MODIFIED CBCS CURRICULUM OF

ENVIRONMENT & WATER MANAGEMENT HONOURS PROGRAMME

SUBJECT CODE = 63

FOR UNDER GRADUATE COURSES UNDER RANCHI UNIVERSITY

Implemented from
Academic Session 2019-2022

Members of Board of Studies of CBCS U.G. Syllabus in "Environment & Water Management" Honours Programme, as per Guidelines of the Ranchi University, Ranchi.

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   iii. **Shri Bipin Kumar**
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Contents

COURSE STUCTURE FOR UNDERGRADUATE **'HONOURS'** PROGRAMME

Table AI-1: Distribution of 164 Credits [*wherever there is a Practical there will be no tutorial and vice –versa.]

	Course Theory + Practical	**Papers**	**Credits** Theory + Tutorial	**Credits**
I.	**Core Course**	**(CC 1 to 14)**		
	Theory	14 Papers	14X4=56	14X5=70
	Practical/Tutorial*	14 Papers	14X2=28	14X1=14
II.	**Elective Course (EC)**			
	A.Discipline Specific Elective	**(DSE1to4)**		
	Theory	4 Papers	4X4=16	4X5=20
	Practical/ Tutorial*	4 Papers	4X2=8	4X1=4
	B.Generic Elective/ Interdisciplinary	**(GE1to4)**		
	Theory	4 Papers	4X4=16	4X5=20
	Practical/ Tutorial*	4 papers	4X2=8	4X1=4
III.	**Ability Enhancement Compulsory Courses (AECC)**			
	1. English/ Hindi Communication	1 Paper	1X2=2	1X2=2
	2. Environmental Science	1 Paper	1x2=2	1x2=2
	3. Skill Enhancement Course of the Core Course opted	**(SEC 1& 2)** 2 Papers	2X2=4	2X2=4
			Total Credit = 140 + 24 =164	**140 + 24 = 164**

Note:

In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered **Two Generic Elective Subjects**(GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their 'Eligibility for Admission' in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Table AI-1.1: Course structure for B.Sc./ B.A./ B.Com./B.Voc. (Hons. Programme)

Semester	**Honours (Core Courses) 14 Papers**	**Allied (Elective Courses) 8 Papers**	**Ability Enhancement (Compulsory Courses) 4 Papers**	**Total Credits**
Sem-I	C-1, C-2 (6+6=12 Credits)	GE-1A, GE-1B (6+6=12 Credits)	English Comm./Hindi Comm. (02 Credits)	**26 Credits**
Sem-II	C-3, C-4 (6+6=12 Credits)	GE-2A, GE-2B (06 Credits)	EVS (02 Credits)	**26 Credits**
Sem-III	C-5, C-6, C-7 (6+6+6=18 Credits)	GE-3A, GE-3B (06 Credits)	SEC-1 (02 Credits)	**32 Credits**
Sem-IV	C-8, C-9, C-10 (6+6+6=18 Credits)	GE-4A, GE-4B (06 Credits)	SEC-2 (02 Credits)	**32 Credits**
Sem-V	C-11, C-12 (6+6=12 Credits)	DSE-1, DSE-2 (6+6=12 Credits)		**24 Credits**
Sem-VI	C-13, C-14 (6+6=12 Credits)	DSE-3, DSE-4 (6+6=12 Credits)		**24Credits**
				Total = 164 Credits

COURSES OF STUDY FOR UNDERGRADUATE
'ENVIRONMENT & WATER MANAGEMENT Hons' PROGRAMME

Table AI-2 Subject Combinations allowed for Hons. Programme (164 Credits)

Honours/Core Subject **CC 14 Papers**	Discipline Specific Elective Subject **DSES 4 Papers**	Skill Enhancement Course **SEC 2 Papers**	Compulsory Course **AECC 1+1=2 Papers**
Environment & Water Management	Environment & Water Management Specific	SEC in Environment & Water Management	Language Communication + EVS

Table AI-2.1 Semester wise Examination Structure for Mid Sem & End Sem Examinations:

Sem	Core Honours, Allied DSE, Compulsory AECC Courses		Examination Structure		
	Code	**Papers**	**Mid Semester Theory (F.M.)**	**End SemesterTheory (F.M.)**	**End Semester Practical/ Viva (F.M.)**
I	C1	Earth and Earth Surface Processes **+Lab**	15	60	50
	C2	Fundamentals of Environmental Sciences**+Lab**	15	60	
	GE1A	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	GE1B	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	AECC	Language Communication	---	100	---
II	C3	Water and Water Resources **+Lab**	15	60	50
	C4	Environment and its Pollution **+Lab**	15	60	
	GE2A	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	GE2B	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	AECC	EVS	---	100	---
III	C5	Water Resources Management I**+Lab**	15	60	75
	C6	Environmental Pollution and Human Health **+Lab**	15	60	
	C7	Solid Waste Management **+Lab**	15	60	
	GE3A	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	GE3B	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	SEC 1	Elementary Computer Application Software **+Lab**	---	100	---
IV	C8	Water Quality Management I**+Lab**	15	60	75
	C9	Environment Management I**+Lab**	15	60	
	C10	Land and Soil Conservation and Management **+Lab**	15	60	
	GE4A	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	GE4B	Refer Table AI-2.3 of the Syllabus of Subject opted	---	100	---
	SEC 2	Rainwater Harvesting and Storage	---	100	---
V	C11	Biodiversity & Conservation **+Lab**	15	60	50
	C12	Entrepreneurship Development**+Lab**	15	60	
	DSE 1	Environmental Economics	25	75	---
	DSE 2	On Job Training I **+Viva**	---	---	100
VI	C13	Natural Resources Management & Sustainability **+Lab**	15	60	50
	C14	Natural Hazards & Disaster Management **+Lab**	15	60	
	DSE 3	Environmental Legislation & Policy	25	75	---
	DSE 4	On Job Training II **+Viva**	---	---	100

GE1 & GE2; Any Two Generic Elective Combinations allowed for UG ENV & Water Management (Hons) Course may be opted from the List given below:

Table AI-2.2: For Student from COMMERCE background

Generic Elective Subject **GE 4 Papers**	Generic Elective Courses for Commerce Stream (GE will be other than Core Subject opted			
	Semester I **GE1**	Semester II **GE2**	Semester III **GE3**	Semester IV **GE4**
Commerce **GEA**	Micro Economics **+T**	Business Statistics **+T**	Macro Economics **+T**	Indian Economy - Performance and Policies **+T**
Commerce **GEB**	Business Organisation **+T**	Business Management **+T**	Monetary Economics **+T**	Indian Banking system **+T**

Table AI-2.3: For Student from SCIENCE background All Four Papers of Two Subjects to be opted:

Generic Elective Subject **GE 4 Papers**	Generic Elective Courses for Science Stream (GE will be other than Core Subject opted)			
	Semester I **GE1**	Semester II **GE2**	Semester III **GE3**	Semester IV **GE4**
Physics	Mechanics **+Lab**	Electricity and Magnetism **+Lab**	Thermal & Statistical Physics **+Lab**	Waves and Optics **+Lab**
Chemistry	Atomic Structure, Bonding, General Org Chem & Aliphatic Hydrocarbons **+Lab**	Chemical Energetics, Equilibria & Functional Gp Org Chemistry-I **+Lab**	Chem. of s- and p-block elements, States of matter and Chem. Kinetics **+Lab**	Chem. of d-block elements, Molecules of Life **+Lab**
Mathematics	Differential Calculus And Coordinate Geometry 2D **+T**	Integral Calculus, Vector Calculus & Trigonometry **+T**	Real Analysis-I, Group Theory & Differential Equations **+T**	Real Anaysis-II, Complex Variable, Set Theory & Matrices **+T**
Zoology	Animal Diversity **+Lab**	Human Physiology **+Lab**	Food, Nutrition & Health **+Lab**	Environment & Public Health **+Lab**
Botany	Biodiversity**+Lab**	Plant Ecology & Taxonomy**+Lab**	Plant Anatomy & Embryology**+Lab**	Plant Physiology & Metabolism**+Lab**
Geology	Essentials of Geology **+Lab**	Rocks & Minerals **+Lab**	Fossils & their Applications **+Lab**	Earth Resources **+Lab**

Table AI-2.3: For Student from ARTS background with Practical Subjects &/OR having Economics

S.No.	**Note: Any One Subject may be opted as GE Subject but only One from S.No.1 and 10 will be allowed, if desired.**		
1	Anthropology/	**10**	Bengali /
	Geography/		Urdu /
	Psychology/		Sanskrit /
	Home Science /		Ho /
2	History		Kharia /
3	Political Science		Khortha /
4	Sociology		Kurmali /
5	Economics		Kurux /
6	Philosophy		Mundari /
7	Mathematics		Nagpuri /
8	Hindi		Panch Pargania /
9	English		Santhali

Table AI-2.4 Generic Subject Papers for B. A. Hons. Programme (140 + 24 = 164 Credits);
All Four Papers of Two allowed Subjects (Table AI-2.3) to be opted:

Generic Elective Subject **GE 4 Papers**	Generic Elective Courses for Arts Stream (GE will be other than Core Subject opted)			
	Semester I **GE1**	Semester II **GE2**	Semester III **GE3**	Semester IV **GE4**
Hindi	कला और साहित्य **+T**	अनुवाद **+T**	साहित्य और पत्रकारिता **+T**	रचनात्मक लेखन की विधाएँ **+T**
English	Academic Writing **+T**	Language & Linguistics **+T**	Literature: Poems & Short Stories **+T**	Language, Literature & Culture **+T**
Bengali	History of Bengali Literature **+T**	Bengali Poetry, Novel, Short Stories **+T**	Bengali Poetry, Drama, Short Stories **+T**	Bengali Poetry, Short Stories, Bengali Essay**+T**
Urdu	Study of Poet Nazir Akbarabadi **+T**	Study of Short Story Writer Prem Chand **+T**	Mass Media: Principles and Practice **+T**	Study of Short Story Writer **+T**
Sanskrit	संस्कृत व्याकरण एवं व्याकरण शास्त्र का इतिहास**+T**	भारतीय संस्कृति एवं राजनीति**+T**	आयुर्वेद की परम्परा**+T**	भाषाविज्ञान**+T**
Ho	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	हो समुदाय की नृत्य शैलियाँ **+T**
Kharia	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	खड़िया समुदाय की नृत्य शैलियाँ **+T**
Khortha	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	खोरठा समुदाय की नृत्य शैलियाँ **+T**
Kurmali	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	कुरमाली समुदाय की नृत्य शैलियाँ **+T**
Kurux	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	कुँड़ुख़ समुदाय की नृत्य शैलियाँ **+T**
Mundari	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	मुण्डा समुदाय की नृत्य शैलियाँ **+T**
Nagpuri	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	नागपुरी समुदाय की नृत्य शैलियाँ **+T**
Panch Pargania	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	पंचपरगनिया समुदाय की नृत्य शैलियाँ **+T**
Santhali	कला, साहित्य एवं संस्कृति **+T**	पारम्परिक वाद्य यंत्र **+T**	झारखण्डी समुदाय का सांस्कृतिक केन्द्र **+T**	संताल समुदाय की नृत्य शैलियाँ **+T**
Geography	Geomorphology **+Lab**	Human Geography **+Lab**	Climatology **+Lab**	Economic Geography **+Lab**
History	Environmental Issues in India **+T**	Making of Contemporary India **+T**	History of West Asia **+T**	India and her Neighbours **+T**
Political Science	An Introduction to Political Theory **+T**	Indian Govt. and Politics **+T**	Comparative Govt. and Politics **+T**	Public Administration **+T**
Psychology	Introduction of psychology **+Lab**	Social psychology **+Lab**	Psychopathology **+Lab**	Psychological Statistics **+Lab**
Sociology	Indian Society and Culture **+T**	Social Movement in India **+T**	Sociology of Religion **+T**	Indian Sociological Theories **+T**
Economics	Principals of Microeconomics **+T**	Principals of Macroeconomics **+T**	Indian Economy **+T**	Money Banking& Public Finance **+T**
Anthropology	Economic Anthropology **+Lab**	Political Anthropology **+Lab**	Anthropology of Religion **+Lab**	Linguistic Anthropology **+Lab**
Philosophy	Indian Philosophy-I **+T**	Indian Philosophy-II **+T**	Indian Ethics **+T**	Western Ethics **+T**
Home Science	Human Nutrition **+Lab**	Entrepreneurship for small Catering units **+Lab**	Current concerns in Public Health Nutrition **+Lab**	Care and Wellbeing in Human Development **+Lab**
Mathematics	Differential Calculus & Coordinate Geometry 2D **+T**	Integral Calculus, Vector Calculus &Trigonometry **+T**	Real Analysis-I, Group Theory &Differential Equations **+T**	Real Anaysis-II, Complex Variable, Set Theory &Matrices **+T**

SEMESTER I **5 Papers**

Total 100 x 5 = 500 Marks

I. CORE COURSE –C 1: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	**Pass Marks: Th (MSE +ESE) = 30**

Instruction to Question Setter for

Mid Semester Examination (MSE):
*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):
*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

EARTH AND EARTH SURFACE PROCESSES

Theory: 60 Lectures

Preamble: The paper will introduce students to the basic structure and composition of the Earth and will explore various surface processes and their impact on and role in living systems. It will also deal with the interactive processes in the inner as well as outer Earth's surface.

Unit 1: History of Earth (10 lectures)
Solar system formation and planetary differentiation; formation of the Earth: formation and composition of core, mantle, crust, atmosphere and hydrosphere; chemical composition of Earth; geological time scale and major changes on the Earth's surface; Holocene and the emergence of humans, role of humans in shaping landscapes; development of cultural landscapes.

Unit 2: Earth system processes (10 lectures)
Movement of lithosphere plates; mantle convection and plate tectonics, major plates and hot spots, plate boundaries; sea floor spread; earthquakes; volcanic activities; orogeny; isostasy; gravitational and magnetic fields of the earth; origin of the main geomagnetic field; continental drift, Pangaea and present-day continents, paleontological evidences of plate tectonics; continental collision and mountain formation with specific example of the Himalaya.

Unit 3: Minerals and rocks (15 lectures)
Minerals and important rock forming minerals; rock cycle: lithification and metamorphism; Three rock laws; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical, biogeochemical processes; erosion: physical processes of erosion, factors affecting erosion; agents of erosion: rivers and streams, glacial and aeolian transportation and deposition of sediments by running water, wind and glaciers.

Unit 4: Earth surface processes (15 lectures)

Atmosphere: evolution of earth's atmosphere, composition of atmosphere, physical and optical properties, circulation; interfaces: atmosphere–ocean interface, atmosphere–land interface, ocean–land interface; land surface processes: fluvial and glacial processes, rivers and geomorphology; types of glaciers, glacier dynamics, erosional and depositional processes and glaciated landscapes; coastal processes.

Unit 5: Importance of being a mountain (10 lectures)

Formation of Peninsular Indian mountain systems - Western and Eastern Ghats, Vindhyas, Aravallis, etc. Formation of the Himalaya; development of glaciers, perennial river systems and evolution of monsoon in Indian subcontinent; formation of Indo-Gangetic Plains, arrival of humans; evolution of Indus Valley civilization; progression of agriculture in the Indian subcontinent in Holocene; withdrawing monsoon and lessons to draw.

Suggested Readings

- Bridge, J., & Demicco, R. 2008. *Earth Surface Processes, Landforms and Sediment deposits*. Cambridge University Press.
- Duff, P. M. D., & Duff, D. (Eds.). 1993. *Holmes' Principles of Physical Geology*. Taylor & Francis.
- Gupta, A. K., Anderson, D. M., & Overpeck, J. T. 2003. Abrupt changes in the Asian southwest monsoon during the Holocene and their links to the North Atlantic Ocean. *Nature* **421:** 354-357.
- Gupta, A. K., Anderson, D. M., Pandey, D. N., & Singhvi, A. K. 2006. Adaptation and human migration, and evidence of agriculture coincident with changes in the Indian summer monsoon during the Holocene. *Current Science* **90:** 1082-1090.
- Keller, E.A. 2011. *Introduction to Environmental Geology* (5th edition). Pearson Prentice Hall.
- Krishnan, M. S. 1982. *Geology of India and Burma*. CBS Publishers & Distributors.
- Leeder, M., Arlucea, M.P. 2005. *Physical Processes in Earth and Environmental Sciences.* Blackwell Publishing.
- Pelletier, J. D. 2008. *Quantitative Modeling of Earth Surface Processes* (Vol. 304). Cambridge: Cambridge University Press. Chicago.

II. CORE COURSE- C 2: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

FUNDAMENTALS OF ENVIRONMENTAL SCIENCES Theory: 60 Lectures

Introduction of Ecology: 10 Lectures
Ecosystem concept, ecosystem structure, development and evaluation ecosystem components of ecosystem, process within the ecosystem.
Ecosystem functions, energy exchange between plant communities and their environment, trophic levels and energy flow, Biogeochemical cycle.
Forest ecosystem, grass land ecosystem, fresh water ecosystem, agroecosystem vegetation mapping.

Environmental Chemistry 10 Lectures
Acid-base Equilibria
Fundamentals, Buffer in water systems. The carbonate and other systems of importance in water chemistry, Degradation and Degradative Pathways.
Inorganic and Organic Compounds carbonates, Sulphates, Nitrates, Phosphates nitrates salts, carbohydrates Fat, Proteins, hydrocarbons.
Xenobiotic compounds-detegrents, pesticides, plastics etc.

Environmental Microbiology: 10 Lectures
Characteristics of growth and death of microbes in natural environment.
Significance of bacteria, Fungi, Algae, Protozoa and other higher animals in environmental management. Role of microbes in water degradation.

Preliminary idea of Biostatistics 5 Lecturers
Mean, Mode, Probability, Standard deviation, standard error.

Introduction to fluid mechanics 10 Lectures
Properties of fluids, velocity, acceleration, streamline. One dimensional flow of fluids.
Conservation of mass and momentum-energy equations. Laminar and turbulent flows.

Flow of Water in Open channels and Pipes 15 Lectures
Open channel flow systems. Definition Uniform flow in open channeles, gradually varied and rapidly used flows, velocity distribution, Open channel sections.

Flow in pipes
Calculation of flow velocity and head losses. Flow in partially full pipes. Flow distribution in pipe systems pumping equipment for water. Measurement of flow in pieces and open channels.

ENVIRONMENT & WATER MANAGEMENT PRACTICAL-C 1 & C2 LAB

60 Lectures

Marks : Pr (ESE: 3Hrs) =50	**Pass Marks: Pr (ESE) = 20**

Instruction to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3Hrs duration.The questions in practical examination will be so framed that the students are able to answer them within the stipulated time.

Evaluation of Practical Examination may be as per the following guidelines:

Experiment = 30 marks
Practical record notebook = 10 marks
Viva-voce = 10 marks

Group-A

A. Filed ecology-Terrestrial and Aquatic Elora and Farm.
B. Ambient air sampling and determination of criteria pollutants.
C. Measurement of Total dust and dust fall rate.
D. Monitoring of stack emissions and automobile exhausts.
E. Visits to water and wastewater treatment plants and industries employing and pollution control equipment.

Group-B

1. Study of vegetation of local area/ college campus
2. Study of fauna of local area/ college campus
3. To find out minimum size of the quadrat for vegetation study
4. Study of vegetation density by quadrat method
5. Study of Phytoplankton.
6. Study of Zooplankton
7. Study of aerial photographs.
8. Study of Ecological adaptations of Hydrophytes
9. Study of Ecological adaptations of Xerophytes
10. Study of Ecological adaptations of Epiphytes
11. Study of Ecological adaptations of Halophytes
12. Field visit to terrestrial/ aquatic environments/ protected area/ area of ecological interest.
13. Study tour (one day)

III. ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

(Credits: Theory-02)

योग्यता संवर्धन अनिवार्य पाठ्यक्रम: (क्रेडिट: सैद्धान्तिक-02)

HINDI COMMUNICATION **Theory: 30 Lectures**

Marks : 100 (ESE 3Hrs) =100	**Pass Marks Th ESE = 40**

प्रश्न पत्र के लिए निर्देश

छमाही परीक्षा :

*प्रश्नों के दो समूह होंगे। **खण्ड 'A' अनिवार्य है** जिसमें तीन प्रश्न होंगे। **प्रश्न संख्या 1** में दस **अत्यंत लघु उत्तरीय** 1 अंक के प्रश्न होंगे। **प्रश्न संख्या 2 व 3 लघु उत्तरीय** 5 अंक का प्रश्न होगा। **खण्ड 'B'** में छः में से किन्हीं चार 20 अंको के **विषयनिष्ठ/ वर्णनात्मक प्रश्नों** के उत्तर देने होंगे।*

***नोट :** थ्योरी परीक्षा में पूछे गए प्रत्येक प्रश्न में उप–विभाजन हो सकते हैं।*

हिन्दी व्याकरणएवं संप्रेषण सैद्धान्तिक:30व्याख्यान

इकाई–1 **हिन्दी व्याकरण और रचना,**
संज्ञा, सर्वनाम, विशेषण, क्रिया, अव्यय, कारक, वचन, संधि,उपसर्ग, प्रत्यय तथा समास, लिंग निर्णय, पर्यायवाची शब्द, विलोम शब्द, अनेक शब्दों के लिए एक शब्द, शब्द शुद्धि, वाक्य शुद्धि, मुहावरे और लोकोक्तियां, पल्लवन एवं संक्षेपण।

इकाई–2 **निबंध कला तथा समसामयिक एवं राष्ट्रीय विषयों पर निबंध लेखन**

इकाई–3 **संप्रेषण (संचार)**
–संप्रेषण की अवधारण और महत्व, संप्रेषण के लिए आवश्यक शर्तें, संप्रेषण के प्रकार, संप्रेषण का माध्यम, संप्रेषण कला, संप्रेषण की तकनीक, वाचन कला, समाचार वाचन, साक्षात्कार कला,रचनात्मक लेखन का लक्ष्य, रचनात्मक लेखन का आधार, भाव और विचारों की प्रस्तुति, वाक् कला की उपयोगिता।

अनुशंसित पुस्तकें :–

- वृहत व्याकरण भास्कर : डॉ0 वचनदेव कुमार
- वृहत निबंध भास्कर : डॉ0 वचनदेव कुमार
- आधुनिक हिन्दी व्याकरण और रचना : डॉ0 वासुदेव नन्दन प्रसाद
- रचना मानस : प्रो0 रामेश्वर नाथ तिवारी
- व्यवहारिक हिन्दी : डॉ0 जंग बहादुर पाण्डेय
- रचनात्मक लेखन : डॉ0 रमेश गौतम
- राजहंस हिन्दी निबंध : प्रो0 आर0 एन0 गौड़
- सफल हिन्दी निबंध : रत्नेश्वर
- निबंध सहचर : डॉ0 लक्ष्मण प्रसाद
- उपकार मुहावरे और लोकोक्तियाँ : प्रो0 राजेश्वर प्रसाद चतुर्वेदी
- कहानियों कहावतों की : प्रताप अनम
- सम्प्रेषणपरक हिन्दी भाषा शिक्षण : डॉ0 वैश्ना नारंग
- शैली विज्ञान : डॉ0 सुरेश कुमार
- शैली विज्ञान प्रतिमान और विश्लेषण : डॉ0 पांडेय शशिभूषण 'शीतांशु'
- शैली विज्ञान का इतिहास : डॉ0 पांडेय शशिभूषण 'शीतांशु'

OR

ENGLISH COMMUNICATION

Theory: 30 Lectures

Marks : 100 (ESE 3Hrs) =100	**Pass Marks Th ESE = 40**

Instruction to Question Setter for
End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain three questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2& 3 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of 20 marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

OBJECTIVE: To equip students effectively to acquire skills in reading, writing, comprehension and communication, as also to use electronic media for English Communication.

Unit I: Communication – Definition, stages, barriers, types: verbal and non-verbal, Listening- Meaning, Nature and importance, Principles of Good Listening.

Unit II: Class-presentation (Oral for five minutes) on any of the above-mentioned topics: Descriptive writing, expansion of an idea.

Unit III: Writing skills –, notice writing, advertisement writing, précis writing, essay writing, letter writing (applications), Business letter formats (letters of enquiry, replies and complaints), resume writing, covering letter

Unit IV: Vocabulary building: One word substitution, synonyms and antonyms, idioms and phrases

Suggested Reading:

- *Technical Communication*, M.H. Rizvi, Tata McGrawhill
- *Effective Business Communication*, Asha Kaul
- *Developing Communication Skills*, Krishnamohan
- *Functional Grammar and Spoken and Written Communication in English*, Bikram K. Das, Orient Blackswan
- *Precis, Paraphrase and Summary*,P.N. Gopalkrishnan, Authors Press
- *Communication Skills*, Sanjay Kumar and Pushplata, Oxford Publication

Note: Latest edition of text books may be used.

IV. GENERIC ELECTIVE (GE 1A): (Credits: 06)

All Four Papers (GE-1A, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

V. GENERIC ELECTIVE (GE 1B): (Credits: 06)

All Four Papers (GE-1B, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

SEMESTER II 4 Papers

Total 100 x 4 = 400 Marks

I. CORE COURSE -C 3: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	**Pass Marks: Th (MSE +ESE) = 30**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of whichany three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

WATER AND WATER RESOURCES Theory: 60 Lectures

Preamble: The paper introduces students to the hydrological cycle, properties of water, physicochemical and biological water quality assessment and indices, types of water resources, their use and management. It will also highlight the problems associated with water shortages in India and familiarizes students with case studies on international and national conflicts on water.

Unit 1: Introduction 4 lectures

Sources and types of water; hydrological cycle; precipitation, runoff, infiltration, evaporation, evapotranspiration; classification of water resources (oceans, rivers, lakes and wetlands).

Unit 2: Properties of water 8 lectures

Physical: temperature, colour, odour, total dissolved solids and total suspended solids; Chemical: major inorganic and organic constituents, dissolved gases, DO, COD, BOD, acidity and alkalinity, electrical conductivity, sodium adsorption ratio; Biological: phytoplankton, phytobenthos, zooplankton, macro-invertebrates and microbes.

Unit 3: Surface and subsurface water 12 lectures

Introduction to surface and ground water; surface and ground water pollution; water table; vertical distribution of water; formation and properties of aquifers; techniques for ground water recharge; river structure and patterns; watershed and drainage basins; importance of watershed and watershed management; rain water harvesting in urban settings.

Unit 4: Wetlands and their management **8 lectures**

Definition of a wetland; types of wetlands (fresh water and marine); ecological significance of wetlands; threats to wetlands; wetland conservation and management; Ramsar Convention, 1971; major wetlands of India.

Unit 5: Marine resource management **6 lectures**

Marine resources; commercial use of marine resources; threats to marine ecosystems and resources; marine ecosystem and resource management (planning approach, construction techniques and monitoring of coastal zones).

Unit 6: Water resource in India **8 lectures**

Demand for water (agriculture, industrial, domestic); overuse and depletion of surface and ground water resources; water quality standards in India; hot spots of surface water; role of state in water resources management.

Unit 7: Water resources conflicts **8 lectures**

Water resources and sharing problems, case studies on Kaveri and Krishna river water disputes; Multipurpose river valley projects in India and their environmental and social impacts; case studies of dams - Narmada and Tehri dam – social and ecological losses versus economic benefits; International conflicts on water sharing between India and her neighbours; agreements to resolve these conflicts.

Unit 8: Major laws and treaties **6 lectures**

National water policy; water pollution (control and prevention) Act 1972; Indus water treaty; Ganges water treaty; Teesta water treaty; National River linking plan: ecological and economic impacts.

Suggested Readings

- Bansil, P.C. 2004. *Water Management in India*. Concept Publishing Company, India.
- Brebbia, C.A. 2013. *Water Resources Management VII*. WIT Press.
- CEA. 2011. *Water Resources and Power Maps of India*. Central Board of Irrigation & Power.
- Grumbine, R.E. & Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science* **339**: 36-37.
- Loucks, D.P., Stedinger, J.R. & Haith, D. A. 1981. *Water Resource Systems Planning and*
- *Analysis*. Englewood Cliffs, NJ, Prentice Hall.
- Mays, L.W. 2006. *Water Resources Sustainability*. The McGraw-Hill Publications.
- Schward& Zhang, 2003. *Fundamentals of Groundwater*. John Willey and Sons.
- Souvorov, A.V. 1999. *Marine Ecologonomics: The Ecology and Economics of Marine Natural*
- *Resource Management*. Elsevier Publications.
- Vickers, A. 2001. *Handbook of Water Use and Conservation*. WaterPlow Press.

II. CORE COURSE -C 4: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENVIRONMENT AND ITS POLLUTION **Theory: 60 Lectures**

Unit 1: Environment: **4 Lectures**
Definition, Components- Atmosphere, hydrosphere, lithosphere their compositions and interactions.

Unit 2: Environmental Pollution: **3 Lectures**
Definition, Causes of environmental pollution-population, resource consumption deforestation, industrialization, agriculture, urbanization and transport.

Unit 3: Types of Pollution:
Water Pollution: **15 Lectures**
Source of pollution of surface and ground water. Types of pollutants-organic including bicides, surfactants, detergents and volatile compounds, inorganic pollutants including outrients, salte and heavy metals biological pollution; thermal pollution. Effects and pollution on water quality and aquatic life in surface water bodies' oxygen economy eutrophication in lakes and reservoirs.

Solid Waste **6 Lectures**
Municipal solid wastes, industrial solid waste (Non-hazardous) Major waste producing industries.
Sewage Water **2 Lectures**

Air Pollution: **20 Lectures**
Definition: Air quality standards, emission standard. Sources and classification of air pollutants. Criteria pollutants. Carbon monoxide, oxides of nitrogen and sulphur, particulate matter, hydrocarbons, photochemical smog and ozone. Effect of air pollution on human health, plants materials visibility and aquatic ecosystems. Climatic changes including global warming green house effect ozone layer depletion acid rain.

Noise Pollution **4 Lectures**
Sources, Standards, measurement and control

Unit 4: Soil erosion and Land Degradation **4 Lectures**

Unit 5: Radio-active pollution-ionic and Non-ionic radiation's **2 Lectures**

ENVIRONMENT & WATER MANAGEMENT PRACTICAL -C 3 & C4 LAB

60 Lectures

Marks : Pr (ESE: 3Hrs) =50	**Pass Marks: Pr (ESE) = 20**

Instruction to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3Hrs duration.The questions in practical examination will be so framed that the students are able to answer them within the stipulated time.

Evaluation of Practical Examination may be as per the following guidelines:

Experiment	*= 30 marks*
Practical record notebook	*= 10 marks*
Viva-voce	*= 10 marks*

Group-A (Hydraulics)

Flow visualization:

1. Measurement of discharge in an open laboratory channel by area-velocity method using a pitor tube.
2. Measurement of discharge in an open laboratory channel by area velocity method usinga current meter.

Measurements:

1. Measurement of discharge in an open laboratory channel using flumes (venture/Parshal) and notches.
2. Measurement of discharge in a pipe using orifice meter, venture meter, water meter.
3. Determination of resistance coefficient in a uniform channel flow and in a pipe flow.

Group-B

Environmental Management

1. Determination of bacteriological pollution in water (total facial calprotection)
2. Visits to training in a municipal waste disposal system/national laboratories dealingin pollution control.
1. Study of water/wastewater/industrial effluent treatment plant and air pollution controlplants of 5 days in each plant.

III. ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

(Credits: Theory-02)

Marks : 100 (ESE: 3Hrs)=100	**Pass Marks Th ESE = 40**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **objective type test**consisting of hundred questions of1 mark each. Examinees are required to mark their answer on **OMR Sheet** provided by the University.*

AECC – ENVIRONMENT STUDIES

Theory: 30 Lectures

Unit 1 : Introduction to environmental studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

(2 lectures)

Unit 2 : Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :

  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(2 lectures)

Unit 3 : Natural Resources : Renewable and Non--renewable Resources

- Land resources and landuse change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water : Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).
- Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

(5 lectures)

Unit 4 : Biodiversity and Conservation

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega--biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity : In--situ and Ex--situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

(5 lectures)

Unit 5 : Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

(5 lectures)

Unit 6 : Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

(4 lectures)

Unit 7 : Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

(3 lectures)

Unit 8 : Field work

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site--Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems--pond, river, Delhi Ridge, etc.

(Equal to 4 lectures)

Suggested Readings:

- Raziuddin, M.., Mishra P.K. 2014,*A Handbook of Environmental Studies*, Akanaksha Publications, Ranchi.
- Mukherjee, B. 2011: *Fundamentals of Environmental Biology*.Silverline Publications, Allahabad.
- Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
- Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
- Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment &Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science,* 339: 36---37.
- McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29---64). Zed Books.
- McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

- Odum, E.P., Odum, H.T. & Andrews, J. 1971.*Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
- Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
- Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
- Thapar, V. 1998. *Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
- Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
- Wilson, E. O. 2006.*The Creation: An appeal to save life on earth*. New York: Norton.
- World Commission on Environment and Development. 1987.*Our Common Future*. Oxford University

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IV. GENERIC ELECTIVE (GE 2A): (Credits: 06)

All Four Papers (GE-2A, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

V. GENERIC ELECTIVE (GE 2B): (Credits: 06)

All Four Papers (GE-2B, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

SEMESTER III 5 Papers

Total 100 x 5 = 500 Marks

I. CORE COURSE -C 5: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	**Pass Marks: Th (MSE +ESE) = 30**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):
*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

WATER RESOURCES MANAGEMENT **Theory: 60 Lectures**

Water as a Resource Material **2 Lectures**
Drinking water, water used as raw material, cooling water, irrigation water, fishing water, industrial water, recreation water, cultural water.

Introduction to Hydrology **20 Lectures**
Precipitation infiltration, evaporation and transpiration, Run and off hydrological cycle. Hydrologic budget, water balance-global and regional surface water hydrology. Surface water Hydrology Run off process. Estimation of run off and hydrograph Ground water Hydrology Aquifers, Ground water hydraulics, safe yield, Ground water Collection system. Collection of hydrologic data. Rainfall, Evaporation measurement. Stream gauging. Use of remote sensing in data collection.

Water Requirement for Various Uses **10 Lectures**
Irrigation Water, Consumptive use of water for crops, determination of irrigation requirements, comparative performance of irrigation Methods. Domestic and Industrial Water Supply Needs
Per capita water demands, water needs of major industries. Water requirement for non-consumptive uses such as power generation and inland navigation.

Management of water Availability **10 Lectures**
Rain fall data, Surface water development, ground water development, weather modification, water conservation, inter busin transfer of water, west water reuse, desalination other approaches.

Development of water sheds **5 Lectures**
Management of extremes such as floods-structural and non-structural approaches, droughts
Collection, Conveyance and Distribution System, water Losses
Location and boring of tube wells, maintenance of tube wells and related machinery.

Micro Water Shed Management **8 Lectures**

Plantation & their maintenance. Equivalent to **5Lectures**

II. CORE COURSE -C 6: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENVIRONMENTAL POLLUTION AND HUMAN HEALTH

Theory: 60 Lectures

Preamble: This paper deals with different aspects of environmental contamination, which have adverse effects on human health. It will lay emphasis on understanding mechanisms of pollutants impacting human health by developing an understanding of different types of pollutants, their sources and mitigation measures. The students will also be introduced to the concept of permissible limits.

Unit 1: Introduction **2 lectures**

Definition of pollution; pollutants; classification of pollutants.

Unit 2: Air pollution **8 lectures**

Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs) and control measures; indoor air pollution: sources and effects on human health.

Unit 3: Water pollution **10 lectures**

Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; effect of water contaminants on human health (nitrate, fluoride, arsenic, chlorine, cadmium, mercury, pesticides); water borne diseases; concept and working of effluent treatment plants (ETPs).

Unit 4: Soil pollution **5 lectures**

Causes of soil pollution and degradation; effect of soil pollution on environment, vegetation and other life forms; control strategies.

Unit 5: Noise pollution **5 lectures**

Noise pollution – sources; frequency, intensity and permissible ambient noise levels; effect on communication, impacts on life forms and humans - working efficiency, physical and mental health; control measures.

Unit 6: Radioactive and thermal pollution **5 lectures**

Radioactive material and sources of radioactive pollution; effect of radiation on human health (somatic and genetic effects); thermal pollution and its effects.

Unit 7: Marine pollution **5 lectures**

Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management; existing challenges and management techniques (planning, construction, environmental monitoring of coastal zones).

Unit 8: Chemistry of environmental pollutants **10 lectures**

Solubility of pollutants (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, role of chelating agents in transferring pollutants, concept of biotransformation and bioaccumulation, concept of radioactivity, radioactive decay and half-life of pollutants, organometallic compounds, acid mine drainage.

Unit 9: Pollution control **10 lectures**

Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors, membrane bioreactor neutralization, ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bioscrubbers, biotrickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Yamuna Action Plan; implementation of CNG in NCT of Delhi.

Suggested Readings

- Gurjar, B.R., Molina, L.T. & Ojha C.S.P. 2010. *Air Pollution: Health and Environmental Impacts*. CRC Press, Taylor & Francis.
- Hester, R.E. & Harrison, R.M. 1998. *Air Pollution and Health*. The Royal Society of Chemistry, UK.
- Park, K. 2015. *Park's Textbook of Preventive and Social Medicine* (23rd edition). Banarsidas Bhanot Publishers.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2006. *Environmental and Pollution Science*. Elsevier Academic Press.
- Purohit, S.S. & Ranjan, R. 2007. *Ecology, Environment & Pollution*. Agrobios Publications.
- Vesilind, P.J., Peirce, J.J., & Weiner R.F. 1990. *Environmental Pollution and Control*. Butterworth-Heinemann, USA.

III. CORE COURSE -C 7: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

SOLID WASTE MANAGEMENT Theory: 60 Lectures

Preamble: Every human activity ends up in the generation of unwanted waste product. This paper throws light on the current scenario of solid waste generation and problem in its handling and management. It also deals with the different governmental policies that explain proper transportation, handling and disposal of solid waste to minimize its effect on environment.

Unit 1: Introduction 3 lectures

Sources and generation of solid waste, their classification and chemical composition; characterization of municipal solid waste; hazardous waste and biomedical waste.

Unit 2: Effect of solid waste disposal on environment 8 lectures

Impact of solid waste on environment, human and plant health; effect of solid waste and industrial effluent discharge on water quality and aquatic life; mining waste and land degradation; effect of land fill leachate on soil characteristics and ground water pollution.

Unit 3: Solid waste Management 14 lectures

Different techniques used in collection, storage, transportation and disposal of solid waste (municipal, hazardous and biomedical waste); landfill (traditional and sanitary landfill design); thermal treatment (pyrolysis and incineration) of waste material; drawbacks in waste management techniques.

Unit 4: Industrial waste management 6 lectures

Types of industrial waste: hazardous and non-hazardous; effect of industrial waste on air, water and soil; industrial waste management and its importance; stack emission control and emission monitoring; effluent treatment plant and sewage treatment plant.

Unit 5: Resource Recovery 8 lectures

4R- reduce, reuse, recycle and recover; biological processing - composting, anaerobic digestion, aerobic treatment; reductive dehalogenation; mechanical biological treatment; green techniques for waste treatment.

Unit 6: Waste- to- energy (WTE) **4 lectures**

Concept of energy recovery from waste; refuse derived fuel (RDF); different WTE processes: combustion, pyrolysis, landfill gas (LFG) recovery; anaerobic digestion; gasification.

Unit 7: Integrated waste management **4 lectures**

Concept of Integrated waste management; waste management hierarchy; methods and importance of Integrated waste management.

Unit 8: Life cycle assessment (LCA) **5 lectures**

Cradle to grave approach; lifecycle inventory of solid waste; role of LCA in waste management; advantage and limitation of LCA; case study on LCA of a product.

Unit 9: Policies for solid waste management **8 lectures**

Municipal Solid Wastes (Management and Handling) Rules 2000; Hazardous Wastes Management and Handling Rules 1989; Bio-Medical Waste (Management and Handling) Rules 1998; Ecofriendly or green products.

Suggested Readings

- Asnani, P. U. 2006. Solid waste management. *India Infrastructure Report 570*.
- Bagchi, A. 2004. *Design of Landfills and Integrated Solid Waste Management*. John Wiley & Sons.
- Blackman, W.C. 2001. *Basic Hazardous Waste Management*. CRC Press.
- McDougall, F. R., White, P. R., Franke, M., & Hindle, P. 2008. *Integrated Solid Waste Management: A Life Cycle Inventory*. John Wiley & Sons.
- US EPA. 1999. *Guide for Industrial Waste Management*. Washington D.C.
- White, P.R., Franke, M. &Hindle P. 1995. *Integrated Solid waste Management: A Lifecycle Inventory*. Blackie Academic & Professionals.
- Zhu, D., Asnani, P.U., Zurbrugg, C., Anapolsky, S. & Mani, S. 2008. *Improving Municipal Solid waste Management in India.* The World Bank, Washington D.C.

ENVIRONMENT & WATER MANAGEMENT PRACTICAL -C5, C6 & C7 LAB
60 Lectures

Marks : Pr (ESE: 3Hrs) =75	**Pass Marks: Pr (ESE) = 30**

Instruction to Question Setter for
End Semester Examination (ESE):

There will be one Practical Examination of 3Hrs duration.The questions in practical examination will be so framed that the students are able to answer them within the stipulated time.

Evaluation of Practical Examination may be as per the following guidelines:
Experiment = 45 marks
Practical record notebook = 15 marks
Viva-voce = 15 marks

Group-A

A. An EIA study of a Industrial/Water Resource development project
B. Measurement of discharge and calculation of seepage loss in a canal reach. Lysimeter experiment on the same site.
C. Measurement of pan evaporation and its comparision with penman equation.
D. Determination of infiltration rate from a controlled plot experiment.

Group-B
Water Analysis

1. Estimation of water quality parameters such as turbidity, colour, solids, alkalinity, acidity.
2. Determination of pH
3. Hardness
4. Determination of D.O
5. Chemical oxygen demand (COD)
6. Biochemical oxygen demand (BOD)
7. Estimation of fluoride
8. Estimation of phosphate
9. Estimation of Nitrate
10. Estimation of Nitrite

Group-C
Soil Analysis

2. Determination of soil pH
3. Determination of soil moisture content
4. Estimation of soil chloride
5. Determination of Soil Texture

IV. SKILL ENHANCEMENT COURSE SEC 1: (Credits: Theory-02)

Marks : 100 (ESE: 3Hrs)=100	**Pass Marks Th ESE = 40**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **objective type test** consisting of hundred questions of 1 mark each. Students are required to mark their answer on **OMR Sheet** provided by the University.*

ELEMENTARY COMPUTER APPLICATION SOFTWARES:

A Common Syllabus Prescribed by Ranchi University **Theory: 30 Lectures**

Objective of the Course

The objective of the course is to generate qualified manpower in the area of Information Technology (IT) and Graphic designing which will enable such person to work seamlessly at any Offices, whether Govt. or Private or for future entrepreneurs in the field of IT.

A. INTRODUCTION TO COMPUTER SYSTEM

Basic Computer Concept

Computer Appreciation - Characteristics of Computers, Input, Output, Storage units,CPU, Computer System. **1 Lecture**

Input and Output Devices

Input Devices - Keyboard, Mouse, joystick, Scanner, web cam,
Output Devices- Soft copy devices, monitors, projectors, speakers, Hard copy devices, Printers – Dot matrix, inkjet, laser, Plotters. **4 lectures**

Computer Memory and Processors

Memory hierarchy, Processor registers, Cache memory, Primary memory- RAM, ROM, Secondary storage devices, Magnetic tapes, Floppy disks, hard disks, Optical Drives- CD-ROM, DVD-ROM, CD-R, CD-RW, USB Flash drive, Mass storage devices: USB thumb drive. Managing disk Partitions, File System. Basic Processor Architecture, Processor speed, Types of processor.

5 lectures

Numbers Systems and Logic Gates

Decimal number system, Binary number system, Octal number system, Hexadecimal number system, Inter-conversion between the number systems. Basic Logic gates-AND, OR, NOT, Universal logic gates- NAND, NOR

3 lectures

Computer Software

Computer Software- Relationship between Hardware and Software, System Software, Application Software, Compiler, Names of some high level languages, Free domain software.

2 Lectures

Internet & its uses

History of Internet, WWW and Web Browsers: Web Browsing software, Surfing the Internet, Chatting on Internet, Basic of electronic mail, Using Emails, Document handling, Network definition, Common terminologies: LAN, WAN, MAN, Node, Host, Workstation, Bandwidth, Network Components: Severs, Clients, Communication Media. Wireless network **3 Lectures**

Operating system-Windows

Operating system and basics of Windows, The User Interface, Using Mouse and Moving Icons on the screen, The My Computer Icon, The Recycle Bin, Status Bar, Start and Menu & Menu-selection, Running an Application, Windows Explorer Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows, Windows Setting, Control Panels, Wall paper and Screen Savers, Setting the date and Sound, Concept of menu Using Help, Advanced Windows, Using right Button of the Mouse, Creating Short cuts, Basics of Window Setup, Notepad, Window Accessories

2 Lectures

B. MICROSOFT OFFICE 2007 AND LATEST VERSIONS

Word Processing

Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Checking. Correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards, Mail merge and Macros.

3 Lectures

Microsoft Excel (Spreadsheet)

Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts. Integrating word processor, spread sheets, web pages. Pivot table, goal seek, Data filter and scenario manager

4 Lectures

Microsoft Power Point (Presentation Package)

Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations. Creating photo album, Rehearse timing and record narration. Master slides. **3 Lectures**

Reference Books

- Nishit Mathur, Fundamentals of Computer , Aph publishing corporation(2010)
- Misty E. Vermaat,.Microsoft word 2013 1st Edition (2013).
- Satish Jain, M.Geeta, MS- Office 2010 Training Guide, BPB publication (2010)
- Joan Preppernau, Microsoft PowerPoint 2016 step by step, Microsoft press(2015)
- Douglas E Corner, The Internet Book 4th Edition, prentice –Hall(2009)
- Faithe wempen, word 2016 in depth 1st edition, que publishing(2015)
- Steven welkler, Office 2016 for beginners, Create Space Independent publishing Plateform (2016)

SKILL ENHANCEMENT LAB- SEC 1 LAB 30 Lectures

A. MS-WORD LAB ASSIGNMENT

1. Write down the following Paragraph OR any one provided by your teacher;

Without a doubt, the Internet is one of the most important inventions of modern times. The Internet is a global interconnected computer networks which allow each connected computer to share and exchange information with each other. The origins of the Internet can be traced to the creation of Advanced Research Projects Agency Network (ARPANET) as a network of computers under the auspices of the U.S. Department of Defense in 1969.

Apply following effects on The paragraph:

i. Paragraph **font-size** and **font-type** must be 12 Verdana.
ii. Paragraph **alignment** must be justified and double line spacing.
iii. **Highlight** the "(ARPANET)" with green color.
iv. Make the "Internet" keywords **Bold and Italic**.
v. Insert any "**WordArt**" and a **symbol** to your document.
vi. Insert a **clipart** to your document.
vii. Add following lines to your document:

Internet, Intranet, Extranet, URL, WWW, Networking, Protocols, HTTP, TCP/IP

2. Create a Table of following fields:

Name, Surname, Age, Gender, Job and apply the following effects

i. Insert 10 records
ii. Font size should be 12
iii. Title size should be 14
iv. Font type should be Times new Roman
v. Title color should be blue
vi. Text color should be black
vii. Table border should be 2

3. Write a letter on 'Road Safety' and send to 'Multiple Recipients' using mail merge.

4. Type the paragraph given below:

Today, the Internet is a public, cooperative and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the Internet uses a portion of the total resources of the currently existing public telecommunication networks. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP (for Transmission Control Protocol/Internet Protocol). Two recent adaptations of Internet technology, the intranet and the extranet, also make use of the TCP/IP protocol. Today, the Internet is a public, cooperative and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the Internet uses a portion of the total resources of the currently existing public telecommunication networks. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP (for Transmission Control Protocol/Internet Protocol). Two recent adaptations of Internet technology, the intranet and the extranet, also make use of the TCP/IP protocol.

Apply the following:

i. Change Internet into Internets at a time
ii. Heilight TCP/IP in red color
iii. Replace protocol into protocols
iv. Find the word "Public"

B. MICROSOFT EXCEL LAB ASSİGNMENT

Basic Formatting and Spreadsheet Manipulation

1. Add rows and columns to an existing spreadsheet
2. Reformat data (center, comma and currency styles, bold, text color)
3. Work with a simple formula (product) and function (sum)

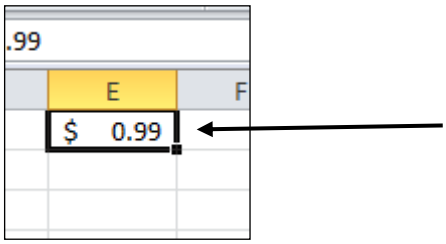
Assignment

1. Create a workbook as shown below.
2. To enter new rows or columns, simply click on the row or column header to select the whole row or column. Then right click with the mouse and choose insert.
3. Add the new row for S Spade with the data that's shown below (between the original rows 7 and 8).
4. Add a column for gender and the data as shown below (between the original columns A and B). Enter the appropriate gender for yourself in the last row.

A	B	C	D
Name	**Male/Female**	**Genre**	**Number of Songs**
J Smith	F	Blues	50
B Doe	M	Country	110
S Spade	F	Country	200
F Zappa	M	Blues	1400
F Zappa	M	Alternative	2300
J Smith	F	Alternative	150
S Spade	F	Blues	1000
B Doe	M	Blues	75
yourname	M	Blues	800

5. Center the data in columns B and C. Do this by selecting the whole column and click the center icon on the ribbon.
6. Bold the data in row 1, the column headings (ensure that the data all remains visible within the column boundaries).
7. Change the font color for row 1 to Blue.
8. Change the format of the data in column D to comma style (no decimal places showing).There is an icon on the home tab that sets it to comma style easily.
9. Add two new column labels to the right of the current columns; **Unit Price** and **Total Cost**. (They will be in columns E and F.) These two columns of data should be currency type so that the dollar sign is shown. There is an icon to quickly format the selected column as currency type.
10. All tunes are $.99, so enter that value for all rows in Column E. You can copy quickly by using the **Auto Fill** handle and drag that amount down. When you over your mouse over the tiny square in

the bottom right hand corner of the active cell, your mouse shape will become a skinny plus sign, and you can click and drag that cell to make a copy.



11. Calculate Total Cost (column F) as *column D times Column E*. You will type in a formula like this into cell F2: **=D2*E2**(Be sure to begin the formula with an equal sign)
12. Use the AutoFill (skinny plus sign) again to copy the formula down column F; down to F10. Double check the picture below to make sure yours has the correct values
13. Add a border to all of the cells (A1-f10) using the Borders tool in the Fonts group on the Home Tab.
14. Change the page layout to landscape. Do this by clicking the Page Layout tab on the ribbon and then to Orientation to Landscape.
15. Save the file.
16. Click in cell F11 and Use the sum function or the shortcut icon that looks like ∑ to get the total of the Total Cost column.
17. Ensure that the data is all visible within the column boundaries. Make the columns wider if needed.
18. Save the workbook. Your final spreadsheet should look like the following when printed.

Name	Male/Female	Genre	Number of Songs	Unit Price	Total Cost
J Smith	F	Blues	50	$ 0.99	$ 49.50
B Doe	M	Country	110	$ 0.99	$ 108.90
S Spade	F	Country	200	$ 0.99	$ 198.00
F Zappa	M	Blues	1,400	$ 0.99	$ 1,386.00
F Zappa	M	Alternative	2,300	$ 0.99	$ 2,277.00
S Spade	F	Blues	1,000	$ 0.99	$ 990.00
J Smith	F	Alternative	150	$ 0.99	$ 148.50
B Doe	M	Blues	75	$ 0.99	$ 74.25
yourname	M	Blues	800	$ 0.99	$ 792.00
					$ 6,024.15

Create a sample table given below in Excel

- Using formula find Total
- Find the maximum value using MAX function from the **Units** column
- Find minimum value from **Total** column

Order Date	Region	Rep	Item	Units	Unit Cost	Total
1/6/2016	East	Jones	Pencil	95	1.99	189.05
1/23/2016	Central	Kivell	Binder	50	19.99	999.50
2/9/2016	Central	Jardine	Pencil	36	4.99	179.64
2/26/2016	Central	Gill	Pen	27	19.99	539.73
3/15/2016	West	Sorvino	Pencil	56	2.99	167.44
4/1/2016	East	Jones	Binder	60	4.99	299.40
4/18/2016	Central	Andrews	Pencil	75	1.99	149.25
5/5/2016	Central	Jardine	Pencil	90	4.99	449.10
5/22/2016	West	Thompson	Pencil	32	1.99	63.68
6/8/2016	East	Jones	Binder	60	8.99	539.40
6/25/2016	Central	Morgan	Pencil	90	4.99	449.10
7/12/2016	East	Howard	Binder	29	1.99	57.71
7/29/2016	East	Parent	Binder	81	19.99	1,619.19
8/15/2016	East	Jones	Pencil	35	4.99	174.65
9/1/2016	Central	Smith	Desk	2	125.00	250.00
9/18/2016	East	Jones	Pen Set	16	15.99	255.84
10/5/2016	Central	Morgan	Binder	28	8.99	251.72
10/22/2016	East	Jones	Pen	64	8.99	575.36
11/8/2016	East	Parent	Pen	15	19.99	299.85
11/25/2016	Central	Kivell	Pen Set	96	4.99	479.04
12/12/2016	Central	Smith	Pencil	67	1.29	86.43
12/29/2016	East	Parent	Pen Set	74	15.99	1,183.26

C. MS-POWERPOINT LAB ASSIGNMENT

Activity 1 : Using Text & Background/Themes

i. Create one new slide and insert any text.
ii. To make your slide more attractive, use the themes or background.
iii. Make sure it apply for every slide not only one slide.

Activity 2 : Apply Custom Animation On Text

i. Use the custom animation to add effects on your text. Set the text move after you click the mouse.
ii. If you have more than one text, add effects for each of text.

Activity 3 : Insert Image & WordArt

i. Insert one new blank slide.
ii. Choose one pictures or clip art from any source and insert in your new slide.
iii. Using the WordArt, make a note or title on your picture.
iv. Use the custom animation again to add effects on your picture and WordArt.

Activity 4 : Insert Text Box

i. Insert one new blank slide.
ii. Use the text box to insert one paragraph of text and adjust your text.

Activity 5 : Insert Smart Art

i. Insert one new blank slide.
ii. Insert the Smart Art and put your text on the Smart Art.

Activity 6 : Insert Audio

i. Back to your first slide and insert one audio on that slide. The audio must play automatically when you show your slide.
ii. Make sure the speaker also not appear when you show your slide. (the icon).
iii. The audio must play when you show alls your slide, not only one slide.

Activity 7 : inserting Video

i. Insert one new slide and insert one short video

Activity 8 : Save File

i. Save your file

Activity 9 : Create Photo Album & Hyperlink

i. Insert one new slide and put a text ex: “My Photo Album”
ii. Create one photo album and adjust your text and your photos
iii. Save your photo album with a new file
iv. Make a hyperlink to your photo using the text “My Photo Album”

Reference Books:

- Faithe wempen, word 2016 in depth 1st edition, que publishing(2015)
- steven welkler, Office 2016 for bignners, Create Space Independent publishingplateform(2016)
- Elaine Marmel, office 2016 simplified, 1st Edition, John wiley and sons Inc(2016)
- Patrice-Anne Rutledge, Easy office 2016 1st edition, Que publishing(2016)

V. GENERIC ELECTIVE (GE 3A): (Credits: 06)

All Four Papers (GE-3A, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

VI. GENERIC ELECTIVE (GE 1B): (Credits: 06)

All Four Papers (GE-3B, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

SEMESTER IV 5 Papers

Total 100 x 5 = 500 Marks

I. CORE COURSE -C 8: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	**Pass Marks: Th (MSE +ESE) = 30**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

WATER QUALITY MANAGEMENT **Theory: 60 Lectures**

Water Quality Requirements and Standards for Various Uses. **3 Lectures**

Quality of Water in Difference Sources **2 Lectures**

Water Quality Monitoring **6 Lectures**

Sampling methods for wastewater, steam and lake water and sedimen sampling equipment.
Water Treatment Process Conventional Water Treatment Process **20 Lectures**

Coagulation and flocculation, sedimentation, filtration, disinfection, water sofiening Specific water Treatment Process
Removal of iron and manganese, deflueridation, desalination.
Wastewater Treatment Processes **18 Lectures**

Quality and characteristics of domestic wastewater.
Primary treatment, secondary treatment (conventional and Low Cost). Advanced wastewater treatment including nitrogen phosphorus removal. Treatment and disposal of sludge.
Characteristics and Treatment of a Few typical Industrial Wastewater **6 Lectures**

Maintenance of effluent treatment plants.
Performance studies of a few typical treatment plants.
Wastewater Disposal and Reuse **3 Lectures**

Water Quality Protection for open wells and Ponds **2 Lectures**

II. CORE COURSE -C 9: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENVIRONMENT MANAGEMENT Theory: 60 Lectures

Air Pollution Abatement 30 Lectures

Air Pollution and Metrology
Metrological parameters, vertical motion of air and atmospheric stability, wind rose diagram and wind direction frequency. Lapse rates, temperature inversion, maximum mixing dept.
Atmospheric Dispersion
Plumes and plume rise, dispersion of pollutant:
Ambient air Quality monitoring.
Stack gas emissions and their measurement.
Ambient air and stack gas quality standards, threshold limit value.
Air Pollution Control
Control of stationary, source emissions-particulate emissions.
Control, gaseous emissions control.
Control of mobile source emissions,
Role of plants and trees in air pollution abatement.
Disposal of hazardous waters.
Management of Land Surface

Green chemistry & Green technology 4 Lectures

Group 'A'- Environmental Management-2
Global atmospheric Change **4 Lectures**

Introduction, Global Temperatures, Greenhouse Effect
Carbon dioxide, Chlorofluorocarbons and other greenhouse gases
Ozone layer and destruction of stratospheric ozone.

Sustainable Development **2 Lectures**

Concept, Environmental friendly products and technologies

Environmental impact Assessment **8 Lectures**

Needs for EIA studies, Stages in the process and methodology

Environmental effects of construction and operation of facilities including remedial measures.
Environment Monitoring Programmes.
Industrial Plant location and city planning

Economics and Benefits of Pollution Control **2 Lectures**

Group- 'B' Environmental Law
Concept of Environmental audit **3 Lectures**

Industrial licensing and Environmental Clearance Procedure **12 Lectures**

Environmental Acts and legislation
Water (Prevention and Control of Pollution) Act 1974
Water less Act 1977
Air (Prevention and Control of Pollution) Act 1981
EPA 1986
Wildlife (Protection) Act 1972
Public Hearing, Problems Implementation
Function of key nodal agencies- MoEF, GoE, CPCB, SPCB

III. CORE COURSE -C 10: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

LAND AND SOIL CONSERVATION AND MANAGEMENT

Theory: 60 Lectures

Preamble: This paper introduces students to the fundamentals of land and soil degradation. Each unit covers a range of topics, which will help students develop basic understanding of properties of soil and how the quality of land and soil degrades due to anthropogenic activities.

Unit 1: Introduction 5 lectures
Land as a resource, soil health; ecological and economic importance of soil; types and causes of soil degradation; impact of soil loss and soil degradation on agriculture and food security; need for soil conservation and restoration of soil fertility.

Unit 2: Fundamentals of soil science 10 lectures
Soil formation; classification of soil; soil architecture; physical properties of soil; soil texture; soil water holding capacity; soil temperature; soil colloids; soil acidity and alkalinity; soil salinity and sodicity; soil organic matter; micronutrients of soil; nitrogen, sulphur, potassium and phosphorus economy of soil; soil biodiversity; soil taxonomy maps.

Unit 3: Soil degradation – causes 10 lectures
Soil resistance and resilience; nature and types of soil erosion; non-erosive and erosive soil degradation; losses of soil moisture and its regulation; nutrient depletion; soil pollution due to mining and mineral extraction, industrial and urban development, toxic organic chemicals, and organic contaminants in soils; fertilizers and fertilizer management; recycling of soil nutrients.

Unit 4: Landuse changes and land degradation 15 lectures
Land resources: types and evaluation; biological and physical phenomena in land degradation; visual indicators of land degradation; drivers of land degradation - deforestation, desertification; habitat loss, loss of biodiversity; range land degradation; land salinization; human population pressure, poverty, socio-economic and institutional factors; drivers of land use and land cover change in major geographic zones and biodiverse regions with particular reference to the Himalaya and the Western Ghats.

Unit 5: Costs of land degradation **15 lectures**

Economic valuation of land degradation; onsite and offsite costs of land degradation; loss of ecosystem services; effects on farming communities; effects on food security; effects on nutrient cycles; future effects of soil degradation; emerging threats of land degradation to developing countries.

Unit 6: Controlling land degradation **5 lectures**

Sustainable land use planning; role of databases and data analysis in landuse planning control and management; land tenure and land policy; legal, institutional and sociological factors; participatory land degradation assessment; integrating land degradation assessment into conservation.

Suggested Readings

- Brady, N.C. & Well, R.R. 2007.*The Nature and Properties of Soils* (13th edition), Pearson Education Inc.
- Gadgil, M. 1993. Biodiversity and India's degraded lands. *Ambio* **22:** 167-172.
- Johnson, D.L. 2006. *Land Degradation* (2nd edition). Rowman& Littlefield Publishers.
- Marsh, W. M. &Dozier,J. 1983. *Landscape Planning: Environmental Applications*. John Wiley and Sons.
- Oldeman, L. R. 1994. The global extent of soil degradation. *Soil resilience and sustainable land use, 9*. (http://library.wur.nl/isric/fulltext/isricu_i26803_001.pdf).
- Pandit, M.K. et. al. 2007. Unreported yet massive deforestation driving loss of endemic biodiversity in Indian Himalaya. *Biodiversity Conservation* **16**: 153-163.
- Pandit, M.K. &Kumar, V. 2013. Land use and conservation challenges in Himalaya: Past, present and future. In: Sodhi, N.S., Gibson, L. & Raven, P.H. *Conservation Biology: Voices from the Tropics.* pp. 123-133. Wiley-Blackwell, Oxford, UK (file:///Users/mkpandit/Downloads/Raven%20et%20al.%202013.%20CB%20Voices%20from%20Tropics%20(2).pdf) .
- Peterson, G. D., Cumming, G. S. & Carpenter, S. R. 2003. Scenario planning: a tool for conservation in an uncertain world. *Conservation Biology* 17: 358-366.
- Scherr, S. J. 1999. *Soil degradation: A threat to developing-country food security by 2020?* (Vol. 27). International Food Policy Research Institute.

ENVIRONMENT & WATER MANAGEMENT PRACTICAL -C8, C9 & C10 LAB
60 Lectures

Marks : Pr (ESE: 3Hrs) =75	**Pass Marks: Pr (ESE) = 30**

Instruction to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3Hrs duration. The questions in practical examination will be so framed that the students are able to answer them within the stipulated time.

Evaluation of Practical Examination may be as per the following guidelines:

Experiment	*= 45 marks*
Practical record notebook	*= 15 marks*
Viva-voce	*= 15 marks*

Group-A
Water Analysis

1. Determination of conductivity
2. Determination of total solids (Gravimetry)
3. Determination of total dissolved solids (Gravimetry)
4. Determination of total suspended solids (Gravimetry)
5. Determination of chlorides
6. Estimation of carbon dioxide
7. Estimation of residual chlorine.
8. Estimation of sulphate

Group-B

1. Estimation of wastewater characteristics of some typical wastewater as per pollution control board requirements including DO, BOD, COD.
2. Estimation of iron (Colourimetry)
3. Colorimetric measurement of some heavy metals in effluents (e.g. Cr. (VI), Pb).
4. Analysis of heavy metals – As, Hg, Pb, Cd(Demonstration)
5. Estimation of Total Nitrogen (Kjeldahl method)(Demonstration)
6. Estimation of Sodium & Potassium (Flame photometry)(Demonstration)
7. Detection of pesticides using TLC / paper chromatography

Group-C
Soil Analysis

1. Determination of TOC
2. Determination of Ca^{2+}& Mg^{2+}
3. Analysis of soil sulphate (Gravimetry)

IV. SKILL ENHANCEMENT COURSE SEC 2: (Credits: Theory-02)

Marks : 100 (ESE 3Hrs) =100	**Pass Marks Th ESE = 40**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain three questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 & 3 will be short answer type** of 5 marks. **Group B will contain descriptive type**six questions of 20 marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

RAINWATER HARVESTING AND STORAGE

30 Lectures

Unit 1: Rain Water Harvesting: Conservation and Harvesting of rain. Types and design of water harvesting structures; catchments – type and methods. Rainwater harvesting-Catchment and roof top harvesting; yield calculation, Check dams, Artificial recharge, Farm ponds, Percolation tanks, traditional rain water harvesting structures

Unit 2: Traditional methods: Traditional methods of water harvesting like Medhbandi, Naada/bandha, Hembar, Chak, Talab, Saza kuva, Khadin, Johad, Baoris/Bers, Step Well or Water Temples; Places of Importance from Ancient India famous for constructing water reserviours.

Unit 3: Modern techniques: Modern techniques of water haervesting.

Unit 4: Water harvesting & Jharkhand: Planning & Policies for water harvesting in Jharkhand.

Reference Books:

- Anil Agarwal, Sunitha Narain and Indira Khurana (Editors) (2003). Making Water Everybody's Business – Practice and Policy of Water Harvesting. Centre for Science and Environment, New Delhi.
- Archana Mishra (2006). Water Harvesting – Ecological and Economic Appraisal. Authorspress, Jawahar Park, Laxmi Nagar, Delhi.
- Atharvale R.N. (2003). Water Harvesting and sustainable supply in India. Centre for Environmental Education (CEE), Ahmedabad, Rawat Publications, Jaipur.
- Bagdi G.L. (2005). People participation in soil and water management through watershed approach. International Book Distribution Company, Lucknow.
- Centre for Science and Environment (CSE) (2003). A Water Harvesting Manual for Urban Areas, Case studies from Delhi and Mumbai (2003), Centre for Science and Environment, New Delhi.
- Chakravarthy K.K., Gyan Lall Badam and Vijay Paranjpye (Eds). (2006). Traditional Water Management Systems in India. Aryan Book International, New Delhi.
- CWRDM (2000). Integrated Watershed management. Handbook. CWRDM Kerala
- Dilipkumar Majumdar (2009). Irrigation Water Management. PHIL Learning Publishers Pvt.Ltd. New Delhi.
- Ian R Calder (2006). Blue Revolution Integrated Land and Water Resource Management (Second Edition). Earthscan Publications Limited, London, UK.
- Jat B.C. and Sujan Singh (2010). Water management through traditional technologies. Avishkar Publishers, Jaipur, India.
- Kamlesh Kumar Jha (2009). Environmental and Water resource Management. Oxford Book Company, Jaipur, India. P302
- Larry N. Mayers (1996). Water Resources Handbook. Mc Graw Hill Publishers, New York.
- Mane M.S., B.L. Ayare and S.S. Magar (2006). Principles of drip irrigation. Jain Brothers, New Delhi. 160p .

- Murthy JVS (2009). Watershed Management, New Age International Publishers New Delhi.
- Murthy VVN (2004). Land and water management Engineering. Kalyani Publishers, New Delhi.
- Neil S. Grigg (2009). Water Resources Management. Principles, Regualtions and Cases. McGraw-Hill Companies, United States of America.
- Prihar S.S and B.S. Sandhu (1987). Irrigation of Field crops. ICAR, New Delhi
- Ramaswamy R. Iyer (2009). Water and the laws in India. Sage Publishers India Pvt. Ltd., New Delhi.
- Seethapathi V., Dutta D. And Sivakumar R. (2008). Hydrology of small watersheds. TERI, New Delhi
- Sheshagni Rao (2003). Watershed : Comprehensive Development. B.S. Publications, Hyderabad.
- Shree Padre (2002). Rainwater harvesting. Altermedia Publishers, Thrissur, Kerala.
- Vaidyanathan A. (1999). Water Resource Management – Institutions and Irrigation Developments in India. Oxford University Press, New Delhi.
- Water Conservation: A Guide To Promoting Public Awareness (2001). Water Resources Series No. 81, United Nations Publications, New York.
- Water Management – Environmental Management in Developing Countries (1994). Dresden University of Technology and the Institute for Scientific Co-operation, Tubingen,under the sponsorship of Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, FRG(BMU),UNEP and UNESCO.
- Western Ghat Cell (2002). Watershed Management projects in India : A Compendium of articles on water management practices, Western Ghat Cell, Planning and Economic Affairs Department. Govt. of Kerala.

V. GENERIC ELECTIVE (GE 4A): (Credits: 06)

All Four Papers (GE-4A, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

VI. GENERIC ELECTIVE (GE 4B): (Credits: 06)

All Four Papers (GE-4B, One paper to be studied in each semester; Refer Table AI 2.2-2.3) of any One Subject to be opted other than the Honours Subject. Refer Table AI 2.4 and for Content in detail refer the Syllabus of Opted Generic Elective Subject.

SEMESTER V 4 Papers

Total 100 x 4 = 400 Marks

I. CORE COURSE -C 11: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	**Pass Marks: Th (MSE +ESE) = 30**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

BIODIVERSITY & CONSERVATION

Theory: 60 Lectures

Preamble: This course is aimed at helping students to understand and appreciate various concepts and issues concerning biodiversity and conservation at local, regional and global levels. The course will attempt at encouraging students to appreciate the paradigm "think globally, act locally" for a sustainable common future of humankind.

Unit 1: Levels of organization in living world 8 lectures

From genes to ecosystems; tree of life; history of character transformation; organic evolution through geographic time scale; species concept – what's in a name?; how many species are there on earth?; concept and types of speciation.

Unit 2: Biodiversity patterns 4 lectures

Spatial patterns: latitudinal and elevational trends in biodiversity; temporal patterns: seasonal fluctuations in biodiversity patterns; importance of biodiversity patterns in conservation.

Unit 3: Biodiversity estimation 10 lectures

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; molecular techniques: RAPD, RFLP, AFLP; NCBI database, BLAST analyses.

Unit 4: Importance of biodiversity 8 lectures

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.

Unit 6: Threats to biodiversity **10 lectures**

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.

Unit 7: Conservation of biodiversity **10 lectures**

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.

Unit 8: Biodiversity in India **10 lectures**

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; status of protected areas and biosphere reserves in the country; National Biodiversity Action Plan.

Suggested Readings

- Gaston, K J. & Spicer, J.I. 1998. *Biodiversity: An Introduction.* Blackwell Science, London, UK.
- Krishnamurthy, K.V. 2004. *An Advanced Text Book of Biodiversity - Principles and Practices*. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
- Pandit, M.K. & Grumbine R.E. 2012. Ongoing and proposed hydropower development in the
- Himalaya and its impact on terrestrial biodiversity. *Conservation Biology* **26**:1061-1071.
- Primack, R.B. 2002. *Essentials of Conservation Biology* (3rd edition). Sinauer Associates, Sunderland, USA.
- Singh, J. S. & Singh, S. P. 1987. Forest vegetation of the Himalaya. *The Botanical Review* **53**: 80-192.
- Singh, J. S., Singh, S.P. & Gupta, S. 2006. *Ecology, Environment and Resource Conservation.*
- Anamaya Publications, New Delhi.
- Sodhi, N.S. & Ehrlich, P.R. (Eds). 2010. *Conservation Biology for All*. Oxford University Press.
- Sodhi, N.S., Gibson, L. & Raven, P.H. 2013. *Conservation Biology: Voices from the Tropics.* Wiley-Blackwell, Oxford, UK.

II. CORE COURSE -C 12: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENTREPRENEURSHIP DEVELOPMENT Theory: 60 Lectures

Need, Scope and Characteristic of Entrepreneurship,
Special schemes for Technical Entrepreneurs, STED
Identification of opportunity.
Exposure to demand based, resource based, service based, import substitute and expert promotion industries.

Market service techniques.
Need scope and approaches for project formulation.
Criteria for Principals of Product selection and development Structure of project report.
Choice of technology, plant and equipment.
Institutions, financing procedure and financial incentives. Financial ratio and their significance.
Books of accounts, financial statements and funds flow analysis. Energy requirement and Utilisation.
Resources Management Men, Machine and Materials.

Critical Path Method [CPM] and Project Evaluation Review Techniques [PER] as planning tools for establishing SSI.

a) Nature product and market strategy.
b) Packaging and advertising.
c) After sales service. Costing and printing

Management of self and understanding human behavior
Sickness in small scale industries and their remedial measures.
Copying with uncertainties, stress management and positive reinforcement

Important provisions of factory Act, Sales of Goods Act, Partnership Act.
A] Dilution control
B] Social responsibility and business ethics. Income Tax, Sales Tax and Excise Rules.

ENVIRONMENT & WATER MANAGEMENT PRACTICAL -C 11 & C12 LAB
60 Lectures

Marks : Pr (ESE: 3Hrs) =50	**Pass Marks: Pr (ESE) = 20**

Instruction to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3Hrs duration. The questions in practical examination will be so framed that the students are able to answer them within the stipulated time.

Evaluation of Practical Examination may be as per the following guidelines:

Experiment	*= 30 marks*
Practical record notebook	*= 10 marks*
Viva-voce	*= 10 marks*

Group-A
Microscopy

1. Staining: Simple, gram, spore, Lactophenol cotton blue staining, -ve staining
2. Identification using Permanent Slides
    a. gram +ve Streptococcus, Staphylococcus, Clostridium etc.
    b. gram –ve E.coli. Klebsiella, Pseudomonas, Vibrio
3. Parasites- Entamoeba, Plasmodium etc
4. Media Preparation: Liquid and Solid Media
    a. Nutrient agar Media
    b. Nutrient Broth
5. Sterilization Technique
    a. Hot air oven
    b. Autoclave
    c. Testing of Sterility

III. ENV & WATER MANGEMENT SPECIFIC (DSE 1):

(Credits: Theory-04, Practicals-02)

Marks : 25 (MSE: 1Hr) + 75 (ESE: 3Hrs) =100	**Pass Marks: Th (MSE +ESE) = 40**

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of whichany three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENVIRONMENTAL ECONOMICS Theory: 60 Lectures

Preamble: This paper introduces students to the fundamentals of environmental economics. It covers some basic concepts of economics to familiarize students with absence of market, demand and supply in nature. Each unit covers a range of topics, which will help students develop modern concepts of environmental economics and its importance in conservation of biodiversity and ecosystems through understanding of economic costs associated with these.

Unit1: Introduction to microeconomics 15 lectures
Definition and scope of environmental economics; environmental economics versus traditional economics; brief introduction to major components of economy: consumer, firm and their interaction in the market, producer and consumer surplus, market failure, law of demand and supply, tangible and non tangible goods; utilitariasm; Pareto optimality; compensation principle.

Unit 2: Environmental economics 15 lectures
Main characteristics of environmental goods; marginal analysis; markets and market failure; social benefit, costs and welfare functions; meaning and types of environmental values; measures of economic values; tangible and intangible benefits; Pareto principle or criterion; Hardin's Thesis of 'The Tragedy of Commons'; prisoner's dilemma game; methods of abatement of externalities; social cost benefit analysis; cost-effectiveness analysis.

Unit 3: Economic solutions to environmental problems 15 lectures
Social costs and benefits of environmental programmes: marginal social benefit of abatement, marginal social cost of abatement; pollution control: policies for controlling air and water pollution, disposal of toxic and hazardous waste- standards vs. emissions charges, environmental subsidies, modelling and emission charges; polluter pay principles; pollution permit trading system.

Unit 4: Natural resource economics 5 lectures

Economics of non-renewable resources; economics of fuels and minerals; Hotelling's rule and extensions; taxation; economics of renewable resources; economics of water use, management of fisheries and forests; introduction to natural resource accounting.

Unit 5: Tools for environmental economic policy 10 lectures

Growth and environment; environmental audit and accounting, Kuznets curve, environmental risk analysis, assessing benefits and cost for environmental decision making; cost benefit analysis and valuation: discounting, principles of Cost-Benefit Analysis, estimation ofcosts and benefits, techniques of valuation, adjusting and comparing environmental benefits and costs.

Suggested Readings

- Arrow, K., Bolin, B., Costanza, R., Dasgupta, P., Folke, C., Holling, C.S., Jansson, B.O.,
- Levin, S., Maler, K.G., Perrings, C., Pimentel, D. 1995. Economic growth, carrying capacity, and the environment. *Ecological Economics* **15**: 91-95.
- Hanley, N., Shogren, J. F., & White, B. 2007. *Environmental Economics: In Theory and Practice*. Palgrave Macmillan.
- Kolstad, C.D. 2010. *Environmental Economic*s. Oxford University Press.
- Perman, R. 2003. *Natural Resource and Environmental Economics*. Pearson Education.
- Singh, K. & Shishodia, A. 2007. *Environmental Economics: Theory and Applications*. Sage Publications.
- Thomas, J.M. & Callan, S.J. 2007.*Environmental Economics*. Thomson Learning Inc.
- Tietenberg, T. 2004. *Environmental and Natural Resource Economics* (6th Edition). Pearson Education Pvt. Ltd.
- Tietenberg, T. H. & Lewis, L. 2010. *Environmental Economics and Policy*. Addison-Wesley.
- Turner, R. K., Pearce, D., & Bateman, I. 1994. *Environmental Economics: An Elementary Introduction*. Harvester Wheatsheaf.

IV. ENV & WATER MANGEMENT SPECIFIC (DSE 2): (Credits: Practicals-06)

Marks : 100(ESE: 3Hrs)=100	**Pass Marks: Pr ESE =40**

Instruction to Question Setter for

End Semester Examination (ESE):

Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Internship programme with reputed organization*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

Academic Credits for training shall be based on following:

A **Power Point presentation** (based on the report) for duration of **10 minutes** should be make. This will be presented in front of examiners (One External & One Internal). Marks will be awarded on this presentation and documents submitted to the faculty coordinator at the institute.

Project Report (Total = 75 marks)

- 1. Introduction and Data collection = 25
- 2. Discussion and Result = 25
- 3. Presentation of Report = 25

Viva Voce Examination (Total = 25 marks)

- 1. Power-point Presentation = 15

2. Viva = 10

ON JOB TRAINING - I

1. Student have to do industrial Training from reputed origination (**Reference letter for on-job training must be issued from Concern Department**). Student has to produce daily report. In this daily report, Attendee sheet, Work culture and working hour list day by day, must be listed.
2. Hard bound copy (Two print Copies) and One soft copy in C.D. along with Power Point presentation.

The Training Report will be submitted in the form specified as under:

a. The typing should be done on both sides of the paper(instead of single side printing)
b. The font size should be12 with Times New Roman font.
c. The Training Report may be typed in 1.5 line spacing.
d. The paper should be A-4size.

Two copies meant for the purpose of evaluation may be bound in paper- and submitted to the approved authority.

The On-Job Training report should include:-

- ❖ The First page should include Name of The Institute / University, Project undertaken, Roll Number & Name.
- ❖ Certificate by Candidate of genuine work.
- ❖ Acknowledgement.
- ❖ Certificate of approval.
- ❖ Introduction to the topic.
- ❖ Problem Definition
  - Need of study
  - Problem Definition
  - Research objective
  - List of Information
- ❖ Data Collection
  - Source of data
  - Instrumentation of data collection
  - Sampling Design

- ❖ Analysis, Findings & Interpretation.
- ❖ Suggestions & Recommendations.
- ❖ Conclusion or Silent Findings
- ❖ Limitation
- ❖ Bibliography
- ❖ Annexure

Selecting A Topic:-

Selecting a topic is the first issue. About the only thing you will be sure of should be that do you want to write on a subject that directly relates to Water or Environment related issues. A lot of thinking & creativity is required at planning stage.

The purpose of On-Job Training for you is to-

- Learn about various techinques.
- Learn how to evaluate the potential.
- Improve skills in practical situations.

The candidates are free to select a topic of their choice with due consultation with the faculty member who is mentoring the candidate in the Institute.

SEMESTER VI **4 Papers**

Total 100 x 4 = 400 Marks

I. CORE COURSE -C 13: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	**Pass Marks: Th (MSE +ESE) = 30**

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

NATURAL RESOURCES MANAGEMENT & SUSTAINABILITY

Theory: 60 Lectures

Preamble: This paper takes an objective view of the nature of Earth's resources, their generation, extraction and impact of human activities on earth's environment. The students are expected to understand effective management strategies. It aims to provide an idea of effective management strategies and a critical insight of the major sustainability issues.

Unit 1: Introduction **10 lectures**

Resource and reserves; classification of natural resources; renewable and non-renewable resources; resource degradation; resource conservation; resource availability and factors influencing its availability; land resources; water resources; fisheries and other marine resources; energy resources; mineral resources; human impact on natural resources; ecological, social and economic dimension of resource management.

Unit 2: Natural resources and conservation **10 lectures**

Forest resources: economic and ecological importance of forests, forest management strategies, sustainable forestry; water resources: supply, renewal, and use of water resources, freshwater shortages, strategies of water conservation; soil resources: importance of soil, soil conservation strategies; food resources: world food problem, techniques to increase world food production, green revolution.

Unit 3: Mineral resources **10 lectures**

Mineral resources and the rock cycle; identified resources; undiscovered resources; reserves; types of mining: surface, subsurface, open-pit, dredging, strip; reserve-to-production ratio; global consumption patterns of mineral resources techniques to increase mineral resource supplies; ocean mining for mineral resources; environmental effects of extracting and using mineral resources.

Unit 4: Non-renewable energy resources **10 lectures**

Oil: formation, exploration, extraction and processing, oil shale, tar sands; natural gas: exploration, liquefied petroleum gas, liquefied natural gas; coal: reserves, classification, formation, extraction, processing, coal gasification; environmental impacts of non renewable energy consumption; impact of energy consumption on global economy; application of green technology; future energy options and challenges.

Unit 5: Renewable energy resources **10 lectures**

Energy efficiency; life cycle cost; cogeneration; solar energy: technology, advantages, passive and active solar heating system, solar thermal systems, solar cells, JNN solar mission; hydropower: technology, potential, operational costs, benefits of hydropower development; nuclear power: nuclear fission, fusion, reactors, pros and cons of nuclear power, storage of radioactive waste, radioactive contamination; tidal energy; wave energy; ocean thermal energy conversion (OTEC); geothermal energy; energy from biomass; bio-diesel.

Unit 6: Resource management **10 lectures**

Approaches in resource management: ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies; concept of sustainability science: different approach towards sustainable development and its different constituents; sustainability of society, resources and framework; sustainable energy strategy; principles of energy conservation; Indian renewable energy programme.

Suggested Readings

- Craig, J.R., Vaughan. D.J. & Skinner. B.J. 1996. *Resources of the Earth: Origin, Use, and*
- *Environmental Impacts* (2nd edition). Prentice Hall, New Jersey.
- Freeman, A.M. 2001. *Measures of value and Resources: Resources for the Future*. Washington DC.
- Freeman, A.M. 2003. *Millennium Ecosystem Assessment: Conceptual Framework*. Island Press.
- Ginley, D.S. & Cahen, D. 2011. *Fundamentals of Materials for Energy and Environmental Sustainability*. Cambridge University Press.
- Klee, G.A. 1991. *Conservation of Natural Resources*. Prentice Hall Publication.
- Miller, T.G. 2012. *Environmental Science*. Wadsworth Publishing Co.
- Owen, O.S, Chiras, D.D, & Reganold, J.P. 1998. *Natural Resource Conservation – Management for Sustainable Future* (7th edition). Prentice Hall.
- Ramade, F. 1984. *Ecology of Natural Resources*. John Wiley & Sons Ltd.
- Tiwari, G.N. & Ghosal. M. K. 2005. *Renewable Energy Resources: Basic Principles and Application*. Narosa Publishing House.

II. CORE COURSE -C 14: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) =75	Pass Marks: Th (MSE +ESE) = 30

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

NATURAL HAZARDS & DISASTER MANAGEMENT

Theory: 60 Lectures

Preamble: This paper introduces the students to various aspects of environmental hazards, their causes, classifications, and impacts. It also focuses on the management strategies and governmental action plan to mitigate and prepare for such hazards.

Unit 1: Introduction **5 lectures**

Definition of hazard; natural, technological, and context hazards; concept of risk and vulnerability; reasons of vulnerability - rapid population growth, urban expansion, environmental pollution, epidemics, industrial accidents, inadequate government policies.

Unit 2: Natural hazards **15 lectures**

Natural hazards: hydrological, atmospheric & geological hazards; earthquake: seismic waves, epicenter; volcanoes: causes of volcanism, geographic distribution; floods: types and nature, frequency of flooding; landslides: causes and types of landslides, landslide analysis; drought: types of drought - meteorological, agricultural, hydrological, and famine; Glacial Lake Outburst Floods (GLOF); tornadoes, cyclone & hurricanes; tsunamis: causes and location of tsunamis; coastal erosion, sea level changes and its impact on coastal areas and coastal zone management.

Unit 3: Anthropogenic hazards **15 lectures**

Impacts of anthropogenic activities such as rapid urbanization, injudicious ground water extraction, sand mining from river bank, deforestation, mangroves destruction; role of construction along river banks in elevating flood hazard; disturbing flood plains. Deforestation and landslide hazards associated with it; large scale developmental projects, like dams and nuclear reactors in hazard prone zones; nature and impact of accidents, wildfires and biophysical hazards. Case studies of Bhopal, Minamata and Chernobyl disaster.

Unit 4: Risk and vulnerability assessment **5 lectures**

Two components of risk: likelihood and consequences, qualitative likelihood measurement index; categories of consequences (direct losses, indirect losses, tangible losses, and intangible losses); application of geoinformatics in hazard, risk & vulnerability assessment.

Unit 5: Mitigation and preparedness **10 lectures**

Concept of mitigation; types of mitigation: structural and non-structural mitigation, use of technologies in mitigations such as barrier, deflection and retention systems; concept of preparedness; importance of planning, exercise, and training in preparedness; role of public, education and media in hazard preparedness.

Unit 6: Disaster management in India **10 lectures**

Lessons from the past considering the examples of Bhuj earthquake, tsunami disaster, and Bhopal tragedy; National Disaster Management Framework, national response mechanism, role of government bodies such as NDMC and IMD; role of armed forces and media in disaster management; role of space technology in disaster management; case study of efficient disaster management during cyclone '*Phailin*' in 2013.

Suggested Readings

- Coppola D. P. 2007. *Introduction to International Disaster Management*. Butterworth Heinemann.
- Cutter, S.L. 2012. *Hazards Vulnerability and Environmental Justice*. EarthScan, Routledge Press.
- Keller, E. A. 1996. *Introduction to Environmental Geology*. Prentice Hall, Upper Saddle River, New Jersey.
- Pine, J.C. 2009. *Natural Hazards Analysis: Reducing the Impact of Disasters*. CRC Press, Taylor and Francis Group.
- Schneid, T.D. & Collins, L. 2001. *Disaster Management and Preparedness*. Lewis Publishers, New York, NY.
- Smith, K. 2001. *Environmental Hazards: Assessing Risk and Reducing Disaster*. Routledge Press.
- Wallace, J.M. & Hobbs, P.V. 1977. *Atmospheric Science: An Introductory Survey*. Academic Press, New York.
- Wasson, R.J., Sundriyal, Y.P., Chaudhary, S., Jaiswal, M.K., Morthekai, P., Sati, S.P.&Juyal,
- N. 2013. A 1000-year history of large floods in the upper Ganga catchment, central Himalaya, India. *Quaternary Science Reviews* **77**: 156–166.

ENVIRONMENT & WATER MANAGEMENT PRACTICAL -C 13 & C14 LAB
60 Lectures

Marks : Pr (ESE: 3Hrs) =50	**Pass Marks: Pr (ESE) = 20**

Instruction to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3Hrs duration. The questions in practical examination will be so framed that the students are able to answer them within the stipulated time.

Evaluation of Practical Examination may be as per the following guidelines:

Experiment	*= 30 marks*
Practical record notebook	*= 10 marks*
Viva-voce	*= 10 marks*

Group-A

Pure Culture Techniques

1. Bacteria, Fungi and Actinomycetes from soil
2. Anaerobic culture Bell jar/ Mc Intosh jar
3. Presumptive, confirmatory, complete Milk Quality Test-MBRP
4. BOD

Group-B

Identification: Biochemical Test:

1. Carbohydrate fermentation test
2. Catalase test, Oxidase test,Ureases test

III. ENV & WATER MANGEMENT SPECIFIC (DSE 3):

(Credits: Theory-04, Practicals-02)

Marks : 25 (MSE: 1Hr) + 75 (ESE: 3Hrs) =100	**Pass Marks: Th (MSE +ESE) = 40**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type**three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type**consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENVIRONMENTAL LEGISLATION & POLICY

Theory: 60 Lectures

Preamble: This paper introduces students to the legal structure of India and fundamentals of environmental legislation and policy making. Each unit will help the students to develop basic concepts of environmental legislation and policy making in India and around the world.

Unit 1: Introduction (5 lectures)

Constitution of India; fundamental rights; fundamental duties; Union of India; union list, state list, concurrent list; legislature; state assemblies; judiciary; panchayats and municipal bodies; National Green Tribunal.

Unit 2: History of environmental legislation and policy (10 lectures)

Ancient period: worship of water, air, trees; Mauryan period: Kautilya's Arthashastra, Yajnavalkyasmriti and Charaksamhita; Medieval period: forests as woodland and hunting resourcesduring Mughal reign; British India: Indian Penal Code 1860, Forest Act 1865, Fisheries Act 1897; Independent India: Van Mahotsava 1950, National Forest Policy 1952, Orissa River pollution and prevention Act 1953.

Unit 3: Environmental legislation (5 lectures)

Legal definitions (environmental pollution, natural resource, biodiversity, forest, sustainable development); Article 48A (The protection and improvement of environment and safeguarding of forests and wildlife); Article 51 A (Fundamental duties).

Unit 4: Legislative Instruments (20 lectures)

The Indian Forest Act 1927; The Wildlife (Protection) Act 1972; The Water (Prevention and Control of Pollution) Act 1974; The Forests (Conservation) Act 1980; The Air (Prevention and Control of Pollution) Act 1981; The Environment (Protection) Act 1986; Motor Vehicle Act 1988; The Public

Liability Insurance Act 1991; Noise Pollution (Regulation and Control) Rules 2000; The Biological Diversity Act 2002; The Schedule Tribes and other Traditional Dwellers (Recognition of Forests Rights) Act 2006; The National Green Tribunal Act 2010; scheme and labeling of environment friendly products, Ecomarks.

Unit 5: Government institutions (5 lectures)

Role of Ministry of Environment, Forests & Climate Changein environmental law and policy making; role of central and state pollution control boards in environmental law and policy making.

Unit 6: Case studies (5 lectures)

National Green Tribunal: Aditya N Prasad vs. Union of India & Others; Ganga Tanneries Case: M.C. Mehta vs. Union of India 1988; environmental education case: M.C. Mehta vs. Union of India, WP 860/1991.

Unit 7: International laws and policy (10 lectures)

Stockholm Conference 1972; United Nations Conference on Environment and Development 1992; Rio de Janeiro (Rio Declaration, Agenda 21); Montreal Protocol 1987; Kyoto Protocol 1997; Copenhagen and Paris summits; Ramsar convention.

Practicals: Tutorial and case study based.

Suggested Readings

- Abraham, C.M. 1999. *Environmental Jurisprudence in India*. Kluwer Law International.
- Agarwal, V.K. 2005. Environmental Laws in India: Challenges for Enforcement. *Bulletin of the National Institute of Ecology* **15**: 227-238.
- Divan, S. & Rosencranz, A. 2001. *Environmental Law and Policy in India*. Oxford University Press.
- Divan, S. & Rosencranz, A. 2002. *Environmental Law and Policy in India: Cases, Materials and Statues* (2nd edition). Oxford University Press.
- Gupta, K.R. 2006. *Environmental Legislation in India*. Atlantic Publishers and Distributors.
- Leelakrishnan, P. 2008. *Environmental Law in India* (3rd edition). LexisNexis India.
- Naseem, M. 2011. *Environmental Law in India Mohammad*. Kluwer Law International.
- Venkat, A. 2011. *Environmental Law and Policy*. PHI Learning Private Ltd.

IV. ENV & WATER MANGEMENT SPECIFIC (DSE 4):

(Credits: Practicals-06)

Marks : 100(ESE: 3Hrs)=100	**Pass Marks: Pr ESE =40**

Instruction to Question Setter for

End Semester Examination (ESE):

Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Internship programme with reputed organization*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

Academic Credits for training shall be based on following:

A **Power Point presentation** (based on the report) for duration of **10 minutes** should be make. This will be presented in front of examiners (One External & One Internal). Marks will be awarded on this presentation and documents submitted to the faculty coordinator at the institute.

Project Report (Total = 75 marks)

- 1. Introduction and Data collection = 25
- 2. Discussion and Result = 25
- 3. Presentation of Report = 25

Viva Voce Examination (Total = 25 marks)

- 1. Power-point Presentation = 15

2. Viva = 10

ON JOB TRAINING - I

3. Student have to do industrial Training from reputed origination (**Reference letter for on-job training must be issued from Concern Department**). Student has to produce daily report. In this daily report, Attendee sheet, Work culture and working hour list day by day, must be listed.
4. Hard bound copy (Two print Copies) and One soft copy in C.D. along with Power Point presentation.

The Training Report will be submitted in the form specified as under:

e. The typing should be done on both sides of the paper(instead of single side printing)
f. The font size should be12 with Times New Roman font.
g. The Training Report may be typed in 1.5 line spacing.
h. The paper should be A-4size.

Two copies meant for the purpose of evaluation may be bound in paper- and submitted to the approved authority.

The On-Job Training report should include:-

- ❖ The First page should include Name of The Institute / University, Project undertaken, Roll Number & Name.
- ❖ Certificate by Candidate of genuine work.
- ❖ Acknowledgement.
- ❖ Certificate of approval.
- ❖ Introduction to the topic.
- ❖ Problem Definition
  - Need of study
  - Problem Definition
  - Research objective
  - List of Information
- ❖ Data Collection
  - Source of data
  - Instrumentation of data collection
  - Sampling Design
- ❖ Analysis, Findings & Interpretation.
- ❖ Suggestions & Recommendations.
- ❖ Conclusion or Silent Findings
- ❖ Limitation
- ❖ Bibliography
- ❖ Annexure

Selecting A Topic:-

Selecting a topic is the first issue. About the only thing you will be sure of should be that do you want to write on a subject that directly relates to Water or Environment related issues. A lot of thinking & creativity is required at planning stage.

The purpose of On-Job Training for you is to-

- Learn about various techinques.
- Learn how to evaluate the potential.
- Improve skills in practical situations.

The candidates are free to select a topic of their choice with due consultation with the faculty member who is mentoring the candidate in the Institute.

SAMPLE CALCULATION FOR SGPA & CGPA FOR UNDERGRADUATE
'B.Sc./B.A./B.Com/B.Voc. Honours' PROGRAMME

Distribution of Credits Semester wise for Undergraduate Honours Courses

Table B-1: UG (B.A./ B.Sc./B.Com. /B.Voc Hons. Programme)

Semester wise distribution of 164 Credits

	CC	**AECC**	**GE-A**	**GE-B**	**SEC**	**DSE**	**Total credits**
Semester I	12	02	06	06			20
Semester II	12	02	06	06			20
Semester III	18		06	06	02		26
Semester IV	18		06	06	02		26
Semester V	12					12	24
Semester VI	12					12	24
	84	**04**	**24**	**24**	**04**	**24**	**140 + 24 = 164**

CC=Core Course; AECC=Ability Enhancement Compulsory Course; GE=Generic Elective; SEC=Skill Enhancement Course; DSE=Discipline Specific Elective

Table B-3: Sample calculation for SGPA for B.Sc./B.A./B.Com/B.Voc. Honours Programme

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
Semester I					
C-1	06	A	8	48	
C-2	06	B+	7	42	
AECC-1	02	B	6	12	
GE-1A	06	B	6	36	
GE-1B	06	B+	7	42	
Total	**26**			**180**	**6.92 (180 / 26)**
Semester II					
C-3	06	B	6	36	
C-4	06	C	5	30	
AECC-2	02	B+	7	14	
GE-2A	06	A+	9	54	
GE-2B	06	B+	7	42	
Total	**26**			**176**	**6.76 (176 / 26)**
Semester III					
C-5	06	A+	9	54	
C-6	06	0	10	60	
C-7	06	A	8	48	
SEC-1	02	A	8	16	
GE-3A	06	0	10	60	
GE-3B	06	B+	7	42	
Total	**32**			**280**	**8.75 (280 / 32)**
Semester IV					
C-8	06	B	6	36	
C-9	06	A+	9	54	
C-10	06	B	6	36	
SEC-2	02	A+	9	18	
GE-4A	06	A	8	48	
GE-4B	06	B+	7	42	
Total	**32**			**234**	**7.31 (234 / 32)**
Semester V					
C-11	06	B	6	36	
C-12	06	B+	7	42	
DSE-1	06	0	10	60	
DSE-2	06	A	8	48	
Total	**24**			**186**	**7.75 (186 / 24)**
Semester VI					
C-13	06	A+	9	54	
C-14	06	A	8	48	
DSE-3	06	B+	7	42	
DSE-4	06	A	8	48	
Total	**24**			**192**	**8.0 (192 / 24)**
CGPA					
Grand Total	**140+24=164**			**1248**	**7.61 (1248 / 164)**

Table B-4: Sample calculation for CGPA for B.Sc./B.A./B.Com/B.Voc. Honours Programme

Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI
Credit:26; SGPA:6.92	Credit:26; SGPA: 6.76	Credit:32; SGPA: 8.75	Credit:32; SGPA: 7.31	Credit:24; SGPA: 7.75	Credit:24; SGPA: 8.0

Thus CGPA= (26x6.92+26x6.76+32x8.75+32x7.31+24x7.75+24x8.0)/164**=7.61**

MARKS DISTRIBUTION FOR EXAMINATIONS AND FORMAT OF QUESTION PAPERS

Marks Distribution of Mid Semester Theory Examinations:

Table No. C1: Marks distribution of Theory Examinations of Mid Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions with Choices) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A	Group B
Mid Sem*	T15	15	---	1 Hr	5 x1 =5	2 (out of 3) x5 =10	5	3
	T25	25	---	1 Hr	5 x1 =5	4 (out of 6) x5 =20	5	6

Marks Distribution of End Semester Theory Examinations:

Table No. C2: Marks distribution of Theory Examinations of End Semester

Topic	Code	Full Marks	Pass Marks including Mid Sem	Time	Group-A# (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions with Choices) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A#	Group B
End Sem	T60	60	30	3 Hrs	Q.No.1 (10x1) + 1x5 =15	3 (out of 5) x15 =45	2	5
	T75	75	40	3 Hrs	Q.No.1 (10x1) + 1x5 =15	4 (out of 6) x15 =60	2	6
	T100	100	40	3 Hrs	Q.No.1 (10x1) + 2x5 =20	4 (out of 6) x20 =80	3	6
	T50 +T50	50X2=100	20	3 Hrs	2 x5 =10	2 (out of 3) x20 =40	2	3

 # Question No.1 in Group-A carries 10 very short answer type 1 Mark Questions.

Marks Distribution of Mid/End Semester Practical Examinations:

Table No. C3: Marks distribution of Practical Examinations of End Semester

Topic	Code	Full Marks	Pass Marks	Time	Distribution of Marks			Total No. of Questions to Set
					Experiment	Record	Viva	
End Sem	P25	25	10	3 Hrs	15	5	5	
	P50	50	20	3 Hrs	30	10	10	Pr. with components of both papers
	P75	75	30	3 Hrs	45	15	15	Pr. with components of all three papers
	P100	100	40	3 Hrs	60	20	20	Pr. with components of all four papers

Abbreviations : T= Theory Examination, **P**= Practical Examination.

Mid Sem* **:** There will be 15 Marks Theory Examination in Practical Subjects and 25 Marks Theory Examination in Non-Practical Subjects/ Papers. 25 Marks Theory Examination may include 10 Marks questions from Assignment/ Project/ Tutorial where ever applicable.

Note **:** There may be subdivisions in each question asked in Theory Examinations.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

OF

SUBJECTS WITH PRACTICAL

Ranchi University, Ranchi

Mid SemNo. Exam Year

Subject/ Code

F.M. =15 **Time**=1Hr.

General Instructions:
समान्य निर्देश :

i. **Group A** carries very short answer type compulsory questions.
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
ii. **Answer 2 out of 3**subjective/ descriptive questions given in **Group B**.
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ/वर्णनात्मकप्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5x1=5]
2. .....
3. .....
4. .....
5. .....

Group B

6. ..... [5]
7. ..... [5]
8. ..... [5]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

OF

SUBJECTS WITHOUT PRACTICAL

Ranchi University, Ranchi

Mid SemNo. Exam Year

Subject/ Code

F.M. =25 **Time**=1Hr.

General Instructions:
समान्य निर्देश :

i. **Group A** carries very short answer type compulsory questions.
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
ii. **Answer 4 out of 6**subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ/वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5x1=5]
2. .....
3. .....
4. .....
5. .....

Group B

6. ..... [5]
7. ..... [5]
8. ..... [5]
9. ..... [5]
10. ..... [5]
11. ..... [5]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

AECC NH + MB COMMUNICATION

Ranchi University, Ranchi

EndSemNo. Exam Year

Subject/ Code

F.M. =50 **P.M.**=20 **Time**=1.5Hrs.

General Instructions:

i. **GroupA** carries short answer type **compulsory** questions.
(खंड 'A' में लघु उत्तरीय अनिवार्य प्रश्न हैं।)

ii. **Answer 2 out of 3**subjective/ descriptive questions given **in Group B**.
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ/वर्णनात्मक प्रश्नों के उत्तर दें।)

iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)

iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)

v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5]
2. ..... [5]

Group B

3. ..... [20]
4. ..... [20]
5. ..... [20]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

SUBJECTS WITH PRACTICAL

Ranchi University, Ranchi

EndSemNo. Exam Year

Subject/ Code

F.M. =60 **P.M.**=30 (Including Mid Sem) **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 3 out of 5**subjective/ descriptive questions given in **Group B**.
(खंड 'B' के पाँच में से किन्हीं तीन विषयनिष्ठ/वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [10x1=10]

i. ..... [10x1=10]
ii. .....
iii. .....
iv. .....
v. .....
vi. .....
vii. .....
viii. .....
ix. .....
x. .....

2. ..... [5]

Group B

3. ..... [15]
4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

SUBJECTS WITHOUT PRACTICAL

Ranchi University, Ranchi

EndSemNo. Exam Year

Subject/ Code

F.M. =75 **P.M.**=40 (Including Mid Sem) **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6**subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ/वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [10x1=10]

i. .....
ii. .....
iii. .....
iv. .....
v. .....
vi. .....
vii. .....
viii. .....
ix. .....
x. .....

2. ..... [5]

Group B

3. ..... [15]
4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]
8. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

GE, SEC, GENERAL & AECC HINDI/ ENGLISH COMMUNICATION

Ranchi University, Ranchi

EndSemNo. Exam Year

Subject/ Code

F.M. =100 **P.M.**=40 **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [10x1=10]

i. .....
ii. .....
iii. .....
iv. .....
v. .....
vi. .....
vii. .....
viii. .....
ix. .....
x. .....

2. ..... [5]

3. ..... [5]

Group B

4. ..... [20]

5. ..... [20]

6. ..... [20]

7. ..... [20]

8. ..... [20]

9. ..... [20]

Note: There may be subdivisions in each question asked in Theory Examination.