SACRED HEART COLLEGE (AUTONOMOUS)

Department of Environmental Studies

MSc Environmental Science

Course Plan

Academic Year 2018-19

Semester 1

	PROGRAMME OUTCOMES
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 STRUCTURE

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 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
CO4	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

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 shown	Seminar	CO1, CO2
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,	Out door activity,	Group	CO1, CO2

	trophic levels.	making food chain and food web	discussion	
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 shown	Seminar	CO1, CO2
19	Ecological pyramids	Class room, Lecture, PPT Discussion. Photos diagrams of working shown	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	Inter specific 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 Group discussion, Lecturing		CO3, CO5
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	Seminar	CO3, CO5

		discussion		
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	Demo video	CO3

		discussion		
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	PPT		(CO4)

	sacred groves, biovillages.			
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)**	**Couse Outcome**
1		Role of Intergovernmental and Nongovernmental organizations in conservation	CO 5

REFERENCES

- Abbasi, S.A. and Ramasami, E.V.1998.Biotechnological Methods of Pollution Control. Oxford University Press, Hyderabad.
- Arvind, K., and Pashupati, K,R. (2008), Environmental resource management: (critical issues) Astral International.
- Benton, A.H. and Werner, W.E. 1976. Field Biology and Ecology. Tata McGraw Hill, New Delhi.
- Biswas, A., and Cline, S.: Global warming: Impacts onWater and Food Security, Dehra dun, 1982.
- Holling C.S. 1973. Resilience and stability of ecological systems. Annual Review of ecology and systematic 4: 1-23.
- Boitani, L and T.K.Fuller.2000.Research Techniques in Animal Ecology. Columbia University Press, USA
- Daniel,C.D. 2010.Environmental Science.(8thedn).Jones and Bartlett Publishers.
- Dasman, R.F: (1972). Environmental conservation, New York, Wiley,
- EmbardHaque C (2005) Mitigation of Natural Hazards and DisastersNatural

COURSE 2

PROGRAMME	MSC ENVIRONMENTAL SCIENCE	SEMESTER	2
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
CO1	To tabulate statistical information given in descriptive form.	PO1, PO4, PSO1, PSO2	A
CO2	To use graphical techniques and interpret	PO1, PO4, PSO1, PSO2	An
CO3	To compute various measures of central tendency, dispersion.	PO1, PO4, PSO1, PSO2	A
CO4	To compute correlation coefficient and Regression	PO1, PO4, PSO1, PSO2	A
CO5	Compute probability of various events based on Binomial Poisson and Normal Distribution	PO1, PO4, PSO1, PSO2	A
CO6	Do Large Sample Tests, Small Sample test , Chi square Test, Anova , Non Parameteric Test	PO1, PO4, PSO1, PSO2	E

CL* Cognitive Level

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE I - BASICS OF BIOSTATISTICS				
1	Introduction to statistics	PPT	video	CO1
2	Collection of data, Types of data	PPT/Lecture		CO1
3	Sampling methods	PPT/Lecture		CO1
4	Classification and Tabulation	PPT/Lecture	e-resource	CO1
5	Diagrammatic representation of data	PPT/Lecture		CO1
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		CO2
10	Median	Lecture		CO2
11	Mode	Lecture	Quiz	CO2
12	Geometric mean and Harmonic mean, problems	Lecture		CO2
MODULE III - MEASURES OF DISPERSION				
13	Absolute and relative measures of dispersion	PPT/Lecture		CO3
14	Range, Quartile Deviation	PPT/Lecture		CO3
15	Mean Deviation	PPT/Lecture		CO3
16	Standard Deviation	Lecture	Quiz	CO3
17	Standard Deviation	PPT/Lecture		CO3
18	Properties, Problems	PPT/Lecture		CO3
19	Folds, faults and dykes	PPT/Lecture		CO3
20	Folds, faults and dykes	PPT/Lecture		CO3
21	Skewness	PPT/Lecture		CO3
22	Kurtosis	PPT/Lecture		CO3
MODULE IV - CORRELATION ANALYSIS				
38	Correlation			
39	Correlation Coefficient	PPT/Lecture		CO4
40	Rank Correlation	Lecture		CO4
41	Rank Correlation Coefficient	PPT/Lecture		CO4
42	Problems	PPT/Lecture		CO4
MODULE V - REGRESSION ANALYSIS				

58	Regression Equations	Lecture		CO5
59	Regression Problems	PPT/Lecture		CO5
60	Profit Analysis	PPT/Lecture		CO5
61	Mathematical models in Biology	PPT/Lecture		CO5
62	Length-Weight Relationship	PPT/Lecture		CO5
63	VBG Model	PPT/Lecture		CO5
MODULE VI - THEORY OF PROBABILITY				
64	Probability concepts, Random Experiment	Lecture	Demo video	CO6
65	Sample Space, Events, Probability Measure	Lecture		CO6
66	Classical definition of probability	Lecture	Group discussion	CO6
67	Statistical Definition of probability	Lecture		CO6
68	Axiomatic Definition Of probability	PPT/Lecture		CO6
69	Addition Theorem	PPT/Lecture		CO6
70	Conditional Probability	PPT/Lecture		CO6
70	Independence of events	PPT/Lecture		CO6
71	Multiplication Theorem	PPT/Lecture		CO6
72	Random variable, Probability Distribution	PPT/Lecture	Group discussion	CO6
73	Binomial, Poisson Distributions.	PPT/Lecture		CO6
74	Normal Distribution	PPT/Lecture		CO6
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)	Couse Outcome
1	4/1/2019	Problems based on measures of central Tendancy,Dispersion	CO 3
2	4/1/2019	Problems Based on Correlation	CO 3
3	4/1/2019	Problems based on Regression	CO4
4	4/1/2019	Problems based on Testing	CO4

	COURSE OUTCOMES	PO/ PSO	CL

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.
- Finney ,D.J. 1980.Statistics for Biologists. Chapman and Hall, London
- Frank, Harry and Steven C. Althoen, 1995. Statistics: Concepts and Applications. Cambridge University Press
- Pagano, M and K.Gauvreau. 2000. Principles of Biostatistics. Brooks/Cole, CA, USA
- Prabhakara ,G.N. 2006.Biostatistics.Jaypee Bro. New Delhi
- Rajathi A. and P. Chandran, 2010. SPSS for You. MJP Publishers, Chennai.
- 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 3

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		

CL* Cognitive Level

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

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	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		CO1
3	Life Science - Definition, Laws, Characteristics.	PPT, Discussion		CO1
4	Scientific temper	PPT, Discussion	e-resource	CO1
5	Empiricism	PPT, Discussion		CO1
6	Rationalism	PPT, Discussion		CO1
7	Units of measurements.	PPT, Discussion		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, Discussion		CO5
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	Lecture		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	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 seminar	Student Assignment	CO5
57	Characteristics of good samples	PPT Discussion		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		CO5
63	Dollection 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		CO6
69	Research report writing	PPT		CO6

70	Thesis and dissertations	PPT, Discussion		CO6
71	Research articles,	PPT, Discussion		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		CO6
77	Assignment, Seminar, Debate	PPT, Discussion	Video	CO6
78	Workshop, Colloquium, Conference	PPT, Discussion	video	CO6
79	Abstract, synopsis, summary	PPT, Discussion		CO6
80	Referencing methods.	PPT, Discussion		CO6
MODULE VIII. INFORMATION SCIENCE, EXTENSION AND ETHICS				
81	Sources of Information -Primary and secondary sources.	PPT, Discussion		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		CO2, CO3, CO4, CO5, CO6, CO7

84	Internet -Search engines and software, online libraries, e-Books, Encyclopaedia, TED Talk, and Institutional Websites.	Class room, Lecture, PPT	video	CO2, CO3, CO4, CO5, CO6, CO7
85	Intellectual Property Rights - Copy right, Designs, Patents, Trademarks, Geographical indications.	Class room, Lecture, PPT		CO2, CO3, CO4, CO5, CO6, CO7
86	Safety and precaution - ISO standards for safety, Lab protocols,	Class room, Lecture, PPT		CO2, CO3, CO4, CO5, CO6, CO7
87	Lab animal use, care and welfare, animal houses, radiation hazards.	PPT Discussion		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 or Non-graded etc)	Course Outcome
	8/2/2019	Bioethics: Laws in India, Working with man and animals, Consent, Animal Ethical Committees and Constitution	CO 5

REFERENCES

- 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 4

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

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 Presentati	CO2

			on	
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 Presentati on	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 Presentati on	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.)**	**Couse Outcome**
1.	18/7/2018	CPU components – processors, motherboard, SMPS, Accessory Cards	CO1
2.	20/7/2018	Memory – classification – types – memory devices	CO1
3.	27/7/2018	Computer Software – types – language translators	CO2
4.	14/8/2018	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)	Couse Outcome
1	24/09/2018	Internet - services – world wide web – uploading – downloading –search engines	CO4

2	24/09/2018	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