

University of Mumbai

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Academic Authorities,
Meetings & Services (AAMS)
Room No. 128, M. G. Road, Fort,
Mumbai – 400 032.
Tel. 022-68320033

Re- accredited with A ++ Grade (CGPA 3.65) by NAAC
Category- I University Status awarded by UGC

No. AAMS_UGS/ICD/2024-25/ 454

Date : 24th March, 2025

To,
The Director,
Garware Institute of Career Education
and Development,
Vidyanagari
Santacruz (East)
Mumbai – 400 098.

Sub : M.Sc (Sustainable Development and Environment Management)
(Two year)(Sem – I & II).

Sir,

With reference to the subject noted above, this is to inform you that the recommendations made by the **Advisory Committee & Board of Management** of Garware Institute of Career Education & Development at its Meeting held on **4th September, 2023** & resolution passed by the **Board of Deans** at its meeting held on **9th August, 2023** vide Item No. 9.2 have been accepted by the **Academic Council** at its meeting held on **1st November, 2023** vide Item no. 9.3 (A) 3 (N) and subsequently approved by the **Management Council** at its meeting held on **14th August, 2024** vide Item No. 6 that in accordance therewith, in exercise of the powers conferred upon the Management Council under Section 74(4) of the Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017) the following program with Ordinance for Title of the Program, Eligibility and Regulation numbers for Duration of Program, Intake Capacity, Scheme of Examinations, Standard of Passing and Credit Structure along with syllabus of **M.Sc (Sustainable Development and Environment Management) (Sem I & II)** (Appendix – 'A') have been introduced and the same have been brought into force with effect from the academic year **2023-24**.

The New Ordinances & Regulations as per NEP 2020 is as follows :-

Sr. No	Name of the Programme	Ordinance no. for Title	Ordinance no. for Eligibility	Duration
A	P.G Diploma in Sustainable Development and Environment Management	O.GPA – 25 A	O.GPA – 26 A	Two year
B	M.Sc (Sustainable Development and Environment Management)	O.GPA – 25 B	O.GPA – 26 B	
C	M.Sc (Sustainable Development and Environment Management)	O.GPA – 25 C	O.GPA – 26 C	One year

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: 2 :

Regulation Nos	
Duration	R. GPA - 56
Intake Capacity	R. GPA - 57
Scheme of examination	R. GPA - 58
Standard of Passing	R. GPA - 59
Credit Structure	R. GPA - 60 A
	R. GPA - 60 B
	R. GPA - 60 C
	R. GPA - 60 D


(Dr. Prasad Karande)
REGISTRAR

A.C/9.3(A)3 (N)/01/11/2023
M.C/6/14/8/2024

Copy forwarded with Compliments for information to:-

- 1) The Chairman, Board of Deans
- 2) The Dean, Faculty of Science & Technology.
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Director, Department of Information & Communication Technology,
- 6) The Co-ordinator, MKCL.

Copy forwarded for information and necessary action to :-	
1	The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Dept)(AEM), dr@eligi.mu.ac.in
2	The Deputy Registrar, Result unit, Vidyanagari drresults@exam.mu.ac.in
3	The Deputy Registrar, Marks and Certificate Unit,. Vidyanagari dr.verification@mu.ac.in
4	The Deputy Registrar, Appointment Unit, Vidyanagari dr.appointment@exam.mu.ac.in
5	The Deputy Registrar, CAP Unit, Vidyanagari cap.exam@mu.ac.in
6	The Deputy Registrar, College Affiliations & Development Department (CAD), deputyregistrar.uni@gmail.com
7	The Deputy Registrar, PRO, Fort, (Publication Section), Pro@mu.ac.in
8	The Deputy Registrar, Executive Authorities Section (EA) eau120@fort.mu.ac.in He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
9	The Deputy Registrar, Research Administration & Promotion Cell (RAPC), rapc@mu.ac.in
10	The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA) dy.registrar.tau.fort.mu.ac.in ar.tau@fort.mu.ac.in
11	The Deputy Registrar, College Teachers Approval Unit (CTA), concolsection@gmail.com
12	The Deputy Registrars, Finance & Accounts Section, fort draccounts@fort.mu.ac.in
13	The Deputy Registrar, Election Section, Fort drelection@election.mu.ac.in
14	The Assistant Registrar, Administrative Sub-Campus Thane, thanesubcampus@mu.ac.in
15	The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan, ar.seask@mu.ac.in
16	The Assistant Registrar, Ratnagiri Sub-centre, Ratnagiri, ratnagirisubcentar@gmail.com
17	The Director, Centre for Distance and Online Education (CDOE), Vidyanagari, director@idol.mu.ac.in
18	Director, Innovation, Incubation and Linkages, Dr. Sachin Laddha pinkumanno@gmail.com
19	Director, Department of Lifelong Learning and Extension (DLLE), dlleuniversityofmumbai@gmail.com

Copy for information :-	
1	P.A to Hon'ble Vice-Chancellor, vice-chancellor@mu.ac.in
2	P.A to Pro-Vice-Chancellor pvc@fort.mu.ac.in
3	P.A to Registrar, registrar@fort.mu.ac.in
4	P.A to all Deans of all Faculties
5	P.A to Finance & Account Officers, (F & A.O), camu@accounts.mu.ac.in

To,

1	The Chairman, Board of Deans pvc@fort.mu.ac.in
2	Faculty of Humanities, Dean 1. Prof.Anil Singh Dranilsingh129@gmail.com Associate Dean 2. Dr.Suchitra Naik Naiksuchitra27@gmail.com 3.Prof.Manisha Karne mkarne@economics.mu.ac.in Faculty of Commerce & Management, Dean 1. Dr.Kavita Laghate kavitalaghate@jbims.mu.ac.in Associate Dean 2. Dr.Ravikant Balkrishna Sangurde Ravikant.s.@somaiya.edu 3. Prin.Kishori Bhagat kishoribhagat@rediffmail.com

	Faculty of Science & Technology Dean 1. Prof. Shivram Garje ssgarje@chem.mu.ac.in Associate Dean 2. Dr. Madhav R. Rajwade Madhavr64@gmail.com 3. Prin. Deven Shah sir.deven@gmail.com
	Faculty of Inter-Disciplinary Studies, Dean 1. Dr. Anil K. Singh aksingh@trcl.org.in Associate Dean 2. Prin. Chadrashekhhar Ashok Chakradeo cachakradeo@gmail.com
3	Chairman, Board of Studies,
4	The Director, Board of Examinations and Evaluation, dboee@exam.mu.ac.in
5	The Director, Board of Students Development, dsd@mu.ac.in DSW directr@dsw.mu.ac.in
6	The Director, Department of Information & Communication Technology, director.dict@mu.ac.in

As Per NEP 2020

University of Mumbai



Title of the program

- A- P.G. Diploma in Sustainable Development & Environment Management
- B- M.Sc. (Sustainable Development & Environment Management) (Two Years) } 2023-24
- C- M.Sc. (Sustainable Development & Environment Management) (One Year) - 2027-28

Garware Institute of Career Education and Development

Syllabus for Semester- Semester I and II

Ref: GR dated 16th May,2023 for Credit Structure of PG

UNIVERSITY OF MUMBAI



(AS PER NEP 2020)

Sr. No.	Heading	Particulars	
1	Title of program O: <u>GPA – 25A</u>	A	P.G. Diploma in Sustainable Development & Environment Management
	O: <u>GPA – 25B</u>	B	M.Sc. (Sustainable Development & Environment Management) (Two Years)
	O: <u>GPA – 25C</u>	C	M.Sc. (Sustainable Development & Environment Management) (One Year)
2	Eligibility O: <u>GPA – 26A</u>	A	Bachelor's Degree In Science (Botany, Zoology, Chemistry, Physics, Statistics, Mathematics, Geography, Geology, Life Sciences, Genetics, Environment Sciences, Microbiology, Biotechnology, Biochemistry, Bioanalytical Sciences, Fisheries, Wildlife Conservation, Marine Biology, Horticulture, Agriculture, Computer Science, Veterinary Science, Anthropology, Health Sciences) Or Bachelor's Degree In Any Branch Of Engineering/ Technology Or ***B.Voc.(Renewable Energy Management/ Renewable Energy Technology And Management/ Green House Management/ Sustainable Agriculture/ Green House Technology/ Sustainable Energy Management/ Environmental Assessment And Remediation/ Fisheries & Farm Management) Or Equivalent From UGC Approved Universities With Compulsorily Science At H.S.C. Level. OR Passed Equivalent Academic Level 5.5
	O: <u>GPA – 26B</u>	B	1. The candidate who has successfully completed P.G. Diploma in Sustainable Development & Environment Management. 2. The candidate whose Post Graduate Diploma credits are 60% equivalent to M.Sc. (Sustainable Development & Environment Management) & he/ she earns minimum 8 Credits from P.G. Diploma in Sustainable Development & Environment Management. With Compulsorily Science At H.S.C. Level. 3. As per NEP criteria on the basis of RPL- Recognition of Prior Learning, Candidate to be admitted to 2nd Year subject to He/she securing minimum 50% in the 1st Year assessment of PGDSDEM & proof of employment of Minimum 2 Years. With Compulsorily Science At H.S.C. Level. OR Passed Equivalent Academic Level 6.0

	O: <u>GPA – 26C</u>	C	Any Graduate with 4 year U.G. Degree (Honours / Honours with Research) with Specialization in concerned subject or equivalent academic level 6.0 OR Graduate with four years UG Degree program with maximum credits required for award of Minor degree is allowed to take up the Post graduate program in Minor subject provided the student has acquired the required number of credits as prescribed by NEP.
3	Duration of Program R: <u>GPA – 56</u>	A	1 Year
		B	2 Years
		C	1 Year
4	R: <u>GPA – 57</u> Intake Capacity	30	
5	R: <u>GPA – 58</u> Scheme of Examination	NEP 50% Internal – Continuous Evaluation 50% External- Semester End Examination Individual Passing in Internal and External Examination	
6	Standards of Passing R: <u>GPA – 59</u>	50% in each component	
7	Credit Structure R: <u>GPA – 60A</u> R: <u>GPA – 60B</u> R: <u>GPA – 60C</u> R: <u>GPA – 60D</u>	Attached herewith	
8	Semesters	A	Sem I & II
		B	Sem I, II, III, & IV
		C	Sem I & II
9	Program Academic Level	A	6.0
		B	6.5
		C	6.5
10	Pattern	Semester	
11	Status	New	
12	To be implemented from Academic Year Progressively	A	2023-24
		B	
		C	2027-28

Keyurkumar

Dr. Keyurkumar M. Nayak,
Director,
UM-GICED

Shivram S. Garje

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science

PREAMBLE

Introduction:

Managing sustainability is one of the most challenging and rapidly growing areas in both the public and private sectors. Securing economic development, social equity and justice, and environmental protection is the goal of sustainable development.

Sustainable development encourages us to conserve and enhance our resource base, by gradually changing the ways in which we develop and make use of sound and sustainable technologies.

Rapid industrialization coupled with uncontrolled exploitation of natural resources has affected environment, by ultimate changes in the natural cycle, causing impact and/or effects on air, water, land, flora, fauna, human settlement and health of people. Industrial development, besides economic growth, brings along with it many environmental problems.

Environmental Management is the process of controlling any potential negative impact on the external environment from the human activities in general and industrial activities in particular.

Though industrialization is an integral part of India's progressive economy qualified trained professionals in the field are scarce to find. There is a strong need for professional adept at providing solutions/ expertise in the fields of Sustainable Development And Environment Management in the context of globalization and India's progressive economy.

The course is thus designed to fill up these gaps by imparting the knowledge in the field of Sustainable Development And Environment Management to those interested to make their rewarding career in this field.

Aims:

- To demonstrate and apply sound domain knowledge and competence in environment management, sustainable development studies as well as use skills with respective techniques, methodologies and theories constructively in professional spheres.
- To develop and put into practice effective communication, reading and presentation skills in environment management and sustainability domains and use appropriate body language.
- To analyze, interpret and evaluate different data, emerging industrial trends and be an environmentally responsible individual able to take informed decision for his company and country.
- To identify, select, organize, and apply the research techniques to carry out research and value intellectual property rights as well as interpret the research data correctly on the professional front.
- To choose and use basic computer applications & domain specific tools along with core training in modern laboratory equipments for enhanced output.

- To understand, investigate and evaluate concepts from diverse areas such as social entrepreneurship and public governance and NGOs.
- To be prepared to face a situation or fulfil a requirement and arrive at a win-win solution – both commercially as well as technically through holistic thinking and problem solving approach.
- To serve and assist in socially/ environmentally useful and productive work and be prepared potential entrepreneurs to base their ventures on solid offerings for sustained greatness.
- To interact with people of diverse backgrounds and cultures respecting their beliefs and practices and while effectively engaging within a multicultural society and be able to empathise with the societal needs and be concerned and responsible to environmental issues and practice sustainability.
- To develop professionalism, organizational skills and employability skills, make decisions, put into practice self-, time- and change management and solve problems by following learnt ethical principles.
- To cultivate self-awareness, inner strength, creative and original thinking, attitude to continuously update and upgrade one's knowledge and expertise in alignment with the core Environmental Sensitization

Objectives:

- To inculcate the knowledge base on sustainable development with a view to balance our economic, environmental and social needs, allowing prosperity for now and future generations.
- To train students to undertake major initiatives in the efficient management of natural resources and the prevention of environmental pollution with focus on Sustainable Development - Sustainability in industry aspect.
- To equip individuals to solve problems of environmental pollution and environmental degradation through before end of pipe (BEOP) interventions, over and above the use of conventional way of end-of-pipe (EOP) interventions.
- To promote understanding of efforts that can be made at the Industry and Government level to improve the environment, the economy and the quality of life of biotic and abiotic communities.
- To use environmental management tools that help to improve the quality of environment, to assess local vulnerabilities with respect to climate, natural disasters and to achieve sustainable developmental needs.
- To focus on skill-based education with involvement of multidisciplinary aspects.

Learning Outcomes:

A Student Completing M.Sc. (Sustainable Development and Environment Management) will be able to:

- Undertake major initiatives in the efficient management of natural resources and the prevention of environmental pollution with a view to balance an individual's economic, environmental, social needs and with a focus on Sustainable Development allowing prosperity for now and future generations.
- Be equipped to solve problems of environmental pollution and environmental degradation through before end of pipe (BEOP) interventions, over and above the use of conventional way of end-of-pipe (EOP) interventions.

- Acknowledge and support the efforts made at the Industry and Government level to improve the environment, the economy and the quality of life of biotic and abiotic communities.
- Utilize environmental management tools to improve the quality of environment, to assess local vulnerabilities with respect to climate, natural disasters and to achieve sustainable developmental needs and goals at the individual, professional, local, national and global level.
- Understand the problems faced by the industry while handling an Environmental concern and provide solutions which are Sustainable as well as Environment ally correct at the first place.
- Be employable/ Self-employed and future ready as there would be more emphasis on ‘learning by doing’ and introducing the student to the industry beforehand through inplant training, research, live projects, industrial visits and industry- academia interphase .

5) Credit Structure of the program – (Parishisth-1)

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M.Sc.(Sustainable Development and Environment Management)Structure and

Credit Distribution as per NEP 2020

Year	Level	Sem	Major				RM	OJT/FP	RP	Cum. Cr.	Degree
			Mandatory			Electives					
I	6.0	Sem I	Environmental Chemistry	TH	Credits 4	Credits 4 P 1: Environmental Monitoring/ P2 : : Information and Communication Technology/ P3: Biodiversity Conservation	4			22	PG Diploma (after 3-yr UG or PG Degree)
			Environmental Microbiology	TH	Credits 4						
			Ecology and Ecosystem	TH	Credits 2						
			Practicals I	PR	Credits 4						
					14	4	4	0	0	22	
		Sem II	Air & Noise Pollution Prevention & Control	TH	Credits 4	Credits 4 P 4: Unit Operations & Processes/ P5: Management of Solid Wastes/ P6: Environmental Toxicology		4		22	
			Water Pollution Prevention & Control	TH	Credits 4						
			Environmental Physics	TH	Credits 2						
			Practicals II	PR	Credits 4						
					14	4	0	4	0	22	
Cum. Cr. For 1 YR PG Diploma			28			8	4	4		44	
Exit Option : PG Diploma (44 credits) after Three Year UG Degree											

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M.Sc. (Sustainable Development and Environment Management)**Credit Structure of the Program (Sem III & IV) as per NEP 2020**

Exit option: PG Diploma in MSc (SDEM) with cumulative credit (44 Credits) after Three Year UG Degree												
Year	Level	Sem	Major				RM	OJT/FP	RP	Cum. Cr.	Degree	
			Mandatory			Electives						
II	6.5	Sem III	Sustainability and CSR I	TH	Credits 4	Credits 4 Industrial Safety and Occupational Hygiene/ OR Designing Of Waste Water Treatment Systems			Research Project 4	22	PG Degree (after 3-yr UG)	
			Environmental Regulations And Compliance	TH	Credits 4							
			Environmental Management Tools	TH	Credits 4							
			Practicals III	PR	Credits 2							
					14	4						0
		Sem IV	Sustainability and CSR II	TH	Credits 4	Credits 4 Climate Change and Disaster Management/ OR Green Buildings			Research Project 6	22		
			ESG Reporting & Implementation	TH	Credits 4							
			Risk Management	TH	Credits 4							
					12	4						0
Cum. Cr. For 1 YR PG Diploma			28			8	4	4	-	44		
Cum. Cr. For 2 YR PG Degree			26			8	0	0	10	44		
Cumulative Credits			54			16	4	4	10	88		
Exit Option : PG Degree in MSc SDEM with cumulative credit (88 credits) after Three Year UG Degree												



Dr. Keyurkumar M. Nayak,
Director,
UM-GICED



Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science

M.Sc. (Sustainable Development and Environment Management)

YEAR – 1: SEMESTER – I

	Paper Code	Title of the Course	Scheme of Examination Assessment Pattern			Scheme of Instruction			Credits
			Internal Marks 50	External Marks 50	Total Marks 100	Theory Hours (L)	Practical Hours (P)	Total Hours	
M	PGD(SDEM)S1 MJP1	Environmental Chemistry	50	50	100	60	-	60	4
	PGD(SDEM)S1 MJP2	Environmental Microbiology	50	50	100	60	-	60	4
	PGD(SDEM)S1 MJP3	Ecology and Ecosystem	25	25	50	30	-	30	2
	PGD(SDEM)S1 MJP4	Practicals I	100	-	-	-	120	120	4
E	PGD (SDEM)S1P5A	Environmental Monitoring	50	50	100	60	-	60	4
	PGD (SDEM)S1P5B	Information and Communication Technology	50	50	100	60	-	60	4
	PGD (SDEM)S1P5C	Biodiversity Conservation	50	50	100	60	-	60	4
RP	PGD (SDEM)S1P6	Research Methodology	50	50	100	60	-	60	4
		Total	325	225	550	270	120	390	22

YEAR – 1: SEMESTER – II

	Paper Code	Title of the Course	Scheme of Examination Assessment Pattern			Scheme of Instruction			Credits
			Internal Marks 50	External Marks 50	Total Marks 100	Theory Hours (L)	Practical Hours (P)	Total Hours	
M	PGD (SDEM)S2MJP7	Air & Noise Pollution Prevention & Control	50	50	100	60	-	60	4
	PGD (SDEM)S2MJP8	Water Pollution Prevention & Control	50	50	100	60	-	60	4
	PGD (SDEM)S2MJP9	Environmental Physics	25	25	50	30	-	30	2
	PGD (SDEM)S2MJP10	Practicals II	100	-	100	-	120	120	4
E	PGD (SDEM)S211A	Unit Operations & Processes	50	50	100	60	-	60	4
	PGD (SDEM)S211B	Environmental Toxicology	50	50	100	60	-	60	4
	PGD (SDEM)S211C	Management of Solid Wastes	50	50	100	60	-	60	4

RP	PGD(SDEM)S2 P12	On the Job Training/ FieldProject	100	-	100	-	120	120	4
		Total	375	175	550	210	240	450	22

M.Sc. (Sustainable Development and Environment Management)

COURSE CONTENT BRIEF:

YEAR – 2: SEMESTER – III

	Paper Code	Title of the Course	Scheme of Examination Assessment Pattern			Scheme of Instruction			Credits
			Internal Marks 50	External Marks 50	Total Marks 100	Theory Hours (L)	Practical Hours (P)	Total Hours	
M	M.Sc.(SDEM)S 3MJP13	Sustainability and CSR I	50	50	100	60	-	60	4
	M.Sc.(SDEM)S 3MJP14	Environmental Regulations And Compliance	50	50	100	60	-	60	4
	M.Sc.(SDEM)S 3MJP15	Environmental Management Tools	50	50	100	60	-	60	4
	M.Sc.(SDEM)S 3MJP16	Practicals III	50	-	50	-	60	60	2
E	M.Sc.(SDEM)S 3P17A	Industrial Safety and Occupational Hygiene	50	50	100	60	-	60	4
	M.Sc.(SDEM)S 3P17B	Designing Of Waste Water Treatment Systems	50	50	100	60	-	60	4
RP	M.Sc.(SDEM)S 3P18	Research Project	100	-	100	-	120	120	4
		Total	350	200	550	240	180	420	22

YEAR – 2: SEMESTER – IV

	Paper Code	Title of the Course	Scheme of Examination Assessment Pattern			Scheme of Instruction			Credits
			Internal Marks 50	External Marks 50	Total Marks 100	Theory Hours (L)	Practical Hours (P)	Total Hours	
M	M.Sc.(SDEM)S 4MJP19	Sustainability and CSR II	50	50	100	60	-	60	4
	M.Sc.(SDEM)S 4MJP20	ESG Reporting & Implementation	50	50	100	60	-	60	4
	M.Sc.(SDEM)S 4MJP21	Risk Management	50	50	100	60	-	60	4
E	M.Sc.(SDEM)S4P22A	Climate Change and Disaster Management	50	50	100	60	-	60	4
	M.Sc.(SDEM)S4P22B	Green Buildings	50	50	100	60	-	60	4
RP	M.Sc.(SDEM)S 4P23	Research Project	200	-	200	-	180	180	6
		Total	400	200	600	240	180	420	22

M: Mandatory E: Elective L: Lecture P: Practical

Sem. – I

SUBJECT-WISE SYLLABUS

SEMESTER -I	
MANDATORY	
Subject : PGD(SDEM)S1 MJP1: ENVIRONMENTAL CHEMISTRY	Credits = 4
Total contact hours: 60	Theory Hours = 4/week
Course Objectives 1. To provide insight into the chemical processes influencing the composition and chemical speciation of different spheres of Earth System. 2. To provide an overview of the fundamental chemical processes that are the basis of a range of crucial environmental problems. 3. To utilize acquired knowledge in making critical evaluations of environmental problems. 4. To provide sustainable environmental options for control of toxic pollutants. 5. To develop environmental sensitization.	
Course Specific Learning Outcomes (The students will be able to.....) 1. Develop an understanding and associate the knowledge of interactions of various spheres based on their composition and the chemistry. 2. Comprehend the behavior pattern of various pollutants based on the knowledge of the basic concepts. 3. Predict the impacts of water pollution and apply the gained knowledge to provide sustainable solutions to the concerned issues. 4. Enlist various major environmental issues like ozone depletion, greenhouse effect, anthropogenic climate change, and air pollution. 5. Sensitize the burgeoning air pollution issue and the need for regular monitoring of parameters through AQI. 6. Recognize the importance of environmental changes in context of air pollution. 7. Understand the nature, reactivity, and environmental fates of toxic organic chemicals. 8. Demonstrate an understanding of theoretical and practical environmental issues related to soil, pesticidal and heavy metal pollution. 9. Apply the learnt concepts and case studies for better pollution prevention and control.	

CONTENT	Total Hours
UNIT I The composition and the chemistry of the atmosphere, the hydrosphere, the lithosphere and their interactions with each other and with the biosphere.	18
UNIT II Basic concepts of chemistry, inclusive of the concepts of chemical equilibrium, colloidal chemistry, adsorption, absorption and catalysis as well as behavior pattern of pollutants in aqueous solutions.	10
UNIT III Water pollution: Definition, Sources of water pollution and their effects, water quality criteria, specification of water as per the application including heavy metal pollution in water.	10
UNIT IV Air pollution: Definition, Sources of air pollution and their effects, Ozone depletion, Global warming and climate change, primary pollutant, secondary pollutant, NAAQS and emission standards. Basics of AQI and photocatalysis.	10
UNIT V Soil pollution: Definition, sources & types, classification of soil pollutants, effects of pollution on soil, health and productivity. Effects of pesticides on soil: toxic, inorganic & organic pollutants, soil deterioration, concentration of infecting agents in soil Including heavy metal pollution in soil.	12
*NOTE: Relevant case studies to be covered in each unit.	
Reference books: • Fundamental Concepts of Environmental Chemistry by G. S. Sodhi • Environmental Chemistry by Springer • Environmental Chemistry by B.K. Sharma, H. Kaur • Environmental Chemistry by De Anil Kumar • Environmental Chemistry by Encyclopedia of Environment Pollution and Control by R. K. Trivedi • Air Pollution Vol. I. and II by Stern Arthur C. • APTI manual 435 • Chemistry for Environmental Engineering by Sawyer Claim & McCarthy Perry L. • Pollution Management Vol III- Pesticides Pollution by S. K. Agarwal • Introduction to Air Pollution by R. K. Trivedi and P.K. Goel	

Subject : PGD(SDEM)S1 MJP2 : ENVIRONMENTAL MICROBIOLOGY	Credits = 4
Total contact hours: 60	Theory Hours = 4/week

Course Objectives

1. To comprehend the basic and applied microbiological aspects of environment.
2. To provide a detailed insight into the importance of microbe organisms in the various functions of the environment.
3. To develop an understanding of microorganisms role in biodegradation of wastes.
4. To acquire knowledge of biotechnological aspect for sustainable pollution control solutions.
5. To acquire knowledge of nanotechnology aspect for sustainable pollution control solutions.

Course Specific Learning Outcomes (The students will be able to.....)

1. Develop a comprehensive understanding of microorganism and their environmental significance
2. Understand the nutritional requirement of microorganism.
3. Familiarize with various biochemical pathways and basic genetics.
4. Understand the importance of various biomolecules in regular functioning of the cell.
5. Comprehend growth of microorganism and theoretically analyzing factors responsible for growth of microorganism.
6. Associate the natural growth and death pattern of microorganisms with the methods adopted for disinfection purpose.
7. Compare the causative organisms for various water and air borne diseases.
8. Recognize the importance of Air Microbiology and its applications in various industries.
9. Understand the Waste Water Microbiology, factors & design parameters of a Waste Water treatment plant and its subsequent industrial applications.
10. Acquire knowledge of the concept of Biodegradation & Bioremediation, Biotechnology and Nanotechnology techniques with a view to clean the environment.
11. Identify the recent application of microorganisms for sound Sustainable Environment Management.

CONTENT	Total Hours
General Microbiology: UNIT I Introduction to Microbiology: Five kingdom system, binomial nomenclature, group of micro-organisms and their environmental significance. Structure of Prokaryotic and Eukaryotic cells, functions of each part. Biochemistry of micro-organisms [Pathways]. Respiration, anaerobic, aerobic, energy generation. Photosynthesis. Introduction to Genetics. Disease causing micro-organisms [water borne diseases and fecal organisms including coliforms]	16
UNIT II Nutrition of micro-organisms Overview of proteins, carbohydrates, lipids, nucleic acids. Nutritional classification of micro-organisms. Growth of micro-organisms [Biological growth curve, significance of each stage]; factors affecting growth. Death of micro-organisms [Physical and chemical sterilization techniques]	10
Environmental Microbiology UNIT III Microbiology of Air: Distribution and types of micro-organisms in air. Factors affecting the kind and no. of micro-organisms. Dust, Droplet & Droplet Nuclei. Communicability of infections. Methods of Air Purification.	4
UNIT IV Microbiology of Water: Natural water environment [Freshwater, Marine water & Other] Eutrophication – causes, sources & consequences. Factors influencing micro-organisms present in aqueous environment. Drinking Water Purification [Individual water supplies & Municipal water supplies] Microbiology of Wastewater Microbiology of domestic wastewater [sewage]: types of micro-organisms present, treatment methods for single dwelling unit and sewage treatment plants [STP] Microbiology of industrial wastewater [effluent]: variety of micro-organisms present in different types of effluents, treatment methods for individual effluent treatment plants [ETP] and CETP.	8

UNIT V An introduction to Biodegradation & Bioremediation, Biotechnology and Nanotechnology. Micro-organisms as indicators of pollution, acclimatization and microbial biodegradation (pesticides, hydrocarbons, detergents & oil), microbial bioremediation to clean up the environment.	12
UNIT VI Recent trends in application of microbes in Environment Management (Agriculture, climate change resilience and allied fields)	10
Reference books: • Microbiology by Pelczar Michael J. & Others • General Microbiology by Stanier Roger Y. & Others • Waste Water Treatment by Metcalf & Eddy • Biological Science by Taylor, Green and Stout • Fundamentals Of Microbiology by Frobisher Martin & Others • Microbiology for Environment and Public by R M. Sterritt & J N. Lester • Bioremediation by Baker, K H., and Herson, D.S. • Bioremediation technology recent advances M.H.Fulekar • Environmental Biotechnology-Basic Concepts and Applications Indu Shekhar Thakur, I.K. International Pvt. Ltd. New Delhi. • Environmental Biotechnology S.K. Agawal, APH Publishing Corp., New Delhi. 4. • Elements of Biotechnology, P. K. Gupta, Rastogi Publishing House, New Delhi. • Environmental Biotechnology, Jogdand S.N., Himalaya Publishing House, New Delhi.	
Subject : PGD(SDEM)S1 MJP3 : ECOLOGY AND ECOSYSTEM	Credits = 2
Total contact hours: 30	Theory Hours = 2/week
Course Objectives 1. To acquaint the students from non-biology background to the various aspects of ecology. 2. To explain the structure of ecosystem. 3. To develop an understanding of various functions of ecosystem. 4. To discuss the deviations in Biogeochemical Cycles due to human interference.	

Course Specific Learning Outcomes (The students will be able to.....)

1. Acquire knowledge of basic concepts of ecology.
2. Demonstrate an understanding of various aspect of population and community ecology
3. Undergo a detailed study of major global ecosystems.
4. Discern the working of Biogeochemical Cycles and deviations from these.

CONTENT	Total Hours
UNIT I: Introduction to Ecology Basic concepts and definitions; major terrestrial biomes. Ecological amplitude; Liebig's Law of the Minimum; Shelford's Law of Tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; ecological niche; types of niche; niche breadth; niche partitioning; niche differentiation.	6
UNIT II: Population and Community Ecology Concept of population; its characteristics; population growth; limits to population growth. Community structure and organization; species interactions; ecological succession, models and types of successions, and meta-population; r- and Kselection, climax community concepts, examples of succession, competitive and stress-tolerance strategies.	8
UNIT III: Ecosystem ecology Types of ecosystem globally; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem. function; ecosystem metabolism; primary production and models of energy flow; secondary production and trophic efficiency; ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy. Concept of exotics and invasives; natural spread versus man-induced invasions; characteristics of invaders; stages of invasion; mechanisms of invasions; invasive pathways; impacts of invasion on ecosystem and communities.	10
UNIT IV: Biogeochemical cycles and nutrient cycling Various cycles including nutrient cycle models; ecosystem input of nutrients; biotic accumulation; ecosystem losses; nutrient supply and uptake; role of mycorrhizae; decomposition and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.	6

Reference books:

- Modern Concepts Of Ecology (E.D. 5) by Kumar H. D.
- Ecology (ED. 2) by Odum Eugene P.
- Conservation biology: voices from the Tropics by Gibson, L. & Raven, P.HG.
- Natural Capital: Theory and practice of mapping Ecosystem services by Karaiva et al.2012
- Marine Biology by Castro and Huber
- Ecology: Principles and Applications by J. L. Chapman and Michael J. Reiss

Subject : PGD(SDEM)S1 MJP4 : PRACTICALS I	Credits = 4
Total contact hours: 120	Practical Hours = 10/week
Course Objectives	
1. To acquaint students with various techniques of preservation of collected samples. 2. To understand the basic concepts of titrimetric methods of waste water analysis. 3. To spectrophotometrically estimate various parameter in waste water. 4. To acquire knowledge of various microbial growth techniques.	
Course Specific Learning Outcomes (The students will be able to.....)	
1. Acquire knowledge of various Sampling and Preservation Techniques. 2. Determine various parameters in waste water analysis by titrimetric method. 3. Comprehend the basic concepts and determine various parameters in waste water analysis by spectrophotometric method. 4. Perform microbial isolation and enumeration techniques. 5. Undertake minor research project.	

CONTENT	Total Hours
UNIT I: WASTE WATER ANALYSIS: 1. Sampling and Preservation Techniques. 2. Determination of Chlorides in the given sample. 3. Determination of Acidity in the given sample. 4. Determination of Alkalinity in the given sample. 5. Determination of Hardness in the given sample. 6. Determination of pH value in the given sample. 7. Determination of Dissolved Oxygen in the given sample. 8. Determination of Total Solid in the given solution. 9. Determination of Chemical Oxygen Demand in the given sample. 10. Determination of Bio Chemical Oxygen Demand in the given sample. 11. Determination of Chromium in the given sample. 12. Determination of Iron in the given sample. 13. Determination of Sulfates in the given sample. 14. Determination of Phosphates in the given sample. 15. Determination of Residual Chlorine in the given sample. 16. Determination of Heavy Metals by AAS 17. Determination of sodium/potassium by Flame Photometer 18. Oil and grease	80
UNIT II: MICROBIOLOGICAL ANALYSIS: 1. Study of various sterilization and disinfection techniques. 2. Preparation of culture media for cultivation of microorganisms. 3. Inoculation and Isolation, Enumeration of bacteria by Dilution techniques. 4. Study the Growth curve of bacterial culture in nutrient medium.	20
UNIT III: INDUSTRIAL VISITS Industrial visits (4)	20

Reference books:

- Standard Methods For The Examination Of Water And Waste Water (E.D. 17) by American Public Health Association & Others
- Chemistry For Environmental Engineering (E.D. 3) by Sawyer Clairn& McCarthy Perry L.
- Laboratory Manual For The Examination Of Water, Waste Water & Soil by Rump H. H. & Krist H.

ELECTIVES

Subject PGD (SDEM)S1P5A: ENVIRONMENTAL MONITORING	Credits = 4
Total contact hours: 60	
Theory Hours = 4/week	
Course Objectives	
1. To understand the processes which scan, monitor, analyze, and forecasts the variables of the environment. 2. To provide a clear knowledge about the principle and working of analytical techniques used in the environmental analysis so that they can work with these tools effectively. 3. To understand the principles and instrumentation of chromatography. 4. To equip students to work as an environmental analyst on acquiring sound knowledge and allied skills of the subject. 5. To grasp the concept of Continuous Environmental Monitoring Systems.	

Course Specific Learning Outcomes (The students will be able to.....)

1. Get acquainted with sampling and analysis techniques of air pollutants.
2. Know the sampling and various preservation techniques of water pollution parameters.
3. Learn the analysis of common quality parameters
4. Memorize different Sampling, Preservation & storage techniques for different air and water samples.
5. Acquire fundamental knowledge of electromagnetic spectrum.
6. Comprehend the principles and instrumentation of spectroscopic technique in UV, visible and IR spectrum including flame photometry and AAS.
7. Apply techniques of spectroscopy for analysis of various samples.
8. Gain insight into the principles, instrumentation & application of turbidmetry & nephelometry techniques
9. Apply the chromatographic methods in the Environmental analysis
10. Understand the principles, instrumentation & application of Potentiometry and Conductometry techniques
11. Familiarize with the principles of different separation methods with special reference to solvent extraction and ionexchange chromatography.

CONTENT	Total Hours
UNIT I Sampling Preservation & storage Sampling of air pollutants- Ambient and stack emissions sampling. Analysis of air pollutants eg: SO ₂ , NO _x , NH ₃ , TSPM & RSPM. Sampling of water from different sources, preservation techniques. Analysis of common water quality parameters like pH, solids, DO, COD, BOD, oil & grease, etc.	8
UNIT II Various ranges of the electromagnetic spectrum and their interaction with matter. Beer-Lambert law. UV. VIS, IR Spectrophotometry, Turbidity and Nephelometry Applications in the analysis of air, water and soil samples with reference to detection of specific ions in water, soil and waste samples.	10
UNIT III Flame-Photometry and Atomic Absorption Spectrophotometry along with metal ions in water, soil and waste samples.	8
UNIT IV Electro-analytical methods: Potentiometry including Ion Selective Electrode, Conductometry and the applications of these in detection of ions in water, soil and waste samples.	6
UNIT V Chromatographic Methods- Definition, Theory of chromatographic separation, Stationary and Mobile phase. Classification of chromatographic separation. HPLC Gas Chromatography – instrumentation. Detector, FID, ECD and TCD. GC-MS and GC-AES, Application of chromatographic methods in the Environmental analysis with reference to Hydrocarbons in air samples. Phenol and Pesticides in the water samples.	16
UNIT VI Separation Methods- solvent extraction and Ion exchange.	6
Unit VII Continuous Environmental Monitoring Systems.	6

Reference books:

- Principles of Instrumental Analysis by Skoog Douglas A.
- Instrumental Methods Of Chemical Analysis by Chatwal & Anand
- Air Pollution Vol. III.: Measuring, Monitoring & Surveillance Of Air by Stern Arthur C.
- Basic Concepts Of Analytical Chemistry by Khopkar S. M.
- Analytical Chemistry (E.D.8) by Gary D. Christian.
- Fundamentals Of Analytical Chemistry – Skoog & Others

Subject : PGD (SDEM)S1P5B : INFORMATION AND COMMUNICATION TECHNOLOGY

Credits = 4

Total contact hours: 60

Theory Hours = 4/week

Course Objectives:

1. To provide the students basic as well as advanced knowledge of Information Technology.
2. To develop an understanding of applications of software in context of effective Sustainable Environment Management.
3. To learn the steps taken to complete the project with respect to time, cost, scope and quality.
4. To able to apply the acquire knowledge in communication technology for effective communication in personal as well as professional life.

Course Specific Learning Outcomes (The students will be able to.....)

1. Know how deal with day to day operations and maintaining the records through Microsoft Windows Office.
2. Share the document without much hassle of managing various versions, provide immediate responses to help work faster and enable decision making through use of Google Forms other applications.
3. Recognize the usage of various operating systems.
4. Develop an elementary understanding of database and how to segregate data and manage data.
5. Understand the usage of various statistical softwares for data analysis.
6. Develop an understanding of management information system and discern how one can easily connect other devices to have up-to-date information and creating eco-system.
7. Understand requirement of Management, Middle level managers & operation people and know to design the system to ease the work, remove pain area and all bottle necks.
8. Acquire the knowledge of cloud computing and how CRM system helps.
9. Understand e-commerce/M-commerce concept.

10. Know the basic concept of communication and acquaint the importance of verbal and non-verbal communication. 11. Defend one's own idea to persuade others to agree, inspire or sell and experience positive outcomes. 12. Understand the subtle differences in expressions & vocal sounds and prepare oneself to listen effectively. 13. Designs a resume as per latest trends and know the right approach of use of social media for better career prospects. 14. Know, understand and use modern tools for effective communication.	
CONTENT	Total Hours
INFORMATION TECHNOLOGY	10
UNIT I Microsoft Windows Office: Word, Excel, Advance Excel, Power Point, Application of Google forms and Google docs, Internet Browsing, Add-ons and extensions, Important sites(AQI and others) and apps for environmental education.	
UNIT II Basics on Programming Languages and Operating Systems, DBMS, Elementary understanding of Database. Importance of data security, Introduction to relevant and latest softwares in data analysis. Management Information Systems, IOT, Green computing	10
UNIT III Enterprise Resource Plan (ERP) including basics of Customer relationship management (CRM), Cloud computing, Project Management framework and E-commerce into Sustainability and Environment fields.	10
COMMUNICATION SKILLS	10
UNIT IV Introduction to communication-Elements and process of communication, barriers to effective communication and types of communication. Listening skills- Process of listening –strategies for effective listening.	
UNIT V Resume preparation and tips and tricks for uploading profile on a job portal. Group Discussion & Personal interviews, Social media for career prospects.	10

UNIT VI	10
Business letters: Principles importance and objective, Written communication (Reports – significance, salient features, preparation and planning, types of reports), Project Presentation to clients, Presentation skill (online and face-to-face), Leadership skills, Email Etiquettes, Modern tools for effective communication: Web-ex/VOIP/Dash box.	

Reference books: • Rajaraman V: Fundamentals of Computers, New Delhi, Prentice Hall • Computer Fundamental : P. K. Sinha BPB Publications New Delhi • Information Technology for Management by Henry C. Lucas • Management Information System by James O'Brien George M. Marakas • Communication skills by Das & Rao • Effective communication – Urmila Rai/S.M.Rai – Himalaya Publishing House • Business Communication by Lal, Himalaya Publications.	
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Subject : PGD (SDEM)S1P5C: BIODIVERSITY CONSERVATION	Credits = 4
Total contact hours: 60	Theory Hours = 4/week
Course Objectives: 1. To introduced students to the patterns of biodiversity. 2. To gain knowledge of importance of biodiversity. 3. To develop an understanding of threats to biodiversity. 4. To comprehend the various methods of Conservation of biodiversity 5. To gain an insight into the Biodiversity in India and biodiversity hotspots.	

Course Specific Learning Outcomes (The students will be able to.....)	
1. Understand the different biodiversity patterns. 2. Apply the acquired knowledge for biodiversity conservation. 3. Compare various threats to biodiversity. 4. Comprehend the rich varied biodiversity in Indian context. 5. Recommend the best technique for conservation of various species in the hotspot regions.	
CONTENT	Total Hours
UNIT I Biodiversity patterns and estimation : Definition; Types; Spatial patterns: latitudinal and elevational trends in biodiversity; temporal patterns: seasonal fluctuations in biodiversity patterns. Sampling strategies and surveys: floristic, faunal, and aquatic; qualitative and quantitative methods: scoring, habitat assessment, richness, density, frequency, abundance, evenness, diversity, biomass estimation; community diversity estimation: alpha, beta and gamma diversity.	12
UNIT II Importance of biodiversity: Economic values - medicinal plants, drugs, fisheries and livelihoods; ecological services - primary productivity, role in hydrological cycle, biogeochemical cycling; ecosystem services - purification of water and air, nutrient cycling, climate control, pest control, pollination, and formation and protection of soil; social, aesthetic, consumptive, and ethical values of biodiversity.	12
UNIT III Threats to biodiversity: Natural and anthropogenic disturbances; habitat loss, habitat degradation, and habitat fragmentation; climate change; pollution; hunting; over-exploitation; deforestation; hydropower development; invasive species; land use changes; overgrazing; man wildlife conflicts; consequences of biodiversity loss; Intermediate Disturbance Hypothesis.	10

UNIT IV Conservation of biodiversity Importance of biodiversity patterns in conservation; In-situ conservation (Biosphere Reserves, National Parks, Wildlife Sanctuaries); Ex-situ conservation (botanical gardens, zoological gardens, gene banks, seed and seedling banks, pollen culture, tissue culture and DNA banks), role of local communities and traditional knowledge in conservation; biodiversity hotspots; IUCN Red List categorization - guidelines, practice and application; Red Data book; ecological restoration; afforestation; social forestry; agro forestry; joint forest management; role of remote sensing in management of natural resources.	14
UNIT V Biodiversity in India: India as a mega diversity nation; phytogeographic and zoogeographic zones of the country; forest types and forest cover in India; fish and fisheries of India; impact of hydropower development on biological diversity; biodiversity hotspots, status of protected areas and biosphere reserves in the country; National Biodiversity Action Plan.	12
Reference books: • Global Biodiversity Assessment by Heywood V.H. & Watson, R.T. • Conservation biology: voices from the Tropics by Gibson, L. & Raven, P.HG. • Natural Capital: Theory and practice of mapping Ecosystem services by Karaiva et al.2012 • Marine Biology by Castro and Huber • Ecology: Principles and Applications by J. L. Chapman and Michael J. Reiss	

MANDATORY

Subject: PGD (SDEM)S1P6: RESEARCH METHODOLOGY	Credits = 4
Total contact hours: 60	Theory Hours = 4/week

Course Objectives 1. To understand the basics of research designs and methodologies. 2. To identify research tools applicable to examine a research problem 3. To use the right research techniques to interpret the data. 4. To carry out research in an ethical manner.	
Course Specific Learning Outcomes (The students will be able to.....) 1. Propose appropriate research designs and methodologies to apply to a specific research project in a business function. 2. Determine the relevance of research tools and techniques for analyzing and evaluating research problems. 3. Develop a comprehensive research methodology for a given research question. 4. Analyze qualitative and quantitative data as a part of a defined research project. 5. Evaluate literature for a given research problem from the global and national perspectives. 6. Prioritize ethical research practices in conducting a research study. 7. Justify the chosen research orientation and methodology for a given research problem. 8. Construct an effective research proposal for a given study in a scientific manner.	
CONTENT	Total Hours
UNIT I: Research Fundamentals: Research – meaning and types of research –basic, applied, comparative, absolute, problem solving, problem identifying, qualitative, quantitative, characteristics of good research. Hypothesis, Types of hypothesis – Descriptive, Relational – Correlational and Causal, null and alternate. Brief Introduction to Scientific Research Process.	12
UNIT II: Steps in Business Research Process - I: Problem Identification / Problem statement. Review of Literature (including citation and bibliography / references). Research Questions & Research Objectives. Hypothesis formulation. Research Design: Exploratory Research Design. Difference between Qualitative and Quantitative Research. Qualitative Research: Observation, Focus Group, Depth Interview, Projective Techniques.	12

UNIT III: Conclusive Research Design: Quantitative Research: Descriptive research – survey, survey methods. Causal research – Experimentation – labs v/s field experiments, with & without control, before & after. Steps in Business Research Process - II: Sampling Design – Probabilistic and non-probabilistic sampling. Sources of data – primary and secondary. Measurement and Scaling. Validity and reliability. Questionnaire designing.	12
UNIT IV: Steps in Business Research Process - III: Data Preparation – preliminary questionnaire screening, editing, coding and data entry (using statistical software). Research Writing: - Research Proposal, Synopsis, Research Report.	12
UNIT V: Practical: A group of two students (Maximum) has to work on a Minor Research Project on the topic selected from the beginning of the semester in line with all the steps of Research Design starting from Identification of Research Problem to Findings & Conclusion and has to submit a Report to the concerned faculty member.	12

Reference books:

- Business Research Methods by Naval Bajpai.
- Marketing Research – An applied orientation by Naresh Malhotra and Satyabhusan Dash
- Business Research Methods by Donald R. Cooper and Pamela S. Schindler.
- Business Research Methods by Zikmund William
- Research methods for business: A skill building approach by Uma Sekaran.
- Business Research Methods by Panneerselvam R.
- Research Methodology by D. K. Bhattacharyya.
- Business Research Methodology by J. K. Sachdeva.
- Research Methodology for Management and social Science by Adithan Bhujange.
- Business Research Methods by Alan Bryman
- Journal of Indian Business Research
 1. International Journal of Statistics and Analysis
 2. Sankhya – Indian Journal of Statistics
 3. Economic Times
 4. Financial Express
 5. Business Standard
 6. Economic & Political Weekly
 7. Vikalpa

SEMESTER II**MANDATORY**

Subject: PGD (SDEM)S2MJP 7: AIR & NOISE POLLUTION PREVENTION & CONTROL	Credits = 4
Total contact hours: 60	Theory Hours = 4/week

Course Objectives

1. To introduce the students to basic concepts of ambient as well as industrial air pollution.
2. To outline the control techniques used in the areas of particulate, gaseous pollutants and vapors pollution control.
3. To classify various control techniques for odour pollution, noise pollution and vehicular pollution.

Course Specific Learning Outcomes (The students will be able to.....)

1. Gain knowledge of basic concepts and properties of particulate matter control equipment.
2. Understand principle of working of Gravity Settling Chamber.
3. Familiarize with the principle and working of Cyclone.
4. Know the principle and working of ESP.
5. Comprehend the principle and working of Bag House.
6. Understand principle and working of Wet Scrubber
7. Acquire knowledge of control of gases & vapors including absorption, adsorption, and condensation.
8. Explain various methods for control of Sulphur Dioxide.
9. Learn methods to control of oxides of Nitrogen.
10. Understand basic concepts, sources and control techniques for odor pollution
11. Enlist the methods of Control of Auto-exhaust emissions including the basic understanding of the concept.
12. Determine stack height from the given meteorological data.

CONTENT	Total Hours
UNIT I Introduction of various air pollutants. Control of Gases & Vapors: absorption, adsorption, incineration, condensation, biofiltration. Control of Sulphur Dioxide: Flue gas desulphurization, Desulphurization of coal and oil. Control of oxides of Nitrogen: Thermal combustion, Incineration and Catalytic Incineration.	20

UNIT II Control of particulate: Behavior of particulate matter: settling velocity: deposition from stacks. Particulate collection mechanisms, filtration, Impaction, electrostatic processes, settling etc. Particulate control equipment: gravity settling chambers, cyclone separators, wet collectors, venturi scrubbers, fabric filters, absolute filters, High Efficiency Particulate Air (HEPA) & Ultra Low Particulate Air (ULPA) Filters, electrostatic precipitators, collection efficiencies of various systems. (The scope is to give working principles).	20
UNIT III	4
Noise Pollution Abatement and Control methods.	
UNIT IV Control of Auto-exhaust emissions: after burners, catalytic convertors: importance of maintenance.	6
UNIT V Control of Odour: Ventilation, absorption, adsorption & oxidation.	6
UNIT VI Control by stacks: Determination of stack height from meteorological data: deriving emission limits.	4
Reference books: • Fundamentals Of Air Pollution by Stern Arthur C. & Others • Air Pollution Vol. IV.: Engineering Control Of Air Pollution (ED 3) by Stern Arthur C. • Catalysis and Automotive Pollution Control by Crucq, A. & Frennet, A. • Environmental Pollution Control Engineering by Rao C.S. • Pollution Management. Vol I S.K. Agarwal • Pollution Management. Vol II by S.K. Agarwal • APTI Control of Particulate Matter Student Manual • APTI 415 Control of Gaseous Emissions Student Guide	
Subject : PGD (SDEM)S2MJP 8: WATER POLLUTION PREVENTION & CONTROL	Credits = 4

Total contact hours: 60		Theory Hours = 4/week
Course Objectives 1. To provide students with knowledge of the basics of water pollution along with the technology. 2. To develop an understanding of principles behind the processes and techniques related to the prevention and control of water pollution (surface and ground water). 3. To comprehend the role of physical, chemical and biological treatment processes and advance treatment processes for improving treatment efficiency. 4. To acquire knowledge of the current trends in water treatment through case studies.		
Course Specific Learning Outcomes (The students will be able to.....) 1. Know characterization of Waste Water and the need of Waste Water Treatment. 2. Understand various preliminary & primary treatment methods. 3. Comprehend secondary treatment processes and methods. 4. Be aware of the procedure for handling, treatment and disposal of sludge from wastewater treatment plant. 5. Acquire the knowledge of tertiary and advanced treatment with reference to water renovation technologies and concept of zero waste water discharge. 6. Understand the objectives and methods of tertiary treatment. 7. Gain an in-depth knowledge of advanced treatment. 8. Enlist the Guidelines and notification for Central Ground Water Authority. 9. Acquire a detailed understanding of the concept of Rain-water harvesting.		
CONTENT		Total Hours
Pollution prevention UNIT I Characterization of Waste Water, Need of Waste Water Treatment.		8
Treatment Methods: UNIT II Preliminary & Primary treatment: screening, grit removal, oil water separation, equalization & Neutralization, Sedimentation, Coagulation, Flocculation.		6

UNIT III Secondary Treatment: Activated sludge process and its modifications: Aerobic, Facultative & Anaerobic, Attached growth & suspended growth (waste stabilization ponds, lagoons, conventional and extended aeration process, bio-tower, RBCs) and advanced biological treatment methods (MBR, SBR). Phytoremediation technology and natural treatment system.	12
UNIT IV Handling, treatment and disposal of sludge from wastewater treatment plant.	4
UNIT V Tertiary and Advanced treatment with reference to water renovation technologies and concept of zero waste water discharge. Objectives of tertiary treatment. Tertiary treatment: Activated carbon treatment, reverse osmosis, filtration (ultra-filtration, membrane filtration, nano filtration), disinfection & softening, ZLD. Advanced oxidation: UV, Ozone, Wet air Oxidation, Fenton's reactor, electro dialysis.	20
UNIT VI Guidelines and notification: Central Ground Water Authority latest notifications, types of rainwater harvesting systems for urban and rural areas.	10
Reference books: • Waste Water Engineering Treatment, Disposal, Reuse by Metcalf & Eddy Inc. • Waste Water Treatment: Rational Methods Of Design & Industrial By Narayana Rao M. & Data Amol K. • Principles Of Environmental Engineering by Jorgensen S.E. • Waste Water Treatment for Pollution Control by Soli J Arceivala • Chemical and Biological Methods For Water Pollution Studies by Trivedi R.K. & Goel P.K. • Environmental Engineering by Hardward S Peavy & Others	
Subject: PGD (SDEM)S2MJP 9: ENVIRONMENTAL PHYSICS	Credits = 2
Total contact hours: 30	Theory Hours = 2/week

Course Objectives

1. To impart an understanding of the basic concept and application of radioactivity, noise pollution and air meteorology.
2. To provide the students with the scientific background for research and other careers across a broad spectrum of meteorology and allied science
3. To focus particularly on the links between the atmosphere and the land surface environment.

Course Specific Learning Outcomes (The students will be able to.....)

1. Understand the basic concepts of radioactivity and know how it interacts with matter.
2. Learn various methods for monitoring air emission, radiation protection, principles and techniques.
3. Familiarize the sources, measurement, effects and control techniques of noise pollution including the concept of sonic boom.
4. Understand various metrological parameters including instruments and systems of their measurements.
5. Comprehend various atmosphere transport processes including plume behavior.
6. Compare the meteorology at various levels i.e. local to global.

CONTENT	Total Hours
UNIT I Ionizing Radiation – radioactive decay, Interaction of radiation with matter. Biological effects of radiation with matters. Health hazards associated with radiations. Units of health hazards associated with radiations. Units of radioactivity and radiation dose. Radiochemical Methods of monitoring air and effluent. Methods for monitoring air emission, Radiation Protection, Principles and Techniques.	10
UNIT II Noise Pollution: Physics of the sound wave, Noise- Sources, measurement and effects, Sonic boom.	6
UNIT III Meteorology: Atmospheric transport of pollutants, Meteorological parameters such as wind direction, wind velocity, temperature, solar radiation, humidity topography, precipitation, inversion etc. Instruments and systems of their measurements, Solar Budget Atmosphere transport processes like dispersion, and dilution atmospheric stability and turbulence including plume behavior. Micro, meso, synoptic and global scale and their influence on air meteorology.	14

Reference books:

- Essentials of Nuclear Chemistry (ED. 2) by Arnikar H.J.
- Fundamental Of Applied Statistics By Gupta S.C. & Kapoor
- Environmental Physics by Sood D.D.
- Practical Statistics (E.D. 7) by Gupta S. P.
- Pollution Management Vol IV- Noise Pollution by S. K. Agarwal
- Air Pollution by Rao & Rao.

Subject: PGD (SDEM)S2MJP 10: PRACTICALS II**Credits = 4****Total contact hours: 120****Practical Hours = 10/week****Course Objectives**

1. To develop an understanding of pilot scale designing process of waste water treatment plant
2. To learn how sampling of air pollutants is done.
3. To analyze NO_x, SO_x and SPM in ambient air.
4. To compute various noise levels in various ranges.
5. To plot a wind rose.
6. To determine microbial water quality.

Course Specific Learning Outcomes (The students will be able to.....)

1. Develop and evaluate physical, chemical and biological waste water treatment so as to understand the kind of pollutants in waste water for designing process on pilot scale.
2. Analyze various parameters in soil and provide suitable treatment procedures for the same.
3. Detect NO_x in the ambient air and provide suitable treatment techniques learnt in the theory.
4. Estimate SO₂ in the ambient air and provide suitable treatment techniques learnt in the theory.
5. Detect SPM in the ambient air and provide suitable treatment techniques learnt in the theory.
6. Calculate the L10, L50, L90 of the given area and provide suitable treatment techniques learnt in the theory.
7. Determine predominant wind direction using Wind rose.
8. Find the bacteriological quality of water with Most Probable Number technique
9. Visit industries/ organizations/ institutions for better understanding of working of various instruments, equipments, plants, processes and concepts learnt in theory.

CONTENT	Total Hours
UNIT I : WASTE WATER ANALYSIS 1. Treatability studies: Determination of optimum dose of alum and alkalinity, pH, period of mixing experimentally in the laboratory by Jar test method. 2. Determination of the amount of activated carbon required for removal of pollutants from waste water by adsorption. 3. Development of Activated sludge. 4. Monitoring of activated sludge. 5. Acclimatization of Activated sludge in the given sample. 6. Biodegradability studies using Activated sludge process. 7. Soil Analysis.	60
UNIT II : AIR ANALYSIS 1. Sampling of Air pollutants. 2. Estimation of NO_x in the ambient air by Saltzman method. 3. Estimation of SO₂ in the ambient air by West & Gaeke Method 4. Estimation of suspended particulate matter i.e. SPM by high volume sampling method. 5. Estimation of L10, L50, L90 Noise Levels of the given area. 6. Determination of predominant wind direction using Wind rose.	22
UNIT III: MICROBIOLOGICAL ANALYSIS Determination of bacteriological quality of water with Most Probable Number technique and Membrane filtration techniques for coliform estimation.	18
UNIT IV INDUSTRIAL VISITS: Industrial visits (4)	20
Reference books: • Standard Methods For The Examination Of Water And Waste Water (E.D. 17) by American Public Health Association & Others. • Chemistry For Environmental Engineering (E.D. 3) by Sawyer Clairn& McCarthy Perry L. • Laboratory Manual For The Examination Of Water, Waste Water & Soil by Rump H. H. & Krist H.	

ELECTIVES

Subject : PGD (SDEM)S211A: UNIT OPERATIONS AND PROCESSES		Credits = 4
Total contact hours: 60		Theory Hours = 4/week
Course Objectives 1. To acquire knowledge of basics of fluid mechanics and dynamics 2. To develop an understanding of the concept of heat transfer 3. To gain knowledge of the various unit operations and processes.		
Course Specific Learning Outcomes (The students will be able to.....) 1. Understand the concept of fluid mechanics and fluid dynamics including its properties and measurements of fluids in channels. 2. Enlist various applications of heat exchangers and heat transfer rate usage in the industry. 3. Know about different types of evaporators and its applications. 4. Study the concept of mass transfer and laws and equations related to the same. 5. Acquire knowledge of filtration and screen operation 6. Be aware of energy requirement for mixing and mixer types used in industry 7. Gain knowledge of hydraulic profile of a water treatment plant and waste water treatment plant. 8. Familiarize with hydraulic losses occurring in treatment plant. 9. Solve pipe selection & pipe sizing calculation required for water & waste water treatment. 10. Understand about pump & its type, power requirement calculation for pump. 11. Enlist the application of pumps in Water Industry. 12. Acquire a basic knowledge of motors and their relevant applications.		
CONTENT		Total Hours
UNIT I Fluid Mechanics and Fluid Dynamics Properties of fluids – Hydro statics and hydrodynamics, physical properties and fluid flow patterns. Measurements of flow or fluids in closed conduits and in open channels.		10
UNIT II Heat Transfer - General Principles and its applications, Basic Equation of Heat Transfer Different methods of Heat transfer, Heat Exchangers.		8

UNIT III Evaporation: Types of evaporators and its applications.	6
UNIT IV Mass transfer - Ideal Mixtures. Raoult's and Henry's laws. X-Y diagram the distillation column reflux ratio.	6
UNIT V Operations involving particulate solids – filtration. Mixing. Size separation.	6
UNIT VI Hydraulic Profiles of a water treatment plant and waste water treatment plant.	10
UNIT VII Materials of pipes and conduits. Their properties and applications.	8
UNIT VIII Pumps and pumping systems with introduction to motors.	6
Reference books: • Hydraulics, Fluid Mechanics & Hydraulic mechanics by R. S. Khurmi • Introduction To Chemical Engineering by Badger Walter L. & Banchero Julius • Fluid Mechanics (E.D.2) by Douglas J.F. & Others • Unit Operations & Processes in Environmental Engineering by Tom D Reynolds • Unit Operations by Brown • Hydraulics by Dr. R S. Mathur.	
Subject: PGD (SDEM)S211B: ENVIRONMENTAL TOXICOLOGY	Credits = 4
Total contact hours: 60	Theory Hours = 4/week
Course Objectives 1. To develop an understanding of basics of health and diseases. 2. To introduce students to the concept of disease. 3. To define the concept of Immunology and relate it to diseases. 4. To link community education with good health of individuals in a society. 5. To familiarize with basic concept of toxicology.	

Course Specific Learning Outcomes (The students will be able to.....)	
1. Get acquainted with various epidemiological methods and principles . 2. Connect the learnt principles with morbidity. 3. Identify and classify various communicable and vector borne diseases. 4. Relate toxicity to learnt immunological techniques. 5. Know the importance of education in preventing diseases in a community. 6. Corelate dose exposure effect with severity of impact of a disease.	
CONTENT	Total Hours
UNIT 1: Epidemiology and Health Concept of Health and Disease, principles of epidemiology and epidemiological methods, aims of epidemiology, measurement of mortality, measurement of morbidity.	6
UNIT 2: Concept of Disease Concept of screening the diseases, some communicable diseases like small pox, cholera, acute diarrheal disease, viral hepatitis, water borne pathogens, vector borne diseases, diseases caused by contaminated food and water, soil borne infections, insect borne diseases.	14
UNIT 3: Concept of Immunology Elementary idea about antigens and antibody, hyper sensitivity, allergic reactions, pollens and their allergens. Immunological techniques.	14
UNIT 4: Community and Health Communication for health education, health care of the country.	4

UNIT 5: Basic Concept of Toxicology Different types of toxicant, toxicity test, toxicity by different factors, exposure effect relationship, L50 and L100, different route of exposure, synergistic and antagonistic effect, Bioaccumulation and Biomagnification. Detoxification, toxico-dynamics.	22
Reference books: • Environmental Toxicology by David A. Wright, Pamela Welbourn • Fundamentals of Ecotoxicology The Science of Pollution, Fifth Edition By Michael C. Newman • History of Toxicology and Environmental Health Toxicology in Antiquity II By Philip Wexler • Environmental Biology & Toxicology By Sharma P D • Principles of Toxicology, Second Edition by Stine Karen, Thomas M. Brown	
Subject: PGD (SDEM)S211C: MANAGEMENT OF SOLID WASTES	Credits = 4
Total contact hours: 60	Theory Hours = 4/week
Course Objectives: 1. To develop an understanding of the cradle to grave approach and various process of solid waste management. 2. To comprehend the fact that Hazardous Waste Management is a specialized field in Solid Waste Management and is an open field for further research in safe treatment and handling of Hazardous Material. 3. To discover the entire process of Bio-medical waste management from generation to correct disposal methods. 4. To summarize E-Waste Management processes as a part of extended producers responsibility.	

Course Specific Learning Outcomes (The students will be able to.....)	
1. Acquire knowledge of Solid Wastes Management Rules, 2016 2. Comprehend Construction and Demolition Waste Management Rules, 2016. 3. Be aware of the consequences of incorrect implementation of these rules and handling these situations in daily life. 4. Be motivated to design solutions for Solid Waste Management. 5. Learn Plastic Waste Management (Amendment) Rules, 2018. 6. Understand the Hazardous Waste Management Rules 2016. 7. Acquire knowledge of present systems of Hazardous Waste Management and managing a process so that Hazardous waste is not generated. 8. Comprehend the Bio-Medical Waste Management Rules 2016. 9. Sensitize students towards Bio Medical Waste, so that they can carry the message forward and work in this field also, as a career option. 10. Acquire exposure to E-Waste Industry, its treatment methods, career option, sensitization. 11. Understand Battery Waste Management Rules, 2020 and E-Waste (Management) Rules, 2016.	
CONTENT	Total Hours
UNIT I a. Solid Waste: Functional Elements of Solid Waste Management, Generation of solid wastes, On-site handling, storage and processing, collection of solid waste, transfer and transport. Processing techniques and equipments & disposal of solid waste including sanitary landfill, landfill design, technologies for landfill gas collection, Composting, incineration and pyrolysis. R's of Solid waste management including conversion of waste products into energy. The Solid Wastes Management Rules, 2016 and the latest amendments thereof. Construction and Demolition Waste Management Rules, 2016. Initiatives of various urban local bodies for Solid waste management and the latest amendments thereof. b. Plastic Waste: Plastic Waste Management (Amendment) Rules, 2018 and the latest amendments thereof. The Recycled Plastics Manufacture and Usage (Amendment) Rules, 2003 and the latest amendments thereof.	20

UNIT II Hazardous waste: Management issues: Definition, classification and Generation of Hazardous waste, Management and handling rules and regulatory processes. Leachate Management, packaging requirements under DOT regulations for safe transport of hazardous wastes, Use of environmental sound technologies for treatment and disposal of hazardous wastes including recycling and goal of minimizing HWs with appropriate case studies to demonstrate the use of in-plant control measures and cleaner production technologies. Treatment and disposal methods of HW. Physico-chemical processes, Biological process, stabilization and solidification; Thermal methods, land filling (Engineered land fill). The Hazardous Wastes Management Rules, 2016 and the latest amendments thereof including Basel Convention on the control of transboundary movement.	16
UNIT III Bio-Medical Waste Management: Definition, sources, categories of Biomedical waste as per the legislation. Segregation, transportation, treatment and disposal methods. Bio-Medical Waste Management Rules, 2016 and the latest amendments thereof.	14
UNIT IV E waste & Battery Waste Management: Sources, effects, segregation, recycling treatment and disposal. Batteries Management Rules, 2020 and the latest amendments thereof. E-waste Management Rules 2016 and the latest amendments thereof.	10
Reference books: • Solid Waste Management - A Manual by All India Institute of Local Self-Government Publications • Toxic and Hazardous Waste by Sinha P.C. • Manual on Solid Waste Management by Palnitkar, Sneha • Basic Hazardous Waste Management by William C. Blackman • Management Of Municipal Solid Waste by Ramchandra T. V. • Solid Waste Management by H V. Bijalani	

MANDATORY

Subject: PGD(SDEM)S2 P12 : ON JOB TRAINING/ FIELD PROJECT	Credits = 4
Total contact hours: 120	Hours = 4/week
Course Objectives: 1. To impart a four weeks rigorous training to the students in any one industry/ organization/ institution in the field of Sustainability / Environment. 3. To provide the students with a hands-on physical work experience in an professional-life working scenario. 4. To aid students for pursue careers in the private, public, and nonprofit sectors where there is an increasing demand for Sustainability and Environment professionals.	
Course Specific Learning Outcomes (The students will be able to.....) 1. Explore different organizations involved in manufacturing and applications. 2. Undergo practical training for at least 4 weeks of intensive training in the industry to correlate theoretical knowledge with practical work. 3. List objectives of training with specific instructions on code of conduct while on training. 4. Be provided an opportunity to use the knowledge and acquired skills in execution and conduction of the project. 5. Acquire a training completion certificate from the one industry/ organization/ institution as an added credential.	

CONTENT	Total Hours
• Intensive Practical training for atleast 4 weeks in any one industry/ organization/ institution in the field of Sustainability / Environment to correlate theoretical knowledge with practical work is a mandatory part of the curriculum. • Students will be given a detailed briefing on objectives of training with specific instructions on code of conduct while on training. • Students should prepare their resumes and should be advised to go on training placements as planned by faculty in-charge/ placement officer. • A weekly update regarding learning outcomes during the training period is compulsory. • The students will submit a report after completion of the on-the-job training having the certificate of completion duly signed and stamped by the authorized personal and on the training industry/ organization/ institution letter-head. ▪ There will be an assessment based on presentation and viva-voce exams.	120

PASSING PERFORMANCE GRADING :

The Performance Grading of the learner shall be on ten point scale be adopted uniformly.

Letter Grades and Grade Point

Semester GPA/ Program CGPA Semester / Program	% of Marks	Alpha-Sign/Letter Grade Result	Grading Point
9.00 – 10.00	90.0 - 100	O (Outstanding)	10
8.00 - < 9.00	80.0 < 90.0	A+ (Excellent)	9
7.00 - < 8.00	70.0 < 80.0	A (Very Good)	8
6.00 - < 7.00	60.0 < 70.0	B+ (Good)	7
5.50 - < 6.00	55.0 < 60.0	B (Average)	6
5.00 - < 5.50	50.0 < 55.0	C (Pass)	5
Below 5.00	Below 50	F (Fail)	0
AB (Absent)		Absent	

NOTE : VC : Vocational Courses, SEC : Skill Enhancement Courses, AEC : Ability Enhancement Courses, VEC : Value Education Courses, VSC : Vocational Skill Course, IKS : Indian Knowledge System, OJT: On The Job Training, FP: Field Projects.

The performance grading shall be based on the aggregate performance of Internal Assessment and Semester End Examination.

The Semester Grade Point Average (SGPA) will be calculated in the following manner: $SGPA = \sum CG / \sum C$ for a semester, where C is Credit Point and G is Grade Point for the Course/ Subject.

The Cumulative Grade Point Average (CGPA) will be calculated in the following manner: $CGPA = \sum CG / \sum C$ for all semesters taken together.

PASSING STANDARD:

Passing 50% in each subject /Course separate Progressive Evaluation (PE)/Internal Evaluation and Semester-End/Final Evaluation (FE) examination.

- Carry forward of marks in case of learner who fails in the Internal Assessments and/ or Semester-end examination in one or more subjects (whichever component the learner has failed although passing is on total marks).
- A learner who PASSES in the Internal Examination but FAILS in the Semester-end Examination of the Course shall reappear for the Semester-End Examination of that Course. However, his/her marks of internal examinations shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.
- A learner who PASSES in the Semester-end Examination but FAILS in the Internal Assessment of the course shall reappear for the Internal Examination of that Course. However, his/her marks of Semester-End Examination shall be carried over and he/she shall be entitled for grade obtained by him/her on passing

ALLOWED TO KEEP TERMS (ATKT)

- A. A learner shall be allowed to keep term for Semester II irrespective of the number of heads/courses of failure in the Semester I.
- B. A learner shall be allowed to keep term for Semester III wherever applicable if he/she passes each of Semester I and Semester II.

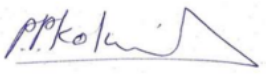
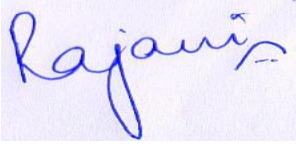
OR

- C. A learner shall be allowed to keep term for Semester III wherever applicable irrespective of the number of heads/courses of failure in the Semester I & Semester II.
- D. A learner shall be allowed to keep term for Semester IV wherever applicable if he/she passes each of Semester I, Semester II and Semester III.

OR

- E. A learner shall be allowed to keep term for Semester IV wherever applicable irrespective of number of heads/courses of failure in the Semester I, Semester II, and Semester III

Team for Creation of Syllabus

Sr.	Name	Signature
1	Dr. Keyurkumar M. Nayak, Director, UM-GICED	
2	Mrs. Kanishka Goraksha Course Coordinator Garware Institute of Career Education & Development, University of Mumbai, Vidyanagari, Kalina, Santacruz(E), Mumbai - 400 098	
3	Mr. Sanjay Patil Adani Dahanu Thermal Power Station, Dahanu Road, Palghar District, Near Dahanu Railway Station, Dahanu, Maharashtra 401608	
4	Ms. Pratiksha More. Founder Sustainability 101 Koparkhairane, Navi Mumbai	
5	Mr. Prashant Kokil Ex Corporate Head Environment and CSO(MO) The Tata Power Co. Ltd. Address: 11, Bhupat Bhuvan, D S Babrekar Marg, Dadar west, Mumbai 400028	
6	Mr. Abhidnya Joshi Asia Pacific Regional Environmental Leader Cummins Inc. 3-21, Paragati Society, MHB Colony, Dindoshi Nagar, Malad East, Mumbai 97	
7	Dr. Elizabeth Abba Associate Professor, School of Sustainability, Associate Dean- International Relations XIM University, Plot No 12(A), Nijigada Kurki, Harirajpur-752050. Dist: Puri, Odisha.	
8	Dr. Rajani Panchang UGC Assistant Professor Department of Environmental Science, Savitribai Phule Pune University, Ganeshkhind, Pune 411007	
9	Mr. Vaibhav Naik DGM EHS Sudarshan Chemicals Industry Ltd. MIDC Industrial Estate,	

	Dhatav, Roha, Raigad 402116	
10	Mr. Nishchal Wadekar Head – Sales and Marketing (WHE division) RO Chem Separation Systems India Pvt. Ltd	Absent

Keyurkumar

Dr. Keyurkumar M. Nayak,
Director,
UM-GICED

Garje

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science

Appendix B

Justification for M.Sc. (Sustainable Development & Environment Management)

1.	Necessity for starting the course	The University of Mumbai's Garware Institute of Career Education & Development plans to introduce two years Full time M.Sc. (Sustainable Development & Environment Management) .Managing sustainability is one of the most challenging and rapidly growing areas in both the public and private sectors. Securing economic development, social equity and justice, and environmental protection is the goal of sustainable development. There is a strong need for professional adept at providing solutions/ expertise in the fields of Sustainable Development & Environment Management in the context of globalization and India's progressive economy.This course is thus designed to fill up these gaps by imparting the knowledge in the field of Sustainable Development and Environment Management to those interested to make their rewarding career in this field.
2.	Whether the UGC has recommended the course:	Yes, UGC has recommended the course as per gazette no. DL(N)-04/0007/2003-05 dated 11th July 2014. UGC encourages the incorporation of skill oriented and value-added courses to develop skilled manpower.
3.	Whether all the courses have commenced from the academic year 2023-2024	Yes, it would be commencing from the Academic year 2023-24 as per NEP 2020. However, the course has been launched in the year 2017-18.
4.	The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available?	Yes, this course is self-financed. The expert visiting faculty from industries come to teach this course.
5.	To give details regarding the duration of the Course and is it possible to compress the course?	The duration of the course is Two years (Four Semesters). It cannot be further compressed.
6.	The intake capacity of each course and no. of admissions given in the current academic year:	The intake capacity of this course is 30 students in each batch. The admission procedure is still ongoing.
7.	Opportunities of Employability/ Employment available after undertaking these courses:	Candidates would have opportunity to get placement in:Every Industry sector (such as Automobile, Food Processing, Chemical, Pharmaceutical, Power including Renewable Energy, Textile, Fertilizer, Cement, Infrastructure, Steel, Refinery, Tyre, etc. and other industry sectors), Pollution Control Boards, Local Bodies including Municipal Corporations, Environmental Consultancy firms, NGO's, Banks (study feasibility of environmental projects), Research & Development Laboratory, Multi-star Hotels (manage WasteWater Treatment Facilities, Environmental Management Systems), Hospitals (Environmental Quality Control, Hospital Waste Management), Waste Management Industries Certifying / Audit agencies.

Km Nayak

Dr. Keyurkumar M. Nayak,
Director,
UM-GICED

Shivram S. Garje

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science