

SACRED HEART COLLEGE (AUTONOMOUS)

Department of Environmental Studies

Post Graduate Programme

(Environmental Science)

Course plan

Academic Year 2018 – 19

Semester 2

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 Structure

Course Code	Title Of The Course	No. Hrs./Week	Credits	Total Hrs./Sem
16P2EVST05	Techniques In Research	4	4	90
16P2EVST06	Disaster Management	4	4	90
16P2EVST07	Earth And Atmosphere	4	4	90
16P2EVST08	Remote Sensing And GIS	4	4	90

COURSE PLAN

PROGRAMME	MSc ENVIRONMENTAL SCIENCE	SEMESTER	2
COURSE CODE AND TITLE	16P2EVST05 : TECHNIQUES IN RESEARCH	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	90
FACULTY NAME	DR. James T J and Dr.Anju S G		

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Know the different analytical techniques.	PO3, PO1, PSO1, PSO3	U
CO 2	Understand and learn to apply different types of separation techniques	PO1,PO3, PSO1, PSO3	U
CO 3	Learn and apply principle, construction and working of GC and HPLC.	PO1,PO3, PO2, PSO1, PSO3	U
CO 4	Acquire an extended knowledge about chromatographic techniques used for separation of amino acids and able to apply.	PO3, PO4,, PSO1, PSO3, PSO4	An
CO 5	Discuss the problem based on distribution coefficient and extraction techniques.	PO3,PO4, PSO1, PSO3, PSO4	U

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		3				2		3	
CO 2	3		3				2		3	
CO 3	2	2	3				3		3	
CO 4			3	2			3		3	3
CO5			2	2			3		3	3

Mapping Strength

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

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
Module I. Microscopy				
1	Differential Interference,	PPT/Lecture	video	CO1
2	contrast microscopy,	PPT/Lecture		CO1
3	Confocal microscope,	PPT/Lecture		CO1
4	Electron microscope	PPT/Lecture		CO1
5	TEM	PPT/Lecture		CO1
6	TEM	PPT/Lecture		CO1
7	SEM,	PPT/Lecture		CO1
8	SEM	PPT/Lecture		CO1
9	Scanning Tunnelling	PPT/Lecture		CO1
10	Atomic Force Microscopes	PPT/Lecture		CO1
Module II. Chromatography				
11	chromatography	PPT/Lecture	Video	CO1,CO2,CO3,,CO5
12	Thin layer chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
13	,Thin layer chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
14	Ion exchange chromatography.	PPT/Lecture		CO1,CO2,CO3, CO5
15	Ion exchange chromatography.	PPT/Lecture		CO1,CO2,CO3, CO5
16	Gel permeation chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
17	Gel permeation chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
18	Affinity chromatography	PPT/Lecture	Quiz	CO1,CO2,CO3, CO5
19	Affinity chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
20	Gas chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
21	Gas chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
22	High pressure liquid chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
23	High pressure liquid	PPT/Lecture		CO1,CO2,CO3, CO5

	chromatography			
24	High pressure liquid chromatography	PPT/Lecture		CO1,CO2,CO3, CO5
Module III. Electrophoresis				
25	Electrophoresis	PPT/Lecture		CO1,CO2,CO4
26	Gel electrophoresis,	PPT/Lecture		CO1,CO2,CO4
27	Polyacrylamide gel (PAGE)	PPT/Lecture		CO1,CO2,CO4
28	Polyacrylamide gel (PAGE)	PPT/Lecture		CO1,CO2,CO4
29	SDS and non SDS	PPT/Lecture		CO1,CO2,,CO4
30	SDS and non SDS	PPT/Lecture		CO1,CO2,CO4
31	Agarose gel electrophoresis	PPT/Lecture		CO1,CO2,CO4
32	Disc electrophoresis	PPT/Lecture		CO1,CO2,CO4
33	Immuno electrophoresis,	PPT/Lecture		CO1,CO2,CO4
34	Immuno electrophoresis,	PPT/Lecture		CO1,CO2,CO4
35	Isoelectric focusing (CO3)	PPT/Lecture		CO1,CO2,CO4
36	Isoelectric focusing (CO3)	PPT/Lecture		CO1,CO2,CO4
Module IV. Colorimetry, Spectrophotometry, Spectroscopy				
37	Principle and applications of colorimetry and spectrophotometry and spectroscopy.,	PPT/Lecture		CO1,CO2,CO4
38	Principle and applications of colorimetry and spectrophotometry and spectroscopy.,	PPT/Lecture		CO1,CO2,CO4
39	Flame emission spectroscopy,	PPT/Lecture		CO1,CO2,CO4
40	Flame emission spectroscopy,	PPT/Lecture		CO1,CO2,CO4
41	Atomic absorption spectroscopy,	Lecture		CO1,CO2,CO4
42	Atomic absorption spectroscopy,	PPT/Lecture		CO1,CO2,CO4
43	Nuclear Magnetic Resonance	PPT/Lecture		CO1,CO2,CO4

	spectroscopy (NMR)			
44	Nuclear Magnetic Resonance spectroscopy (NMR),	PPT/Lecture		CO1,CO2,CO4
45	Circular dichorism spectroscopy	PPT/Lecture		CO1,CO2,CO4
46	Circular dichorism spectroscopy	PPT/Lecture		CO1,CO2,CO4
47	ESR spectroscopy,	PPT/Lecture	Interactive session	CO1,CO2,CO4
48	ESR spectroscopy,	PPT/Lecture		CO1,CO2,CO4
49	Mass spectroscopy	PPT/Lecture		CO1,CO2,CO4
50	Mass spectroscopy	PPT/Lecture	Video	CO1,CO2,CO4
Module V. Centrifugation				
51	Basic principles of sedimentation	PPT/Lecture	Demo video	CO1,CO2,CO4,CO5
52	Types of centrifuges	Lecture		CO1,CO2,CO4,CO5
53	Analytical Centrifugation	Lecture	Group discussion	CO1,CO2,CO4,CO5
54	Preparative centrifugation	PPT/Lecture		
55	Differential	Lecture		CO1,CO2,CO4,CO5
56	Density gradient centrifugation	PPT/Lecture		
Module VI. Radioisotope				
57	Detection and Measurement	PPT/Lecture		CO1,CO2,CO4
58	Dosimetry: Ionization chamber	PPT/Lecture		CO1,CO2,CO4
59	GM counter	PPT/Lecture		CO1,CO2,CO4
60	, Solid and liquid scintillation counters,	PPT/Lecture		CO1,CO2,CO
61	Autoradiography	PPT/Lecture		CO1,CO2,CO4
62	liquid scintillation counters	PPT/Lecture		CO1,CO2,CO4
63	Autoradiography	PPT/Lecture		CO1,CO2,CO4

	Module VII. Nanotechnology			
64	Introduction to Nanobiology.	PPT/Lecture		CO1,CO2,CO4
65	Nanosensors and Nanomedicines	PPT/Lecture		CO1,CO2CO4
66	Nanosensors and Nanomedicines	PPT/Lecture		CO1,CO2,CO4
	Module VIII. Assays.,			
67	Radio Immuno Assay	PPT/Lecture		CO1,CO2,CO4
68	Enzyme Linked ImmunoSorbant Assay (ELISA)	PPT/Lecture		CO1,CO2,CO4
69	Enzyme Linked ImmunoSorbant Assay (ELISA) PPT/Lecture			CO1,CO2,CO4
	Module IX. pH meter.			
70	Principle and working.	PPT/Lecture		CO1,CO2,CO4
71	Types of pH meters	PPT/Lecture		CO1,
	Module X. Biological and Histological Techniques.			
72	Fixation, preparation of temporary and permanent slides,	PPT/Lecture		CO1,
73	Fixation, preparation of temporary and permanent slides,	PPT/Lecture		CO1,
74	Preparation of temporary and permanent slides,	PPT/Lecture	PRACTICLE	CO1,
75	Preparation of temporary and permanent slides,	PPT/Lecture		CO1,
76	Whole mounts, smears, squashes and sections.,	PPT/Lecture		CO1,
77	Specimen preparation for TEM	PPT/Lecture		CO1,
78	Specimen preparation for SEM	PPT/Lecture		CO1,
79	shadow casting, freeze fracturing, freeze etching, negativestaining	PPT/Lecture		CO1,
80	Microphotography. Cytochemical and histological methods-	PPT/Lecture		CO1,

81	Microphotography. Cytochemical and histological methods-	PPT/Lecture		CO1,
82	Cytochemical and histological methods-	PPT/Lecture		CO1,
83	Microtome techniques,	PPT/Lecture		CO1,
84	Cytochemical and histological methods-	PPT/Lecture		CO1,
85	Microtome techniques,	PPT/Lecture		CO1,
86	Cytochemical and histological methods-	PPT/Lecture		CO1,
87	Microtome techniques,	PPT/Lecture		CO1,
88	Fixation, staining.	PPT/Lecture		CO1,
89	Fixation, staining.	PPT/Lecture		CO1,
90	Cytochemistry of nucleic acids, detection of carbohydrates, proteins and lipids	PPT/Lecture		CO1,

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	15/11/2018	TEM, SEM,	CO1,CO2,CO4
2	4/12/2018	Ion exchange chromatography	CO1,CO2,CO4
3	20/12/2018	Gel permeation chromatography	CO1,CO2,CO4
4	4/01/2019	PAGE) – SDS and non SDS	CO1,CO2,CO4
5	4/02/2019	Flame emission spectroscopy,	CO1,CO2,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	2/2/2019	Microtome techniques, fixation, staining	CO1

References

1. Ackerman, E. 1962. Biophysical Science. Prentice Hall Inc. NJ, USA
2. Alonso, A., and Arrondo, J.L.R.2006. Advanced Techniques in Biophysics.Springer,UK
3. Arora, M. P. 2007.Biophysics. Himalaya Publishing House, New Delhi
4. Baker, E.J. and Silverton R.E. 1978.Introduction to Medical Laboratory Technology.
5. ELBS. London,UK
6. Das, D. 1991. Biophysics and Biophysical Chemistry. Academic Publishers, Calcutta
- Edward, A.L. 1997. Radiation Biophysics. Academic Press,NY,USA.
7. Ernster, L. (Ed.). 1985. Bioenergetics. Elsvier, NewYork,USA.
8. Ghatak K.L. 2011.Techniques and Methods in Biology. PHI Learning Pvt. Ltd. New Delhi
- Gupta A. 2009. Instrumentation and Bio-Analytical Techniques.PragatiPrakashan, Meerut.

COURSE PLAN

PROGRAMME	MSc ENVIRONMENTAL SCIENCE	SEMESTER	2
COURSE CODE AND TITLE	16P2EVST06 : Disaster Management	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	90
FACULTY NAME	DR. Anju S G		

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Discuss the disaster management, its components (eg: definitions, terminologies, types, impacts), structure (phases, administrative and institutional) and significance.	PO4, PO5, PSO1, PSO3	U
CO 2	Implement disaster management into public policy and planning based on the vulnerability of places and communities.	PO1,PO4, PSO1, PSO3	U
CO 3	Discuss to develop emergency operations plan (EOP- eg: Components, structure, Activities, SAR); Understanding the significance of the Community-Based Approach to education and public awareness in tackling disasters. Studying disaster response and recovery methods (eg: traditional/modern; short term/long term, environmental friendly/sustainable initiatives) etc.	PO1,PO3, PO4, PSO1, PSO3	U

CO 4	Describe the stages of disaster recovery and associated problems vulnerable groups in disaster and post-disaster times.	PO3, PO4, PO6, PSO1, PSO3, PSO4	An
CO 5	Identifying the stages of disaster recovery and associated problems vulnerable groups in disaster and post-disaster times.	PO3, PO4, PSO1, PSO2, PSO3	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				3	3		3		3	
CO 2	3			3			3		3	
CO 3	3		3	3			3		3	
CO 4			3	3		3	3		3	3
CO 5			3	3			3	3	3	

Mapping Strength

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

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE I (5hrs)				
Introduction				
1	Introduction to Disaster Management	PPT	video	CO 1
2	Introduction to Disaster Management	PPT/Lecture	video	CO 1
3	Introduction to Disaster Management	PPT/Lecture		CO 1
4	Introduction to Disaster Management	PPT/Lecture	e-resource	CO 1
5	Introduction to Disaster Management	PPT/Lecture		CO 1
MODULE II (10 hrs)				
Disaster Management Cycle				
6	Introduction, Disaster Management Cycle	PPT/Lecture		CO1, CO 2
7	Introduction, Disaster Management Cycle	PPT/Lecture		CO1, CO 2
8	Introduction, Disaster Management Cycle	PPT/Lecture		CO1, CO 2
9	Disaster Mitigation	PPT/Lecture		CO1, CO 2
10	Disaster Mitigation	PPT/Lecture	video	CO1, CO 2
11	Mitigation strategies	PPT/Lecture		CO1, CO 2
12	Mitigation strategies	PPT/Lecture		CO1, CO 2

13	Hazard identification and vulnerability analysis,	PPT/Lecture		CO1, CO 2
14	Hazard identification and vulnerability analysis,	PPT/Lecture		CO1, CO 2
15	Mitigation measures	PPT/Lecture		CO1, CO 2
MODULE III Disaster Preparedness, Response and Recovery (15hrs)				
13	Introduction to Disaster Preparedness	PPT/Lecture	DISCUSSION	CO3,CO4
14	Introduction to Disaster Preparedness	PPT/Lecture		CO3,CO4
15	Disaster Risk Reduction (DRR),	PPT/Lecture		CO3,CO4
16	Disaster Risk Reduction (DRR),	PPT/Lecture		CO3,CO4
17	The Emergency Operation Plan (EOP)	PPT/Lecture		CO3,CO4
18	The Emergency Operation Plan (EOP)	PPT/Lecture		CO3,CO4
19	Disaster Response	PPT/Lecture		CO3,CO4
20	Disaster Response	PPT/Lecture		CO3,CO4
21	Disaster Recovery	PPT/Lecture		CO3,CO4
22	Disaster Recovery	PPT/Lecture		CO 3,CO4
23	Disaster Response and Recovery	PPT/Lecture		CO3,CO4
24	Modern methods of disaster response	PPT/Lecture		CO3,CO4
25	Modern methods of disaster response	PPT/Lecture		CO 3,CO4
26	Modern methods of disaster response	Lecture	Quiz	CO 3,CO4
27	The Recovery Plan.	PPT/Lecture		CO 3,CO4
MODULE IV Disaster Education and Public Awareness 30 hrs				
38	Community-based Initiatives,	PPT/Lecture		C04
39	Stakeholders' Roles and Responsibilities	PPT/Lecture		C04
40	Stakeholders' Roles and Responsibilities	PPT/Lecture		C04
41	Categories of stakeholders Government	PPT/Lecture		C04
42	Categories of stakeholders Government	PPT/Lecture		C04
43	Non-Government Organisations (NGOs),	Lecture	Interactive session	CO 4
44	Non-Government Organisations (NGOs),	PPT/Lecture		CO 4
45	Regional and International Organizations	PPT/Lecture		C04
46	Regional and International Organizations	PPT/Lecture		C04
47	Donor Agencies, Island Councils	PPT/Lecture		C04
48	Donor Agencies, Island Councils	PPT/Lecture	Videos	C04
49	Local Government, Community Workers,	PPT/Lecture		C04
50	Local Government, Community Workers,	PPT/Lecture		C04
51	National and Local Disaster Managers	PPT/Lecture		C04
52	National and Local Disaster Managers	PPT/Lecture		C04
53	Trainers, Policy Makers and Grass-roots people	PPT/Lecture		C04
54	Advantages and Disadvantages of the Community-Based Approach,	PPT/Lecture		C04
55	Advantages and Disadvantages of the Community-Based Approach	PPT/Lecture		C04

56	Duties of Response Personnel	PPT/Lecture		C04
60	Duties of Response Personnel	PPT/Lecture		C04
61	Pre-Disaster Mitigation Plan	PPT/Lecture		C04
62	Pre-Disaster Mitigation Plan	PPT/Lecture	Videos	C04
63	Hazardous Materials	PPT/Lecture		C04
64	Hazardous Materials	PPT/Lecture		C04
65	Ways of storing hazardous material	PPT/Lecture		C04
66	Ways of storing hazardous materials	PPT/Lecture	Interactive session	C04
67	Safely handling hazardous materials	PPT/Lecture		C04
68	Safely handling hazardous materials	PPT/Lecture		C04
69	Opportunities	PPT/Lecture		C04
70	Opportunities	PPT/Lecture		C04
71	Regional planning for hazard management	PPT/Lecture	Videos	C04
72	Regional planning for hazard management	PPT/Lecture		C04
73	Revision	PPT/Lecture		C04
74	Revision	PPT/Lecture		C04
Module V				
The Role of Technology in Disaster Management 30 hrs				
58	Geographic Information Systems (GIS)	PPT/Lecture		CO 5
59	Geographic Information Systems (GIS)	PPT/Lecture		CO 5
60	Disaster Management	PPT/Lecture		CO 5
61	Disaster Management	PPT/Lecture		CO 5
62	Remote Sensing and Disaster Management	PPT/Lecture		CO 5
63	Remote Sensing and Disaster Management	PPT/Lecture		CO 5
64	The Role of Media in Disaster Management	PPT/Lecture		CO 5
65	The Role of Media in Disaster Management	PPT/Lecture		CO 5
66	Physical impacts of Disasters	PPT/Lecture		CO 5
67	Physical impacts of Disasters	PPT/Lecture		CO 5
68	Socio-economic Impacts of Disasters	PPT/Lecture		CO 5
69	Socio-economic Impacts of Disasters	PPT/Lecture		CO 5
70	Disaster Associated Health Issues	PPT/Lecture		CO 5
71	Disaster Associated Health Issues	PPT/Lecture		CO 5
72	Emergency Health Services in Disasters	PPT/Lecture		CO 5
73	Emergency Health Services in Disasters	PPT/Lecture		CO 5
74	Infrastructure and procedures in accessing emergency situations	PPT/Lecture		CO 5
75	Infrastructure and procedures in accessing emergency situations	PPT/Lecture		CO 5
76	Infrastructure and procedures in accessing emergency situations	PPT/Lecture	Q&A	CO 5
77	Communicable diseases common in disaster situations	PPT/Lecture		CO 5

78	Communicable diseases common in disaster situations	PPT/Lecture		CO 5
79	Monitoring and Evaluation of Communicable Diseases	PPT/Lecture		CO 5
80	Monitoring of Communicable Diseases	PPT/Lecture		CO 5
81	Evaluation of Communicable Diseases	PPT/Lecture		CO 5
82	Evaluation of Communicable Diseases	PPT/Lecture		CO 5
83	Control, Programme Disaster and Development	PPT/Lecture		CO 5
84	Control, Programme Disaster and Development	PPT/Lecture		CO 5
85	The impact of disasters on development programmes	PPT/Lecture		CO 5
86	The impact of disasters on development programmes	PPT/Lecture		CO 5
87	The impact of disasters on development programmes	PPT/Lecture		CO 5
88	Vulnerabilities caused by development	PPT/Lecture		CO 5
89	Vulnerabilities caused by development	PPT/Lecture		CO 5
90	Revision	PPT/Lecture		CO 5
91	Revision	PPT/Lecture		CO 5

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	09/11/2018	CASE STUDIES	CO 3,CO4 &CO5
2	19/12/2018	Non-Government Organisations (NGOs),Regional and International Organizations	CO 3,CO4 &CO5
3	15/01/2019	Disaster preparedness	

Students were told to take different case studies, Non-Government Organisations (NGOs),Regional and International Organizations

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	2/12/2018	An awareness video regarding DM	C01,C02,C03,C04 & CO 5

References

1. Maxx Dilley (2005) Disaster Hotspots Namboodripad P(2008)Disasters and Hazard Mangement. Rajadhani Printers, Delhi.
2. Sharma R.K and Gagandeep, Sharma (2005) Natural Disaster. , APH Publishing Corporation, New Delhi.
3. Srinivas, H. (2005) Disasters: a quick FAQ. Accessed on 24/01/08 at:http://www.gdrc.org/uem/disasters/1-what_is.html

4. Sumit Malhotra,(2005) Natural Disaster Management. Aavishkas Publishing, Jaipur
William J Petals et al.(1982)Natural Hazard Risk Assessment and Public Policy,
Springer-verlag ,New York

COURSE PLAN

PROGRAMME	MSc ENVIRONMENTAL SCIENCE	SEMESTER	2
COURSE CODE AND TITLE	16P2EVST07 : EARTH AND ATMOSPHERE	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	90
FACULTY NAME	DR. REMYA.R		

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Discuss the principle and scope of Environmental Science	PO4, PO5, PSO1, PSO3	U
CO 2	Describe the concept of life and life supporting systems	PO1,PO4, PSO1, PSO3	U
CO 3	Explain the various components of Physical Environment and geomorphological processes	PO1,PO3, PO4, PSO1, PSO3	U
CO 4	Examine the effect of climate change on ecosystems and human welfare	PO3, PO4,PO6, PSO1, PSO3, PSO4	An
CO 5	Discuss the climatic regions of India with special reference to tropical monsoon climate	PO3,PO4, PO6, PSO1, PSO3, PSO4	U
CO 6	Demonstrate the use of soil survey, aerial photos, topographic maps and other resource data in landscape management	PO3, PO4, PSO1, PSO2, PSO3	A
CO7	Assess the various impacts of invasive species on environment	PO1, PO3, PO4, PSO1, PSO2, PSO3	E

CL* Cognitive Level

*Un-Understand; An-Analyse; Ap-Apply; Cr- Create; Ev-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	3	0	0	3	0	3	0
CO 3	2	0	1	3	0	0	3	0	3	0
CO 4	0	0	0	3	0	3	3	0	3	1
CO 5	0	0	1	3	0	3	3	0	3	1
CO 6	0	0	3	3	0	0	3	3	3	0
CO 7	2	0	3	3	0	0	3	3	3	0

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

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE I : Introduction to Environmental Science				
1	Definition, Principle and Scope of environmental Science	PPT	video	CO 1
2	Definition, Principle and Scope of environmental Science	PPT/Lecture		CO 1
3	Definition, Principle and Scope of environmental Science	PPT/Lecture		CO 1
4	Environmental Science and its relation to other sciences	PPT/Lecture	e-resource	CO 1
5	Environmental Science and its relation to other sciences	PPT/Lecture		CO 1
MODULE II : Earth System and Biosphere				
6	Concept of life	PPT/Lecture		CO 2
7	Life supporting systems	Lecture		CO 2
8	Origin of earth	Lecture	Quiz	CO 2
9	Structure of earth	Lecture		CO 2
10	Planetary differentiation	Lecture		CO 2
11	Formation of core, mantle, crust	PPT/Lecture		CO 2
12	Formation of atmosphere and hydrosphere	PPT/Lecture		CO 2
MODULE III : The Physical Environment				
13	Lithosphere - Weathering and soil formation	PPT/Lecture		CO 3
14	Soil colloids, adsorption and exchange of anions and cations,	PPT/Lecture		CO 3
15	Role of microbes in soil	PPT/Lecture		CO 3
16	Types of soil	Lecture	Quiz	CO 3
17	Soil profile	PPT/Lecture		CO 3
18	Classification of rocks	PPT/Lecture		CO 3
19	Folds, faults and dykes	PPT/Lecture		CO 3
20	Folds, faults and dykes	PPT/Lecture		CO 3
21	Geological formations and their environmental significance	PPT/Lecture		CO 3
22	Geomorphological processes-plate tectonics, sea floor spreading, mountain building	PPT/Lecture		CO 3
23	Evolution of continents and structural deformation	PPT/Lecture		CO 3
24	Evolution of continents and structural deformation	PPT/Lecture		CO 3
25	Atmosphere -Physico-chemical characteristics, divisions	Lecture	Q & Ans Session	CO 3
26	Composition and significance of atmospheric components	PPT/Lecture		CO 3
27	Composition and significance of atmospheric components	PPT/Lecture		CO 3
28	Hydrosphere -Visible and invisible hydrosphere	PPT/Lecture		CO 3
29	Range of aquatic habitats	PPT/Lecture		CO 3
30	Water cycles between earth and the atmosphere	PPT/Lecture		CO 3
31	Water cycles between earth and the atmosphere	PPT/Lecture	Exhibition of charts,	CO 3

			models	
32	Global water balance, ice sheets	PPT/Lecture		CO 3
33	Origin and composition of sea water	PPT/Lecture		CO 3
34	Sea level changes	PPT/Lecture		CO 3
35	River basins and watershed	PPT/Lecture		CO 3
36	Physico-chemical characteristics of water-	PPT/Lecture		CO 3
37	Influence of pH, Turbidity and light on aquatic life	PPT/Lecture		CO 3
MODULE IV : Weather and Climate				
38	Definitions and scope of climatology			
39	Weather and climate	PPT/Lecture		CO 4
40	Components of climate system	Lecture		CO 4
41	Earth's thermal environment	PPT/Lecture		CO 4
42	Earth intercepts solar radiation	PPT/Lecture		CO 4
43	Seasonal variation in intercepted solar radiation, air temperature in relation to altitude	PPT/Lecture	Interactive session	CO 4
44	Global circulation of air masses, wind and earth's rotation on ocean currents	PPT/Lecture		CO 4
45	Global circulation of air masses, wind and earth's rotation on ocean currents	PPT/Lecture		CO 4
46	Influence of temperature on moisture content of air	PPT/Lecture		CO 4
47	Global pattern of precipitation	PPT/Lecture		CO 4
48	Influence of topography on regional pattern of precipitation	PPT/Lecture		CO 4
49	Classification of climate	PPT/Lecture		CO 4
50	Koepfen's classification	PPT/Lecture	Video	CO 4
51	Thornthwaite's scheme	PPT/Lecture		CO 4
52	Climatic types and zones	PPT/Lecture		CO 4
53	Global climatic phenomena-El Nino and La Nina,	PPT/Lecture		CO 4
54	Causes and factors of climate change	PPT/Lecture		CO 4
55	Effect of climate change on ecosystems and human welfare.	PPT/Lecture		CO 4
56	Organisms and microclimate	PPT/Lecture		CO 4
57	Organisms and microclimate	PPT/Lecture		CO 4
MODULE V : Climate of India				
58	Climatic regions of India	Lecture		CO 5
59	Tropical monsoon climate-onset, rain bearing systems	PPT/Lecture		CO 5
60	Break in the monsoon, retreat of monsoon	PPT/Lecture		CO 5
61	Monsoon in Kerala	PPT/Lecture		CO 5
62	Oceanic and continental influence	PPT/Lecture	Debate	CO 5
MODULE VI : Landscape Ecology				
63	Land and Landscape processes	Lecture	Demo video	CO 6
64	Hierarchy: ecosystems to land units;	Lecture		CO 6
65	Ecological principles at work with Landscapes	Lecture	Group	CO 6

			discussion	
66	Ecological principles at work with Landscapes	Lecture		CO 6
67	Human dimensions and Land Use in agro-ecosystems	PPT/Lecture		CO 6
68	Urban ecosystems, rangelands, riparian and wetland systems	PPT/Lecture		CO 6
69	Coastal and estuarine systems	PPT/Lecture		CO 6
70	Coastal and estuarine systems	PPT/Lecture		CO 6
71	Concept of ecological land degradation desertification	PPT/Lecture		CO 6
72	Water logging	PPT/Lecture	Group discussion	CO 6
73	Salinisation and soil erosion.	PPT/Lecture		CO 6
73	Salinisation and soil erosion.	PPT/Lecture		CO 6
74	Ecological assessment of landscape for vegetation and habitats.	PPT/Lecture		CO 6
75	Integrated analytical techniques- land suitability analysis and carrying capacity studies;	PPT/Lecture		CO 6
76	Use of soil survey, aerial photos, topographic maps and other resource data in landscape management	PPT/Lecture		CO 6
	Use of soil survey, aerial photos, topographic maps and other resource data in landscape management	PPT/Lecture		CO 6
77	Case studies on corridor selection problems	PPT/Lecture		CO 6
MODULE VII				
Biological Invasions				
79	Introduction Elton's hypothesis	PPT/Lecture		CO7
80	Invasion patterns and process biological attributes for invasion:	PPT/Lecture		CO7
81	Reproductive potential, Allelopathy Phenotypic plasticity, fitness to the new environment	PPT/Lecture		CO7
82	Hypotheses for invasion success: Natural enemy hypothesis evolution of invasiveness hypothesis,	PPT/Lecture		CO7
83	Hypotheses for invasion success: empty niche hypothesis, novel weapon hypothesis,	PPT/Lecture		CO7
84	Hypotheses for invasion success: turbulence hypothesis and Propagule pressure hypothesis	PPT/Lecture		CO7
85	Invasive alien species of India (plants and animals)	PPT/Lecture	Interaction	CO7
86	Databases of biological invasions.	PPT/Lecture		CO7
87	Impacts and management of invasions: impacts exotics on biodiversity	PPT/Lecture		CO7
88	Impacts and management of invasions: productivity, nutrient cycling	PPT/Lecture		CO7
89	Management: Bio-control programmes,	PPT/Lecture		CO7
90	Management: mechanical and chemical control	PPT/Lecture	Debate	CO7
91	Management: Positive utilization quarantine and EIA of biological invasion	PPT/Lecture		CO7
92	Positive utilization quarantine and EIA of biological invasion	PPT/Lecture	Group discussion	CO7

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	4/12/2018	Physico-chemical characteristics of water- diffusion of oxygen from the atmosphere to surface waters	CO 3
2	20/12/2018	Different aquatic habitats and the influence of pH, turbidity and light on aquatic life-	CO 3
3	4/01/2019	Different processes of energy transfer in the atmosphere and the Earth's surface (with diagrams)	CO4
4	19/02/2019	Different conditions of atmospheric stability and the relationship of stability and daily weather	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	2/02/2019	Causes and factors of climate change. Effect of climate change on ecosystems and human welfare	CO 5

References

- Chapman, G.P. 1977. Human and Environmental Systems: A Geographer's Appraisal. Academic Press, London
- Geomorphological Processes 1st Edition Studies in Physical Geography, Authors: E Derbyshire K. J. Gregory J. R. Hails Editors: K. J. Gregory, e Book ISBN: 9781483192406, Elsevier Publishers.
- Climatology : (An Atmospheric Science: NHBS - John Hidore, John Oliver, Mary Snow, Richard Snow) Pearson Education
- Odum E P (1971), Fundamentals of Ecology, W B Saunders Company, Philadelphia
- **Web resource references:**
- http://cse.ucpress.edu/200_general_topic

COURSE PLAN

PROGRAMME	MSc ENVIRONMENTAL SCIENCE	SEMESTER	2
COURSE CODE AND TITLE	16P2EVST08 : REMOTE SENSING AND GIS	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	90
FACULTY NAME	Dr. Anjana N S		

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Recognize and explain at a basic level fundamental physical principle of remote sensing	PO4, PO5, PSO1, PSO3	R
CO 2	Describe main Remote Sensing Systems and programs (sensors, platforms, etc.) and assess its potential to spatial analysis	PO1,PO4, PSO1, PSO3	U
CO 3	Recognize which remote sensing techniques suite their specific needs.	PO1,PO3, PO4, PSO1, PSO3	R
CO 4	Find the information content of remotely sensed data and how to retrieve the information.	PO3, PO4,PO6, PSO1, PSO3, PSO4	R
CO 5	Explain fundamental concepts and practices of GIS and advances in Geospatial Information Science and Technology (GIS&T).	PO3,PO4, PO6, PSO1, PSO3, PSO4	U
CO 6	Recognize and explain basic computational properties of remote sensing data acquisition, storage, and processing.	PO3, PO4, PSO1, PSO2, PSO3	R U
CO 7	Demonstrate competency with the ArcMap software to enhance and interpret data	PO1, PO3, PO4, PSO1, PSO2, PSO3	A
CO 8	Apply GIS analysis to address geospatial problems and/or research questions.	PO3, PO4, PSO1, PSO2, PSO3	A
CO9	Develop a strategy to implement an effective GIS	PO3,PO4, PO6, PSO1, PSO3, PSO4	C
CO10	Develop critical thinking skills in solving geospatial problems	PO1, PO3, PO4, PSO1, PSO2, PSO3	C

CL* Cognitive Level

*Un-Understand; An-Analyse; Ap-Apply; Cr- Create; Ev-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	0	0	2	3	1	2	3	0	3	0
CO 2	3	2	1	3	2	3	3	1	3	3
CO 3	0	0	1	3	0	1	3	1	3	0
CO 4	1	1	3	3	3	3	0	2	2	1
CO 5	2	3	1	2	2	2	3	1	3	1
CO 6	1	3	3	3	1	3	3	2	3	1
CO 7	2	3	3	3	1	3	3	3	3	2
CO 8	1	3	1	3	0	3	3	0	1	1
CO 9	2	2	3	2	2	2	2	1	2	2
CO10	3	1	3	2	1	1	3	2	0	2

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

Session	Topic	Learning Recourses	Value Additions	Course Outcome
Module I : Fundamentals of Environmental Appraisal Tools				
1	Scales- Definition,)	Learning Activity using a map, Power point presentation	Concept maps (Graphic representation of students' knowledge or how they organize and represent knowledge)	(CO4)
2	Types of scales	PPT		
3	Representation and conversion (introduction only	PPT		
4	Maps- Definition and classification,	Learning Activity using a map, Visuals and Outdoor activity	Computer based Experimental leaning activities	(CO3)
5	Map conversions	PPT		CO1, CO2
6	Grids, Contours,	PPT		CO1, CO2
7	Isobars	PPT		CO1, CO2
8	Measurements of area and distance	PPT		CO1, CO2
9	Square and Planimeter Methods	PPT		CO1, CO2
10	Topographical Maps, Cadastral maps, Toposheets (Interpretation and studies)	PowerPoint presentation, Learning Activity using a map	Class room assignments and resulting students work	(CO3)
11	Surveying: Definition and classification,	Demonstration, and Outdoor activity	Assessing outdoor group work	(CO1)
12	Survey instruments	PPT		CO4

13	Introduction to Compass,	PPT		CO4
14	Theodolite,	PPT		CO4
15	Clinometer,	PPT		CO4
16	Abeny Level,	PPT		CO4
17	Cartographic equipment,	PPT		CO4
18	Preparation of maps	PPT	Video	CO7
19	Basics of cartography	PPT		CO8
20	Photogrammetry	PPT		CO7
21	Definition and types	PPT		CO7
22	Aerial and terrestrial photographs	Group discussion by comparing different aerial and terrestrial photographs	Video	CO7
23	Aerial and terrestrial photographs	PPT		CO8
24	Terrestrial photographs	PPT		CO4
25	Method and equipment used in Aerial Photo Interpretation (Introduction only)	PPT	Group seminar presentation	CO4
Module II : Remote Sensing: Introduction				
26	Definition, History and Scope of Remote Sensing	Audiovisuals and PowerPoint presentation	Seminar presentation	(CO2)
27	Principles of Remote Sensing	Audiovisuals and PowerPoint presentation	Class room assignments and resulting students work	(CO2), (CO1)
28	Concepts of Remote Sensing			
29	Indian Remote sensing	Students	Conducting quiz	(CO4)

	Programs	presentation and group discussion		
30	Indian Remote sensing Programs	PPT		
31	Indian Remote sensing Programs	Students presentation and group discussion	Conducting quiz	(CO4)
Module III: Remote Sensing: Application				
32	Electromagnetic spectrum -	Demonstration and Group discussion	Outdoor group activities	(CO1)
33	Spectral characteristics of surface features of rocks	PPT		CO4
34	Spectral characteristics of surface features of soils,	PPT		CO4
35	Spectral characteristics of surface features of water).	PPT		CO4
36	Spectral characteristics of surface features of vegetation	PPT		CO4
37	Sensors and Platforms	PPT		CO4
38	Types of platforms,	Student presentation, audiovisuals, and collaborating	Using concept test (short, informal, targeted tests)	(CO1), (CO2)
39	scanners	PPT		CO4
40	data products Image processing	PPT	Interactive session	CO4
41	Photo-interpretation	PPT		CO4
42	Photogrammetry	Lecturing and group	Assignment -1	

	-	discussion		CO5 CO4
43	Applications of remote Sensing	Discussion of case studies, Student presentation	Assignment-2	CO10
44	Space Imaging Landsat,	Student presentation and discussion	. Group seminar presentation	CO3 CO4
45	SPOT,	PPT		CO9
46	IRS	PPT		CO9
47	NOAA	PPT		CO9
48	Seasat	PPT	Interactive session	CO9
49	ERS	PPT		CO9
50	RADARSAT	PPT	Video	CO9
51	INSAT.	PPT		CO9
52	Digital Image Processing Principles	PPT	Video	CO10
53	Image Rectification and restoration,	Class room activities, demonstration	Assignment-3	CO6), CO7)
54	Image enhancement and Mosaicing.	PPT		CO7 CO8

55	Image classification, Supervised, Unsupervised	Class room activities, demonstration	Computer based experimental leaning activity	CO7 CO8
56	Ground truth data and training set manipulation,	PPT		CO7
57	Classification accuracy assessment.	PPT		CO8
Module IV: Geographical Information System (GIS)				
58	History and Development	Lecturing And discussion	Conducting quiz	(CO3)
59	Concepts, Components			
60	Organization of GIS			
61	Introduction to mapping and GIS	Demonstration and explanation	Group seminar presentation	(CO5)
62	Introduction to mapping and GIS	Demonstration and explanation	Group seminar presentation	(CO5)
Module V: Geographical Information System (GIS)				
63	Fundamentals of computing GIS	Lecturing, Demonstration and explanation	Assignment-4	CO7), (CO8
	Theory of GIS	PPT	Video	CO7),
64	Spatial Data concepts			(CO8
65	Processing and visualization,	Demonstration and explanation		(CO8), (CO ₁₀)
66	Information analysis	PPT	Video	(CO8), (CO10)
67	Information analysis	PPT		CO8),

68	Information analysis	PPT		CO10
69	Information analysis	PPT		CO8
70	Information analysis	PPT		CO10
71	Digital data processing	PPT	Interactive session	CO8
72	Digital data processing	PPT		CO10
73	Digital data processing	PPT		CO8
74	Digital data processing	PPT		CO10
75	Digital data processing	PPT		CO8
76	Raster and vector data	PPT		CO10
77	Raster and vector data	PPT		CO8
78	Raster and vector data	Demonstration and explanation	Assignment-5	(CO7)
79	Map projection	Class room activity, demonstration	Assignment-6	(CO1)
80	Map projection	PPT		CO10
81	Map projection	PPT		CO10
82	Map projection	PPT		CO10
83	Software used in GIS Surveying:	Student presentation and discussion		(CO6)
84	Leveling,	PPT		CO10
85	Triangulation, y	PPT		CO10
86	Geodetic surge	PPT	Interactive session	CO10

87	Global Positioning System (GPS)	PPT		CO9
88	Basic principles	PPT		CO9
89	Applications to environmental studies.	PPT		CO9
90	Applications to environmental studies.	PPT		CO9
91	Applications to environmental studies.	Outdoor activity and demonstration	Assignment-7	(CO6)

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	14/11/2018	Application of high-resolution thermal infrared remote sensing and GIS to assess the urban heat island effect	CO 5
2	7/12/2018	Applications of Remote Sensing and GIS Technologies in Groundwater Hydrology: Past, Present and Future	CO4
3	20/12/2018	Satellite Remote Sensing and GIS Applications in Agricultural Meteorology	CO2
4	11/01/2019	Application of remote sensing and GIS for the demarcation of groundwater potential zones of a river basin in Kerala, southwest coast of India	CO7
5	01/02/2019	Advances In Remote Sensing And GIS Analysis	CO4
6	27/02/2019	Remote Sensing and Gis Applications for Mapping and Spatial Modelling of Invasive Species	CO8
7	01/03/2019	Application of remote sensing and geographic information systems to forest fire hazard mapping	CO5

REFERENCE

1. Agarwal, N.K. 2004. *Essentials of GPS*. Spatial Networks Pvt. Ltd., Hyderabad.
2. Agarwal, S.K. 2002. *Eco informatics*. APH Publishing Corporation, Hyderabad.
3. Begni Gérard, Escadafal Richard, etal, (2005). Remote sensing: a tool to monitor and assess desertification. Les dossiers thématiques du CSFD
4. DaplynP ,Cropley J, Treagust and Gordon A (1994) The use of Geographical Information Systems in Socio-economic Studies. The Natural Resources Institute.

5. Donnay J P, Barnsley M J and Longley P A (eds) (2001) Remote Sensing and Urban Analysis. Taylor & Francis, London
6. Elachi, C. 1978. *Introduction to Physics and Techniques of Remote sensing*. John Wiley Pub., N.Y.
7. Floyd F., and Sabins Jr., W.H. 1987. *Remote Sensing, Principles and Interpretation*.
8. Freeman & Company, New York, 2nd Ed., 1987.
9. Franklin S E (2001) Remote Sensing for Sustainable Forest Management. Lewis Pub, London.