CO 3
16	Standard Deviation	Lecture	Quiz	CO 3
17	Standard Deviation	PPT/Lecture		CO 3
18	Properties, Problems	PPT/Lecture		CO 3
19	Folds, faults and dykes	PPT/Lecture		CO 3
20	Folds, faults and dykes	PPT/Lecture		CO 3
21	Skewness	PPT/Lecture		CO 3
22	Kurtosis	PPT/Lecture		CO 3

MODULE IV : Correlation Analysis				
38	Correlation			
39	Correlation Coefficient	PPT/Lecture		CO 4
40	Rank Correlation	Lecture		CO 4
41	Rank Correlation Coefficient	PPT/Lecture		CO 4
42	Problems	PPT/Lecture		CO 4
MODULE V : Regression Analysis				
58	Regression Equations	Lecture		CO 5
59	Regression Problems	PPT/Lecture		CO 5
60	Probit Analysis	PPT/Lecture		CO 5
61	Mathematical models in Biology	PPT/Lecture		CO 5
62	Length-Weight Relationship	PPT/Lecture		CO 5
63	VBG Model	PPT/Lecture		CO 5
MODULE VI : Theory of Probability				
64	Probability concepts, Random Experiment	Lecture	Demo video	CO 6
65	Sample Space,Events, Probability Measure	Lecture		CO 6
66	Classical definition of probability	Lecture	Group discussion	CO 6
67	Statistical Definition of probability	Lecture		CO 6
68	Axiomatic Definition Of probability	PPT/Lecture		CO 6
69	Addition THeorem	PPT/Lecture		CO 6
70	Conditional Probability	PPT/Lecture		CO 6
70	Independence of events	PPT/Lecture		CO 6
71	Multiplication Theorem	PPT/Lecture		CO 6
72	Random variable,Probability Distribution	PPT/Lecture	Group discussion	CO 6

73	Binomial ,poisson Distributions.	PPT/Lecture		CO 6
74	Normal Distribution	PPT/Lecture		CO 6
MODULE VII : Testing of Hypothesis				
79	Testing of Hypothesis introduction	PPT/Lecture		CO6
80	Definitions	PPT/Lecture		CO6
81	Large Sample Tests	PPT/Lecture		CO6
82	Large Sample Tests	PPT/Lecture		CO6
83	Chi –square Tests	PPT/Lecture		CO6
84	Small Sample Tests	PPT/Lecture		CO6
85	t test	PPT/Lecture		CO6
86	Paired t test	PPT/Lecture		CO6
87	F test	PPT/Lecture		CO6
88	Anova one way	PPT/Lecture		CO6
89	Anova one way	PPT/Lecture		CO6
90	Non Parametric test : u -test	PPT/Lecture		CO6
MODULE VIII : Vital Statistics				
91	Introduction, uses, records and system of classification	PPT/Lecture		CO6
92	Sample Registration system, Sample Design	PPT/Lecture		CO6
93	Survey of causes of death and age classification	PPT/Lecture		CO6
94	Measures of vital Statistics and Measures of population	PPT/Lecture		CO6
95	Mortality Rate, Fertility Rate, Life Tables	PPT/Lecture		CO6

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Course Outcome
1	11/07/2018	Problems based on measures of central Tendancy,Dispersion	CO 3
2	04/08/2018	Problems Based on Correlation	CO 3
3	23/08/2018	Problems based on Regression	CO4
4	12/09/2018	Problems based on Testing	CO4

References

- Bailey,N.T.J. 1994. Statistical Methods in Biology (3rdedn). Cambridge University Press.
- Chap T.Le.2003.Introductory Biostatistics. John Wiley &Sons, NJ, USA.
- Daniel, W.W. 2006. Biostatistics: A Foundation for Analysis in the Health Sciences (7th edn). John Wiley & Sons, New York.
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- Sundar Rao,P.S.S and J.Richard.2006.Introduction to Biostatistics and Research Methods (4th edn). Prentice Hall, New Delhi.
- Zar, Jerrold H. 2008. Biostatistical Analysis (3rdedn.). Pearson Education Inc., New Delhi.

COURSE PLAN

PROGRAMME	**MSc ENVIRONMENTAL SCIENCE**	SEMESTER	1
COURSE CODE AND TITLE	**16P1EVST03 : RESEARCH METHODOLOGY II**	CREDIT	4
HOURS/WEEK	**4**	HOURS/SEM	90
FACULTY NAME	**DR. T J James and Dr Remya R**		

	COURSE OUTCOMES	**PO/ PSO**	**CL**
CO 1	Explain some basic concepts of research and its methodologies	PO4, PO5, PSO1, PSO3	U
CO 2	Identify appropriate research topics	PO1,PO4, PSO1, PSO3	R
CO 3	Define appropriate research problem and parameters	PO1,PO3, PO4, PSO1, PSO3	R
CO 4	Prepare a project proposal (to undertake a project)	PO3, PO4,PO6, PSO1, PSO3, PSO4	C
CO 5	Organize and conduct research (advanced project) in a more appropriate manner	PO3,PO4, PO6, PSO1, PSO3, PSO4	An
CO 6	Prepare a research report and thesis	PO3, PO4, PSO1, PSO2, PSO3	C
CO7	Prepare a research proposal (for grant)	PO1, PO3, PO4, PSO1, PSO2, PSO3	C

CL* Cognitive Level: R- Remember, A-Apply, An- Analyze, E- Evaluate, Cr-Create

CO - PO/PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4
CO 1				3	3		2		3	
CO 2	3			3			3		3	
CO 3	3		3	2			3		2	
CO 4			2	2		3	2		3	2
CO5			2	3		3	2		2	3
CO6			3	2			2	2	3	
CO7	2		3	3			3	2	3	

Mapping Strength

0- No Mapping strength

1- Low

2- Medium

3- High

Session	Topic	Learning Resource	Value Addition	Course Outcome
Module I. Science and Life Sciences				
1	Basic concepts - Knowledge, Information and Data -	PPT Discussion	e-resource	CO1
2	Science, Pseudoscience	PPT Discussion	e-resource	CO1
3	Life Science - Definition, Laws, Characteristics.	PPT Discussion	e-resource	CO1
4	Scientific temper	PPT Discussion	e-resource	CO1
5	Empiricism	PPT Discussion	e-resource	CO1
6	Rationalism	PPT Discussion	e-resource	CO1
7	Units of measurements.	PPT Discussion	e-resource	CO1
Module II. Concepts of Research				
8	Basic concepts of research	PPT Discussion Seminar		CO1
9	Meaning, Objectives, Motivation and Approaches.	PPT, Seminar Discussion		CO1

10	Types of Research: (Descriptive/Analytical, applied/ Fundamental,	PPT Discussion Seminar		CO2
11	Types of Research: qualitative/Quantitative,	PPT Discussion Seminar	Student Assignment	CO2
12	Types of Research: Conceptual/Empirical.	PPT Discussion Seminar		CO2
13	Serendipity, Research methods versus Methodology,	PPT Discussion Seminar		CO2
14	Research and scientific method.	PPT Discussion Seminar		CO2
15	Research Process.	PPT Discussion		CO3
16	Research Process.	PPT Discussion		CO3
17	Research Process.	PPT Discussion		CO3
18	Research Process.	PPT Discussion		CO3

Module III. Research Formulation				
19	Research formulation - .	Lecture, PPT Discussion	. e-resource	CO5
20	Observation and Facts	Lecture, PPT Discussion		CO5
21	Prediction and explanation,	Lecture, PPT Discussion		CO5
22	Induction,	Lecture, PPT Discussion		CO5
23	Deduction.	Lecture, PPT Discussion		CO5
24	Defining and formulating the research problem,	Lecture, PPT Discussion		CO5
25	Defining and formulating the research problem,	Lecture, PPT Discussion		CO5
26	Defining and formulating the research problem,	Lecture, PPT Discussion		CO5
27	Selecting the problem and necessity of defining the problem.	Lecture, PPT		CO5

		Discussion		
28	Selecting the problem and necessity of defining the problem.	Lecture, PPT Discussion		CO5
29	Literature review -	Lecture, PPT Discussion	e-resource	CO5
30	Literature review -	Lecture, PPT Discussion		CO5
31	Importance of literature reviewing in defining a problem	Lecture, PPT Discussion		CO5
32	Critical literature review,			CO5
33	Identifying gap areas from literature review.	Lecture, PPT Discussion		CO5
34	Hypothesis -	Lecture, PPT Discussion		CO5
35	Null and alternate hypothesis	Lecture, PPT Discussion		CO5
36	testing of hypothesis	Lecture, PPT Discussion		CO5

Module IV. Research Designs				
37	Research Design - a	PPT Group Discussion		CO5
38	Basic principles of research design	PPT Discussion		CO5
39	Research Design: Meaning and Need	PPT Discussion		CO5
40	features of good design,	PPT Discussion		CO5
41	important concepts.	PPT Discussion		CO5
42	Types of research designs	PPT Group Discussion	video	CO5
43	Types of research designs	PPT Discussion		CO5
44	Development of a research plan -	PPT Group Discussion		CO5
45	Development of a research plan: Exploration	PPT Discussion		CO5
46	Development of a research plan: Description	PPT Discussion		CO5

47	Development of a research plan: Diagnosis	PPT Discussion		CO5
48	Development of a research plan: Experimentation	PPT Discussion		CO5
49	Determining experimental and sample designs.	PPT Group Discussion		CO5
50.	Determining experimental and sample designs.	PPT Discussion		CO5
51.	Important experimental designs	PPT Group Discussion	e-resource	CO5
Module V. Sampling				
52	Definition	PPT seminar		CO5
53	Purpose,	PPT Discussion		CO5
54	principle advantages of sampling.	PPT Discussion		CO5
55	Unit of sampling	PPT Discussion		CO5
56	Population: techniques	PPT	Student	

		seminar	Assignment	CO5
57	Characteristics of good samples	PPT Discussion	e-resource	CO5
58	Sampling errors	PPT Discussion		CO5
59	Sampling errors	PPT Discussion		CO5
60	Cays to reduce sampling errors	PPT Discussion		CO5
Module VI. Data Collection.				
61	Experiments and surveys,	PPT	. Quiz	CO5
62	Data collection techniques	PPT Discussion	e-resource	CO5
63	collection of primary data	PPT Discussion		CO5
64	data through questionnaires,	PPT		CO5
65	data through schedules	PPT		CO5
66	secondary data,	PPT	video	CO5
67	selection of appropriate method for data collection, case study method.	PPT Discussion		CO5
Module VII. Scientific Documentation and Communication				

68	Research report writing	PPT	e-resource	CO6
69	Research report writing	PPT		CO6
70	Thesis and dissertations,	PPT Discussion		CO6
71	Research articles,	PPT Discussion	e-resource	CO6
72	Oral communications.	PPT Discussion		CO6
73	Project proposal writing	PPT	video	CO4, CO7
74	Project proposal writing	PPT Discussion		CO4, CO7
75	Project proposal writing	PPT Discussion		CO4, CO7
76	Presentation techniques	PPT Discussion	e-resource	CO6
77	Assignment, Seminar, Debate,	PPT Discussion	Video e-resource	CO6
78	Workshop, Colloquium, Conference.	PPT Discussion	video	CO6
79	Abstract, synopsis, summary	PPT Discussion	e-resource	CO6
80	Referencing methods.	PPT	e-resource	CO6

		Discussion		
Module VIII. Information Science, Extension and Ethics				
81	Sources of Information - Primary and secondary sources.	PPT Discussion	e-resource	CO2, CO3,CO4, CO5, CO6, CO7
82	Library - books, journals, periodicals, reference sources	Class room, Lecture, PPT	Quiz	CO2, CO3, CO4, CO5, CO6, CO7
83	abstracting and indexing sources, Reviews, Treatise, Monographs, Patents	PPT Discussion	e-resource	CO2, CO3, CO4, CO5, CO6, CO7
84	Internet -Search engines and software, online libraries, e-Books, eEncyclopedia, TED Talk, Institutional Websites.	Class room, Lecture, PPT	Video e-resource	CO2, CO3, CO4, CO5, CO6, CO7
85	Intellectual Property Rights - Copy right, Designs, Patents, Trademarks, Geographical indications.	Class room, Lecture, PPT	e-resource	CO2, CO3, CO4, CO5, CO6, CO7
86	Safety and precaution - ISO standards for safety, Lab protocols,	Class room, Lecture, PPT	e-resource	CO2, CO3, CO4, CO5, CO6, CO7
87	Lab animal use, care and welfare, animal houses, radiation hazards.	PPT Discussion	Video	CO2, CO3, CO4, CO5, CO6, CO7
88	Extension: Lab to Field, Extension communication, Extension tools.	Class room, Lecture, PPT		CO2, CO3, CO4, CO5, CO6, CO7

89	Bioethics: Laws in India, Working with man and animals,	Class room, Lecture, PPT	Quiz	CO2, CO3, CO4, CO5, CO6, CO7
90	Consent, Animal Ethical Committees and Constitution	Class room, Lecture, PPT		CO2, CO3, CO4, CO5, CO6, CO7

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded AND Non-graded etc)	Course Outcome
8/08/2018	Bioethics: Laws in India, Working with man and animals, Consent, Animal Ethical Committees and Constitution - Written	CO 5

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded AND Non-graded etc)	Course Outcome
8/07/2018	Assignment, Seminar, Debate, project proposal writing, report writing- Written	CO 1, CO4, CO6, CO7
11/08/2018	Workshop, Colloquium, Conference.- group discussion	CO1
20/09/2018	Workshop, Colloquium, Conference- Mock workshop, seminar, colloquium	CO1

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Ahuja,V.K. 2010. Law of Copy Rights and Neighbouring Rights: National and International Perspectives..Lexis Nexis- Butterworths Wadhwa, Nagpur

Ahuja,V.K. 2007. Law Relating to Intellectual Property Rights. Lexis Nexis-Butterworths Wardha,Nagpur.

Bright Wilson. 1990. An Introduction to Scientific Research. Dover Publications. NY.

Clough,P.and C.Nutbrown.2002. A Student's Guide to Methodology: Justifying Enquiry. Sage, London.

Dharmapalan, Biju. 2012. Scientific Research Methodology. Narosa Publishing House, New Delhi Finney ,D.J. 1980.Statistics for Biologists. Chapman and Hall, London

Glenn McGee.2003. Pragmatic Bioethics. The MIT Press, MA, USA
Jeremy R. Garret.2012. The Ethics of Animal Research. The MIT Press, MA. USA Kothari C.R., 2009. Research Methodology: Methods and Techniques (2ndedn.). NewAge International Publishers, New Delhi.

Paul Oliver.2005. Writing Your Thesis. Vistaar Publications.New Delhi.
Peter Medawar.1979. Advice to Young Scientist. Harper and Row, London.
Phillippe Cullet.2005. Intellectual Property Protection and Sustainable Development. Lexis NexisButterworths, Wardha, Nagpur.

COURSE PLAN

PROGRAMME	**MSc ENVIRONMENTAL SCIENCE**	SEMESTER	1
COURSE CODE AND TITLE	**16P1EVST04 : INFORMATION TECHNOLOGY APPLICATIONS IN RESEARCH**	CREDIT	5
HOURS/WEEK	4	HOURS/SEM	90
FACULTY NAME	TRESSA SHYBE		

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Identify the importance of IT enabled services and challenges.	PO1, PSO1	U
CO 2	Identify the components of a computer system and demonstrate basic proficiency in commonly used applications.	PO1,PSO2	A
CO 3	Interpret the ability to effectively integrate IT-based solutions into the user environment.	PO1,PO2,PSO2	A
CO 4	Illustrate various IT web services for betterment of knowledge.	PO1,PO2,PO3, PO4,PSO2	A

CL* Cognitive Level: R- Remember, A-Apply, An- Analyze, E- Evaluate, Cr-Create

CO - PO/PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2						2			
CO 2	3							3		
CO 3	3	2						3		
CO 4	2	2	2	2				3		

Mapping Strength

0. No Mapping strength
1. Low
2. Medium
3. High

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE 1 - BASICS OF COMPUTER				
1.	Introducing Computers	Lecture		CO1
2.	Computer Characteristics	Lecture		CO1
3.	History and Evolution of Computers	PPT/Lecture		CO1
4.	Generations of Computers	PPT/Lecture		CO1
5.	Components of Computers	PPT/Lecture	e-resource	CO1
6.	Organization of Computers	PPT/Lecture	e-resource	CO1
7.	Types of Computers	PPT/Lecture	Assignment	CO1
8.	Classification - Digital and Analog systems	PPT/Lecture		CO1
9.	Classification – On Basis of Size	PPT/Lecture		CO1
10.	Classification –on basis of functions	PPT/Lecture		CO1
11.	Hardware	PPT/Lecture		CO1

12.	Software & Firmware	Lecture		CO1
13.	Computer Functioning	PPT/Lecture	video	CO1
14.	Booting , Formatting	Lecture		CO1
15.	File, File Extensions	Lecture		CO1
16.	Temporary Files, Folders	Lecture		CO1
17.	GUI, Icon; Installation of Programs	PPT/Lecture	**video**	CO1
18.	Commands, Biossetup, Date and Time	PPT/Lecture		CO1
19.	Memory Partitions, Registry	PPT/Lecture		CO1
20.	Default Operations; Defragmentation	Lecture		CO1
21.	Number Systems: Base of a number system, Positional number system, Popular number systems	Lecture		CO1
22.	Conversion-Decimal to Binary, Binary to Decimal	Lecture		CO1
23.	Decimal to Octal, Octal to decimal	Lecture		CO1
24.	Decimal to hexadecimal, Hexadecimal to decimal	Lecture		CO1
25.	Octal / Hexadecimal to Binary	Lecture		CO1
26.	Binary to Octal/Hexadecimal	Lecture		CO1
MODULE 2 - HARDWARE BASICS				
27.	Input Devices	PPT/Lecture		CO2
28.	Input Devices - Types	PPT/Lecture		CO2
29.	Input Devices –Working and functions	PPT/Lecture	**Video**	CO2
30.	Output Devices	PPT/Lecture		CO2
31.	Output Devices –Types	PPT/Lecture		CO2
32.	Output Devices - Working and functions	PPT/Lecture	**Video**	CO2
33.	Storage Devices	PPT/Lecture		CO2

34.	Storage Devices – Different types	PPT/Lecture		CO2
35.	CPU components - Mother boards, SMPS	PPT/Lecture		CO2
36.	CPU components - Processors	PPT/Lecture		CO2
37.	Accessory Cards – Graphic /Sound/ Networking/ Bluetooth/Wifi	PPT/Lecture		CO2
38.	Memory –Classification	PPT/Lecture	Seminar Presentation	CO2
39.	Types of memory	PPT/Lecture		CO2
40.	Memory Units	PPT/Lecture		CO2
41.	Memory Devices	PPT/Lecture		CO2
42.	New Generation Computers	PPT/Lecture	Assignment	CO2
43.	Input/Output Devices	PPT/Lecture		CO2
44.	Memory Devices	PPT/Lecture	Seminar Presentation	CO2
45.	Storage Devices	PPT/Lecture		CO2
	MODULE 3 - SOFTWARE BASICS			
46.	System Software	PPT/Lecture		CO2
47.	Introduction to Operating System: definition, functions	PPT/Lecture	Seminar Presentation	CO2
48.	Operating System - CUI and GUI	PPT/Lecture		CO2
49.	Working of OS; DOS and Windows	PPT/Lecture		CO2
50.	Working of OS; Linux and UNIX	PPT/Lecture		CO2
51.	Application Software -Programs and Packages	PPT/Lecture	Seminar Presentation	CO2
52.	MS Word – Introducing Features and Uses	PPT/Lecture		CO3
53.	MS Word – Creating, Editing and Formatting Documents	Guided Practice		CO3

54.	MS Word – Essential features and Tools	Guided Practice		CO3
55.	MS Excel – Introducing Features and Uses	PPT/Lecture		CO3
56.	MS Excel – Formatting Cells, Using Formulas	Guided Practice		CO3
57.	MS Excel – Creating different graphs and charts	Guided Practice		CO3
58.	MS PowerPoint - Features and Uses	PPT/Lecture		CO3
59.	MS PowerPoint – Designs, Animations, Transitions	Guided Practice		CO3
60.	MS PowerPoint - graphs and charts etc…	Guided Practice		CO3
61.	Publisher, Acrobat Reader, E Book Reader, Explorer, Photoshop	PPT/Lecture	Video	CO3
62.	Virus and Antivirus	PPT/Lecture	Seminar Presentation	CO3
63.	Statistical Software	PPT/Lecture		CO3
64.	Databases -MS Access	PPT/Lecture		CO3
65.	Revision Test			
MODULE 4 - COMPUTER LANGUAGES				
66.	Programming Languages: Machine Language, Assembly Language, High Level Language	PPT/Lecture		CO3
67.	Computer languages –Classification	PPT/Lecture		CO3
68.	Computer languages –Types, HTML, C and Java Programming concepts	PPT/Lecture		CO3
69.	Algorithm, Codes	PPT/Lecture		CO3
70.	Flow Charts	PPT/Lecture		CO3
71.	Revison Test			

MODULE 5 - NETWORKING, INTERNET AND INFORMATION TECHNOLOGY				
72.	Networking, Internet and Information Technology	PPT/Lecture	Seminar Presentation	CO4
73.	Computer Communication –Networks	PPT/Lecture	Video	CO4
74.	Network Types LAN, WAN, MAN etc.	PPT/Lecture		CO4
75.	Media of networking	PPT/Lecture		CO4
76.	Network Topologies	PPT/Lecture	Seminar	CO4
77.	Modem and Gateway	PPT/Lecture		CO4
78.	A Brief Introduction to the Internet	PPT/Lecture		CO4
79.	Internet and its Services	PPT/Lecture		CO4
80.	The World Wide Web, Web Browsers,	PPT/Lecture		CO4
81.	Web Servers, Uniform Resource Locators	PPT/Lecture		CO4
82.	Uploading, Downloading, Hosting	PPT/Lecture		CO4
83.	Portal, Search Engines	PPT/Lecture	Seminar Presentation	CO4
84.	Firewalls	PPT/Lecture		CO4
85.	Global Information System –BIOSIS	PPT/Lecture		CO4
86.	Cyber Crime and Cyber Laws	PPT/Lecture		CO4
87.	Uploading, Downloading, Hosting	Guided Practice		CO4

88.	Revision			
89.	Revision			
90.	Revision			

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Course Outcome**
1.	18/6/2018	CPU components – processors, motherboard, SMPS, Accessory Cards	CO1
2.	20/7/2018	Memory – classification – types – memory devices	CO1
3.	27/8/2018	Computer Software – types – language translators	CO2
4.	14/9/2018	Operating System – types – functions	CO2

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Course Outcome
1	24/07/2018	Internet - services – world wide web – uploading – downloading –search engines	CO4
2	2/08/2018	Virus and Antivirus – Firewalls	CO4

REFERENCES

- Anitha Goel.2010. *Computer Fundamentals*. Pearson Education India
- Pradeep Sinha and Priti Sinha.2010.*Computer Fundamentals*. BPB Publications., New Delhi
- Sudipto Das.2010. *A Complete Guide to Computer Fundamentals*. Lakshmi Publishers (P) Ltd. New Delhi