teri school of advanced studies

Darbari Seth Block, India Habitat Centre
New Delhi

MINUTES OF THE NINTH MEETING OF THE ACADEMIC COUNCIL HELD ON TUESDAY, 29 JUNE 2004, AT 10.30 HOURS IN THE CONFERENCE ROOM

PRESENT:

The following members of the Academic Council attended the meeting:

1.	Dr Vibha Dhawan	Chairperson
2.	Dr Leena Srivastava	Dean, Faculty of Applied Sciences
3.	Dr Y P Abbi	Head, Centre for Energy and Environment
4.	Dr Alok Adholeya	Head, Centre for Bioresources and Biotechnology
5.	Dr T S Panwar	Head, Centre for Regulatory & Policy Research
6.	Dr Meeta K Mehra	Head, Department of Natural Resources
7.	Dr S R Rao	
8.	Dr S C Adlakha	
9.	Dr P Paradha Saradhi	
10.	Dr Subodh K Sharma	
11.	Dr Banwari Lal	
12.	Dr Ranjan Bose	
13.	Dr S Sreekesh	
14.	Mr Rajiv Seth	Secretary

Prof. Subhash Chander attended the meeting as a Special Invitee.

Dr Neeraj Khera, Dr Nandini Kumar, Dr Vivek Kumar Ms Els Reynaers, Dr Vikram Dayal, Dr M A Khalid, Mr P V Sridharan, Mr Kapil Narula, Mr Ramesh Menon and Dr Suneel Panday attended the meeting as course coordinators.

Dr Abha Agnihotri, Dr Vishal Narain, Dr Malini Balakrishnan and Dr A K Gosain regretted their inability to attend.

Prof. N S Kambo, Dr D K Banerjee and Dr Brij Gopal could not attend.

Item No. 1 To confirm the minutes of the eighth meeting of the Academic Council held on 24th November 2003

The minutes of the eighth meeting of the Academic Council held on 24th November 2003 were confirmed, as circulated.

Item No. 2 To report the matters arising from the eighth meeting of the Academic Council held on 24th November 2003

The Academic Council was briefed on the progress for selection of the new faculty members to be appointed in the School. The names of the selected candidates will be put up to the Board of Management in the next meeting in August 2004.

Item No. 3 Matters for information

The Academic Council noted that, the School will be offering two new programmes - M.A (Regulatory Studies) and M.A (Public Policy and Sustainable Development) and that the course outlines in respect of both these programmes will be put up to the Academic Council for approval in its next meeting.

The Academic Council was also noted the successful completion of the entrance test and selection of the Ph.D. students in various centres and department.

Item No. 4 To report the decision taken by the Executive Committee of the Academic Council on behalf on the Academic Council.

The Academic Council noted the decision taken by the Executive Committee in the names of three experts and approved the selection committees for faculty appointment.

The Council decided that in order to avoid situations where the experts are not available to sit on a selection committee, a larger panel of 7-8 names in each area of expertise could be drawn up and approved by the Board of Management after recommendation of the Academic Council.

Item No. 5 Reduction in minimum period of registration in respect of Ph.D. student Ms Neeti Wilson

The Academic Council accepted the recommendations of the CRC of Centre for Bioresources and Biotechnology and reduced the minimum period of registration to 2 years and 11 months in respect of Ph.D. student Ms Neeti Wilson.

Item No. 6 To discuss on grades awarded to M.Sc students Ms Shalini Sangwan and Mr Devi Dayal Sinha

The Academic Council was briefed by the Chairman on Ms Shalini Sangwan's case. The student has been awarded F grade in 5 courses due to lack of requisite attendance. The Council deliberated on the case and decided that no relaxation in the rules on attendance should be permitted. However, it was left to the Chairman of the Council to take a decision on allowing the student to withdraw from the semester, (clause 8 (g) of the M.Sc prospectus) if the student wishes to apply for semester withdrawal. This, the Council decided, may be allowed by the Chairman, Academic Council, as an exception, inspite of major tests having being given by the student.

The Chairman also briefed the Council on Mr Devi Dayal Sinha's case. The student has secured a SGPA of 5.33 and a CGPA of 4.92 at the end of the second semester. As per rules of the School, (clause 4.2 of the M.Sc prospectus) a student must have a CGPA of 5 or more as a criteria for continuation of registration.

The Council felt that such cases should be decided at the MPEC level and need not be put up to the Council in future.

Item No. 7 To consider and approve M.Sc programmes courses for the third semester.

Courses outlines for the third semester of M.Sc (Environmental Studies) and M.Sc (Natural Resources) in the Department of Natural Resources were discussed by the Council. The approved outlines, after incorporating the suggestions of the Council, are placed at Annexure 7.1.

Item No. 8 Approval of Intellectual Property Rights (IPR) guidelines for TERI School.

Guidelines for protection of IPR at the TERI School were approved as circulated. It was also decided that the students should sign an undertaking at the time of admission/registration to TERI School that they would abide by the School's IPR guidelines.

Item No. 9 Creation of a Department of Regulatory Studies

The Academic Council recommended the creation of a Department of Regulatory Studies. It also recommended the creation of six faculty positions in this department.

Item No. 10 Creation of a Department of Policy Studies

The Academic Council accepted and approved the creation of a Department of Policy Studies. It also recommended the creation of six faculty positions in this department.

Item No. 11 Approval of revised Development Plan of the School

The Academic Council was briefed on the revised development plan. The Council suggested that development plan of the school should include plans for placement of the students. The council also recommended that the terms of appointment of faculty should include a notice period of 3 months or till the end of the semester which ever is later. The amended development plan is placed at Annexure 11.1.

Item No. 12 Any other item with the permission of the Chair

(i) Amendment in clause 7 (e) of the M.Sc prospectus

Clause 7 of the M.Sc prospectus covers attendance requirements of the students.

The Academic Council deliberated and decided that in clause 7 (e) wherein written information to the students and their parents is to be sent by the registrar in case attendance is less than 75%, the word parent be removed/deleted and that written information be sent only to the student.

The meeting ended with a vote of thanks to the Chair.

Annexure 11.1

Development Plan of the TERI School of Advanced Studies
(2004-05 to 2008-09)

TERI School of Advanced Studies is the outcome of the research, consultancy and out reach activities of TERI, a non-profit organisation in the non-governmental sector which is internationally recognised for its contributions in the field of Energy, Environment and Sustainable Development.

The University Grants Commission recognised the contribution of TERI in the above mentioned areas and granted the status of "Deemed University" to the TERI School of Advanced Studies, with a specific mandate to provide for Post-Graduate Instruction, Training and Research in the School.

In the last three years, TERI School has evolved as a Research University and has set up two faculties namely the Faculty of Applied Sciences and the Faculty of Policy and Planning. It is envisaged that the following departments and recognised centres for research, some of which have been created and some of which would emerge during the coming years, will constitute these Faculties:

Faculty of Applied Sciences

(1)	Centre for Bioresources and Biotechnology	(existing)
(2)	Centre for Energy and Environment	(existing)
(3)	Department of Natural Resources	(existing)
(4)	Department of Energy and Environment	(to be created in 2005-06)
(5)	Department of Biotechnology	(to be created in 2006-07)

Faculty of Policy and Planning

(1)	Centre for Regulatory and Policy Research	(existing)
(2)	Department of Regulatory Studies	(to be created in 2004-05)
(3)	Department of Policy Studies	(to be created in 2004-05)

The concept paper of TERI School has defined the functions of departments and centres of research. The major activities in the centres of research will be doctoral research, while that in the departments will be instruction at Master's level as well as doctoral research.

As per UGC guidelines, a minimum of three faculty positions are required for each department. The Planning and Monitoring Board had taken note of the likely availability of adjunct faculty from TERI and projected that 15 faculty positions would be needed in the School for setting up the departments. As the number of programmes increase, it is envisaged that at 5-6 faculty per department, the total faculty strength of the School would be around 25-30. Most of these positions will be funded by setting up contributory chairs from various corporate offices and donor organisations. The procedure of creation of the department is defined in the concept paper.

Programmes planned

In addition to Ph.D. programme in various centers and departments, it is planned that all the departments would run Masters level courses. The Department of Natural Resources is already in existence and is running two Master's programmes - M.Sc (Natural Resources) and M.Sc (Environmental Studies). The Department of Regulatory Studies and the Department of Policy Studies, which will be set up in the academic year 2004 – 2005 will offer M.A (Regulatory Studies) and M.A (Public Policy and Sustainable Development) programmes respectively. In the academic year 2005-06 the Department of Energy and Environment would offer M. Tech (Energy and Environment Engineering). It is also proposed that this department would coordinate a multi-disciplinary MBA programme in Energy Management/Resource Management. The Department of Biotechnology will commence functioning in 2006-07 with the introduction of a M.Sc (Biotechnology) programme. The proposals for initiating and continuing programmes in the School are shown at Appendix 1.

Infrastructure

As per the MoU signed between TERI School and TERI, the infrastructure and facilities available at TERI would be available to the School for the programmes. These include research professionals who would act as adjunct faculty to the School. Guidelines for utilization of TERI researchers as adjunct faculty in the TERI School are already laid down.

The new campus of the School is likely to be fully available by the end of 2005. The second semester of the academic session 2005-06 is proposed to be run at the new campus. Until then the School would continue to operate from the existing facilities at Habitat Place.

Faculty strength

Once the 5 proposed departments are operational, the faculty strength of the School would be 25-30. In addition, about 15-20 professionals of TERI who meet the prescribed requirements of being adjunct faculty of the School, would also be available for Ph.D. supervision and teaching activities.

Student strength

It is envisaged that the maximum number of students the School would have in the PhD programmes in all the centers and departments would be between 50-60. The two M.Sc programmes run by the Department of Natural Resources would admit 20 students each year making the total student strength at a given time 40. Similarly, the M.A (Regulatory Studies) programme would have a total strength of 40 and the M.A (Public Policy and Sustainable Development) programme would have a strength of 60. The M. Tech. (Energy and Environment Engineering) programme to be run by the Department of Energy and Environment would have a strength of 20 in two batches. The MBA programme proposed to be commenced in 2005-06 would initially have a total strength of 30 in two batches. However, this strength is likely to be increased to

60 in future years. The proposed M.Sc (Biotechnology) programme would have a total strength of 40 in two batches.

Thus the total expected strength of students once all the Centres/Departments are functional and all programmes are running would be between 310 and 320.

Student – Faculty ratio

With the continuing involvement of adjunct faculty, the student to faculty ratio with all the programmes running would be approximately 7:1.

Administrative and technical staff

As envisaged in the MoU between TERI School and TERI, the administrative and technical staff will be hired by TERI with the qualifications, pay scales and terms and conditions prevalent in TERI and seconded to the School. It is envisaged that the following administrative and technical staff would be required:

Designation		**No. of Posts**
Registrar		1
Deputy Registrar		1
Finance Officer/Assistant Finance Officer:		1
Director's Office:	Secretary /Office Asst.	1
Registrar's Office:	Assistants/Supdt.	3
Staff for faculty:	Senior steno-cum-office staff	3
	(Shared by the departments and Deans)	
Finance Office:	Accountant/Supdt.	1
Technical Staff/Lab Assistant/Computer technicians		6

Note: All purchases and assets accounting would be done by the Materials Section at TERI.

Qualifications and pay scale for various posts in the School

Appointments in the School shall be on a contract of 5 years with the provision for renewal of the contract for a further period. Employed faculty members would be required to give a notice period of 3 months/ continue till the end of the semester (whichever is later), if they decide to leave the School. Faculty appointments in the departments of the School will be made using the procedures laid down in the rules and regulations of the School. The faculty in the School will also be adjunct professionals in TERI. Qualifications, experience and pay scales for various positions in the School are placed at Appendix 2.

Placement activities

The School has already setup a placement cell, which includes two students from the current batch.

The role of the Placement Cell would be to look at all the possibilities for placing students who complete their master's and Ph.D. degree requirements at the School. The Placement Cell would liaison with coorporates, bilaterals, multilaterals, NGOs and other institutions who would be interested in absorbing students graduating from the School. It would be the role of the placement cell to make a placement brochure containing details of all the students of the batch six to eight months before the end of the course so that placement activities can be completed by February/March of the year when students graduate.

Appendix 1

PROPOSED ACADEMIC ACTIVITIES FOR THE PERIOD 2001-02 to 2003-04

Year	Course	INTAKE	Department/Centre	Remarks
Past activities				
2001-02	Ph.D.	14	All Centres	New Admissions
2002-03	Ph.D.	13	All Centres	Continuing
		15	All Centres	New Admissions
2003-04	Ph.D.	26	All Centres/Deptts	Continuing
		10	All Centres/Deptts	New Admissions
	M.Sc. (Environmental Studies)	10	Dept of Energy & Environment	New Admissions
	M.Sc. (Natural Resources)	10	Department of Natural Resources	New Admissions
Proposed activities for the period 2004-05 to 2008-09				
2004-05	Ph.D.	30	All Centres/Dept.	Continuing
		14	All Centres/Dept.	New Admissions
	M.Sc. (Environmental Studies)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.Sc. (Natural Resources)	9	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.A. Regulatory Studies	20	Dept of Regulatory Studies	New Admissions
	M.A. (Public Policy & Sustainable Development)	25	Dept of Policy Studies	New Admissions
2005-06	Ph.D.	40	All Centres/Dept	Continuing
		10	All Centres/Dept	New Admissions

Year	Course	INTAKE	Department/Centre	Remarks
	M.Tech. (Energy and Environment Engineering)	10	Dept of Energy & Environment	New Admissions
	M.Sc. (Environmental Studies)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.Sc. (Natural Resources)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.A.(Regulatory Studies)	20	Dept of Regulatory Studies	Continuing
		20	Dept of Regulatory Studies	New Admissions
	M.A. (Public Policy & Sustainable Development)	25	Dept of Policy Studies	Continuing
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	New Admissions
	MBA	15	Dept. of Energy & Environment	New Admissions
2006-07	Ph.D.	40	All Centres/Dept	Continuing
		10	All Centres/Dept	New Admissions
	M. Tech. (Energy and Environment Engineering)	10	Dept of Energy & Environment	New Admissions
	M.Sc. (Environmental Studies)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.Sc. (Natural Resources)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.A.(Regulatory Studies)	20	Dept of Regulatory Studies	Continuing
		20	Dept of Regulatory Studies	New Admissions

Year	Course	INTAKE	Department/Centre	Remarks
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	Continuing
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	New Admissions
	MBA	15	Dept of Energy & Environment	Continuing
	MBA	15	Dept of Energy & Environment	New Admissions
	M.Sc (Biotechnology)	10	Dept of Biotechnology	New Admissions
2007-08	Ph.D.	40	All Centres/Dept	Continuing
		10	All Centres/Dept	New Admissions
	M. Tech. (Energy and Environment Engineering)	10	Dept of Energy & Environment	New Admissions
	M.Sc. (Environmental Studies)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.Sc. (Natural Resources)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.A.(Regulatory Studies)	20	Dept of Regulatory Studies	Continuing
		20	Dept of Regulatory Studies	New Admissions
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	Continuing
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	New Admissions
	MBA	15	Dept of Energy & Environment	Continuing
	MBA	30	Dept of Energy & Environment	New Admissions
	M.Sc (Biotechnology)	10	Dept of Biotechnology	Continuing
	M.Sc (Biotechnology)	20	Dept of Biotechnology	New Admissions

Year	Course	INTAKE	Department/Centre	Remarks
2008-09	Ph.D.	40	All Centres/Dept	Continuing
		10	All Centres/Dept	New Admissions
	M. Tech. (Energy and Environment Engineering)	10	Dept of Energy & Environment	New Admissions
	M.Sc. (Environmental Studies)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.Sc. (Natural Resources)	10	Department of Natural Resources	Continuing
		10	Department of Natural Resources	New Admissions
	M.A.(Regulatory Studies)	20	Dept of Regulatory Studies	Continuing
		20	Dept of Regulatory Studies	New Admissions
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	Continuing
	M.A. (Public Policy & Sustainable Development)	30	Dept of Policy Studies	New Admissions
	MBA	30	Dept of Energy & Environment	Continuing
	MBA	30	Dept of Energy & Environment	New Admissions
	M.Sc (Biotechnology)	20	Dept of Biotechnology	Continuing
	M.Sc (Biotechnology)	20	Dept of Biotechnology	New Admissions

Appendix 2

QUALIFICATIONS, EXPERIENCE & EMOLUMENTS OF TEACHING & ADMINISTRATIVE STAFF

S. No	Designation	No. of Posts	Qualifications	Pay Scale (Rs.)
1	Professor	15	1) Ph.D with first class or equivalent (in terms of grades, etc.) in the preceding degree in the appropriate branch with a very good academic record through out. 2) Minimum of 10 years of experience in teaching/research/industry of which at least five years should be at the level of Associate/Assistant Professors. 3) An outstanding Scientist/Engineer/ Technologist working in industry & who has made significant contribution to knowledge who is not having a Ph.D. degree could also be considered for appointment for the Post of Associate Professor/Professor on contract basis.	18400-500-22400
2	Associate Professor		1) Ph.D with first class or equivalent (in terms of grades, etc.) in the preceding degree in the appropriate branch with a very good academic record through out. 2) Minimum of eight years of experience in teaching/research/industry of which at least three years should be at the level of Assistant Professors.	16400-450-20000
3	Assistant Professor		1) Ph.D with first class or equivalent (in terms of grades, etc.) in the preceding degree in the appropriate branch with a very good academic record through out. 2) Atleast three years teaching/research/ industry experience	12000-420-18300

S. No	Designation	No. of Posts	Qualifications	Pay Scale (Rs.)
4	Registrar / Dy Registrar / Asst Registrar	1	**Registrar :** A Master degree with at least 55% of the marks or its equivalent grade of B in the UGC seven point scale **(or)** At least 15 years experience as Lecturer (Sr. Scale)/Lecturer with eight years in Reader's grade along with experience in educational administration ***(or)*** Comparable experience in research establishment and/or other institutions in higher education ***(or)*** 15 years of administrative experience of which 8 years as Deputy Registrar or an equivalent post	16400-450-20900-500-22400
			Dy. Registrar : A Master degree with at least 55% of the marks or its equivalent grade of B in the UGC seven point scale ***(or)*** Five years experience as a Lecturer in a College or a university with experience in educational administration ***(or)*** Comparable experience in research establishment and/or other institutions in higher education ***(or)*** Five years of administrative experience as Assistant Registrar or in an equivalent post	12000-420-18300
			Asst Registrar : Good academic record plus Master's degree with at least 55% of the marks ***(or)***	8000-275-13500

S. No	Designation	No. of Posts	Qualifications	Pay Scale (Rs.)
			its equivalent grade of B in the UGC seven point scale.	
5	Finance Officer / Asst Finance Officer	1	**Finance Officer** : 1) A Master's degree with at least 55% of the marks ***or*** its equivalent grade of B in the UGC seven point scale in Commerce/Economics/C A or their equivalent 2) 8 years experience in financial work, preferably in University/Institute ***(or)*** 5 years experience in Chartered Accountancy	16400-450-20900-500-22400
			Assistant Good academic record plus Master's degree with at least 55% of the marks **Finance Officer** ***(or)*** its equivalent grade of B in the UGC seven point scale.	8000-275-13500
6	Director's Office : Supdt (SG) / Executive Assistant Secretary-cum-Office Assistant	1 1		Posts listed from Sl. No.6 to 10 are to be provided under arrangements of TERI.
7	Registrar's Office : Assistants /Superintendents	3		
8	Accounts Section : Accountant/Supdt. (Accounts)	1		
9	Staff for Faculty : Senior Stenographer-cum- Office Staff (UDC (SG) Scale	3		
10	Technical Staff	4		

No	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
	Different media, different strengths			
40	Overview of the Indian media: relative strengths of different media	1		
	Guest lectures			
41	Environment journalism: Raj Chengappa, Executive Editor, India Today			
42	Common errors in grammar: Paranjoy Guha Thakurta, Director, School of Convergence			
43	AK Bhattacharya: Getting published : Editor, Business Standard			

Suggested readings:

1. Writing and reporting news: A coaching method, Carole Rich, Thomson Wadsworth Publication.
2. The writer's Handbook: A guide to the essentials of good writing By John B Karls & Ronald Szymanski Publication: NTC, Illinois.
3. Reporting for the Media By Fred Fedler; John R Bender et al, Publication: Oxford University Press, NY.
4. Subediting for Journalists By Wynford Hicks & Tim Holmes Publication: Routledge, London.
5. Writing for magazines: A beginner's guide By Chryl Sloan Wray Publication: NTC Illinois.
6. News writing and reporting for today's media - By Bruce D Itule (McGraw Hill Publishers).
7. Reporting and Writing Basics for the 21st Century - By Christopher Scanlan, Harcourt College Publishers.
8. Writing for Television, Radio and New Media - By Robert L Hilliard, (Publisher Wordsworth) Thomson Learing.
9. Error Free Writing - By Robin A Cormier (Publisher Prentice Hall - New Jersey).
10. Investigative Reporting - By David Spark, Focal Press.
11. Basic TV Reporting - By Ivor Yorke, Focal Press.
12. Handbook for Freelance Writing - By Michael Perry (NTC Business Books).

Course No.: NRS 103
Course title: **Environment journalism and media relations**
Number of credits: 2 (2-0-0)
Number of lectures-tutorials-practicals: 23-4-1
Course coordinator:

Course outline:

The aim of the journalism course would be to develop the writing skills of the students towards a more journalistic style of writing. This will assist the students to write in a way that fits the requirements of the newspaper industry and to use the media as a tool to further the cause of environment later in their career.

The course would introduce the students to the basics of journalism, an understanding of the media and would focus on improving their writing skills. In addition the course would also include media relations as it is in the interest of any organisation to build an equation with the media as it is a forceful tool for influencing the stakeholders.

Evaluation procedure:

- 2 Minor tests : 15% each
- Assignments and presentations : 20%
- 1 Major test : 50%

Details of course content & allotted time

No	Topic	Allotted time (hours)		
		Lectures	**Tutorials**	**Practicals**
	Developing communication skills	20	3	Visit to a newspaper office
1	Can we all write	1		
2	Introduction to writing			
3	The importance of being able to talk well, write well			
4	The dynamics of writing	2		
5	How to develop writing skills	1		
6	How to organize thoughts	1		
7	Building mental framework that will help			
8	Thinking creatively			
9	Collecting information. Why research is paramount	1		
10	Developing a logical thought process while writing	1		
11	Developing a logical thought process while writing			
12	Writing the middle			
13	Writing the conclusion			
14	The importance of rewriting.			
15	Using others as a soundboard to sharpen writing			

No	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
	Writing features, conducting interviews			
16	The Art of Interviewing	1		
17	Writing Profiles			
18	The importance of getting quotes and fitting them in the right place	1		
19	How to weave in statistics and figures			
20	Making your writing human			
21	Putting information together			
22	How to write a feature Class exercise	1		
	Handling different media			
23	How different mediums like print, television, radio and internet need a different treatment.	1		
24	Handling Television, radio, print and internet journalists			
25	Thinking visually for television.			
26	Thinking of audio for radio.			
	Media relations		1	
27	Cultivating the media	1		
28	Building relations with them			
29	Getting them interested in your work			
30	Writing press releases, press invites, preparing press kits for seminars and events.	1		
31	Organizing a press conference and preparing for it.	1		
32	The magic of subtle public relations.			
33	Studying the slant of print and television media.			
34	How to sell ideas to journalist			
35	Marketing your work with the media.			
36	Thinking of new angles all the time.	1		
37	What the media expects from communicators and writers.			
	News			
38	What is news	1		
39	Different kinds of news and how there are different sections, editorials.			

Course No.: NRS 173
Course title: **Research methods**
Number of credits: 2 (2-0-0)
Number of lectures-tutorial-practicals: 28-5-0
Course coordinator:

Course outline:
The aim of the course is to create a background and awareness of the nature of the research process and inquiry. It will expose the student to some of the methodological problems encountered in interdisciplinary research. The course will provide a comprehension of basic principles of research design and strategy, including an understanding of how to formulate researchable problems. It will introduce students to a wide range of research methods, quantitative and qualitative – and will review study approaches for combining multiple methods within a single research project. It will discuss the benefits, the appropriateness, and challenges of the qualitative and the quantitative traditions in ENRM research. This course is geared towards preparing students for their research work by focusing on the relative strengths and weaknesses of various data collection and interpretation techniques. The course will also cover questions surrounding the politics and ethics of research.

Evaluation procedure:
- Final exam : 60%
- Assignments : 20%
- 2 Minor tests : 10% each

Details of course content & allotted time

Sr. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
1.	Philosophic and theoretical perspectives	8	0	0
2.	Defining the Research Problem and hypotheses	2	0	0
3.	Elements of research design	2	0	0
4.	Sampling	2	0	0
5.	Quantitative methods of data collection	6	2	0
6.	Qualitative methods of data collection	4	2	0
7.	Interdisciplinary methodologies in ENRM research	2	1	0
8.	Research ethics	2	0	0
	Total	**28**	**5**	**0**

Suggested readings

1. Anderson R J et. al, Philosophy and the human sciences (London : Croom Helm, 1986).
2. Flyvbjerg, B. Making social science matter: why social inquiry fails and how it can succeed again (Cambridge: Cambridge University Press, 2001).
3. Goldthorpe, J H On sociology: numbers, narratives, and the integration of research and theory (Oxford: Oxford University Press, 2000).
4. De Vaus, D.A., Surveys in Social Research, 4th edn., Allen & Unwin, Sydney, NSW, 1995.
5. Foddy, W., Constructing Questions for Interviews and Questionnaires, Cambridge University Press, Cambridge, 1994.

6. Kothari, C. R. (1985). Research Methodology: methods and techniques ; Wiley Eastern Ltd
7. Neumann W L Social research Methods: quantitative and qualitative approaches Moore, D.S., The Basic Practice of Statistics, W.H. Freedman, NY, 1999.
8. Barbour R S and Kitzinger J 1999. Developing Focus group research. Politics, theory and practice: Sage publications
9. Chambers, Robert. 1994. "Participatory Rural Appraisal (PRA): Challenges, Potentials and Paradigms". World Development 22(10).
10. Yin, Case Study Research Eckstein, Harvey, `Case study approach' Fetterman, Ethnography step by step.
11. Berkes, F., and Folke, C. (eds.) (1998). Linking social and ecological systems: Management practices and social mechanisms for building resilience . Cambridge University: Cambridge, United Kingdom.
12. Hammer, V. N. (May, 1992). Misconduct in Science: Do scientists need a professional code of ethics? Electronic version downloaded September 22, 2002 from: http://www.chem.vt.edu/ethics/vinny/www_ethx.html

Course No.:	NRS 185
Course title:	**Water conservation**
Number of credits:	3 (2.5-0.5-0)
Number of lectures-tutorials-practicals:	31-11-0
Course coordinator(s):	Mr Kapil Narula, Dr Sudip Mitra and Dr Vishal Narain

Course outline:

The reasons for increased interest in protecting water concern over increased vulnerability to water-related stress are not difficult to discern. The users of water fall into three sectoral categories namely, agriculture, domestic and industrial sector. While agriculture sector demands a huge share of water for irrigation, the industrial and domestic sectors are mainly responsible for contaminating fresh water sources. Long term sustainability of fresh water resources cannot be guaranteed measured in terms of both availability and quality. Efficient water resources management and water conservation practices are a need of the time. This course will expose the students to the following aspects:

a) Introduction to water resources evaluation and assessment - SPAC, WUE, methods of assessment, sectoral water use and demand, assessment of water stress and need for water conservation
b) Water resources conservation and management including institutional and policy aspects such as rainwater harvesting, conjunctive water use, catchment planning, watershed management, irrigation use and efficiency, advanced treatment systems and zero discharge, participatory irrigation management including WUAs, methods of minimizing evaporation loses, water pricing, river basin organizations, collective action and decentralization etc.

Evaluation procedure:

- Minor (2 Minors) : 40 percent (20 percent each)
- Tutorial and term papers : 10 percent
- Quiz : 10 percent
- Major : 40 percent

Details of course content & allotted time

Content	Allotted time (hours)	
	Lectures	**Tutorials**
Introduction to water conservation and assessment Severity of water crisis, importance of conservation Soil, Plant, Atmosphere Continuum (SPAC); Water use efficiency (WUE) Methods of water resources assessment (hydrology cycle, surface flow assessment, groundwater recharge assessment) Water stress: principles and indicators for assessing water stress Water quality assessment: indicators for assessing water quality	8	3
Water resources conservation and management - Water conservation measures • Soil moisture retention and conservation (cover crop, mulching, etc) • Traditional systems and man made structures (ponds, tanks, reservoirs) • Rainwater harvesting • Groundwater recharging • Minimizing evaporation loses - Irrigation: types, scheduling, efficiency Case studies in various ecosystems: Arid, semi arid and humid ecosystems	12	5

Content	Allotted time (hours)	
	Lectures	Tutorials
Water auditing; Water treatment, recycling and reuse leading to water conservation	6	2
Institutional mechanisms for water management: collective action and decentralisation, river basin organizations, WUAs, multiple stakeholder platforms, programmes and policies for integrated water management	5	1

Suggested readings:

1. Larry Mays. **Urban Water Supply Management Tools**, ISBN: 0071428364. McGraw Hill Publication, 2003, 208 pages
2. Larry Mays. Urban **Stormwater Management Tools**, ISBN: 0071428372, McGraw Hill Publication, 2003, 320 pages.
3. Zdzislaw Kaczmarek, Kenneth M. Strzepek, László Somlyódy, Valentina Priazhinskaya. **Water Resources Management in the Face of Climatic/Hydrologic Uncertainties**. Kluwer Academic Publishers, Dordrecht, ISBN 0-7923-3927-4, 1996, 408 pp.
4. David Stephenson. **Water Supply Management**, ISBN 0-7923-5136-3, Kluwer Academic Publisher, Dordrecht, 1998
5. David C. Major, Harry E. Schwarz, **Large-scale region regional water resources planning**. ISBN 0-7923-0711-9, Kluwer Academic Publishers, Dordrecht, 1990.
6. Freeze, A., Cherry, J.A. **Groundwater**. Prentice Hall, 1979.
7. Russell John. **Soil Conditions and Plant Growth**, 635 p., ISBN 81-7622-057-4.

Course No.:	NRS 123
Course title:	**Biodiversity conservation**
Number of credits:	3 (2.5-0-0.5)
Number of Lectures-Tutorial-Practicals:	35-0-14
Course coordinator:	Dr Neeraj Khera

Course outline:

The course aims at providing students with detailed knowledge of the extent of the world's biodiversity and a critical awareness to the threat to biodiversity posed by human activities and current levels of extinction; an advanced level of knowledge of the biological principles underlying biodiversity assessment, conservation and management. The emphasis would be given to utilize analytical and communication skills of the students for analyzing and discussing a real life issue related to biodiversity conservation.

Evaluation procedure (Percentage of marks to be allotted to each type of test):

- 2 minor tests : 15 + 15
- Assignments and Presentations : 10
- Practicals : 10
- 1 major test (end semester) : 50

Details of course content & allotted time

Sr. No.	***Topic***	***Allotted time (hours)***		
		L	***T***	***P***
1.	**Introduction:** Defining biodiversity; Fundamental principles of genetic, species and ecosystem diversity	*2*		
2.	**Magnitude and distribution of biodiversity** An overview of the variety of life forms; Global distribution of biodiversity, factors affecting species distribution, number of species worldwide, estimates and examples of recently discovered communities, abundance of species in different ecosystems of the world; identification of diversity Hot-spots; Biodiversity of India	*3*		
3.	**Assessment and monitoring of biodiversity** Methods of assessing and measuring biodiversity; Diversity indices; Comparison of different sampling techniques; techniques for monitoring plant, bird, insect, mammals, reptiles and fish biodiversity	*3*		*7*
4.	**Value of biodiversity** Direct and indirect values; total economic value; ethical values	*2*		
5.	**Loss of biodiversity:** Rates of extinction; Estimates of extinction rates worldwide and in India; local extinctions, IUCN, National Red Data Books	*1*		

Sr. No.	*Topic*	*Allotted time (hours)*		
		L	***T***	***P***
6.	**Causes and consequences of biodiversity loss:** Vulnerability to extinction: Endemic species and island biogeography; rare and threatened species; Habitat destruction, fragmentation; overexploitation; Exotic species; Alien invasive species; Commercialization of agriculture and forestry; Impact of pollution and global climate change on biodiversity ***Consequences:*** Food and economic security, livelihood	*4*		4
7.	**Conservation strategies:** • **Theoretical background** genetic variability; population biology of endangered species; conservation genetics	2		
	• **Conservation of biodiversity within ecosystems-*In situ* conservation:** Wild populations; community conservation; Gap analysis; Establishment of protected areas; Design and management of protected areas; Protected areas in India; Connectivity and corridors	7		
	• ***Ex -situ* conservation**: Zoo; Gene bank; seed bank; aquaria; botanical gardens	4		
	• Establishment of new populations, Captive breeding, reintroduction	2		
	Conservation and society: community involvement; indigenous knowledge system, restoration through peoples movement, sustainable resource use, ecological footprints; Environment education and communication	3		3
8.	**Legal and political scenario:** Legislations; international agreements for the protection of species and habitats; Biodiversity act; Emerging International Policies	2		
	Total	**35**		**14**

Basic textbooks:

1. Richard B. Primack. 1998. ***Essentials of conservation biology*** Sinauer Associates Inc., USA.
2. Hunter, M. L. 2001. ***Fundamentals of conservation biology***, second edition. Blackwell Science, Cambridge, UK

Suggested readings:

1. Meffe, G. K. and Carroll, R. L. 1997. ***Principles of conservation biology***. Second edition. Sinauer Associates Inc., USA.
2. Hunter, M. L. 1999. ***Maintaining biodiversity in forest ecosystems***. Cambridge University Press. ISBN 0-521-63104-1.
3. Rodgers, W.A.1991. ***Techniques for Wildlife Census in India: A Field Manual***. Wildlife Institute of India
4. Sutherlans, W, J. 2000. ***The conservation handbook: Research, Management and Policy***. Blackwell Science, Oxford
5. Ildos and Bardelli. 2001. ***The Great National Park of the World***. ISBN 81-87107-06-5. Om Book Service, New Delhi.
6. Singh and Singh. ***A Pocketbook of Indian Pheasants***. Wildlife Institute of India, Dehradun.
7. V. B. Saharia. 1998. ***Wildlife in India***. Natraj Publishers, Dehradun.
8. Salim Ali. 2002. ***The Book of Indian Birds.*** (13th edition). Bombay Natural History Society.
9. MacKinnon et al. 1996. ***Managing Protected Areas in the Tropics***. Natraj Publishers, Dehradun.
10. David Black. 1981. ***Animal Wonders of the World***. Orbis Publishing, London.
11. RLEK. ***Community Forest Management In Protected Areas***. Natraj Publishers, Dehradun

Course No.:	NRS 125
Course title:	**Forest Protection**
Number of credits:	*3 credits (3-0-0)*
LTP structure:	*34-0-16*
Course coordinator:	Dr. M A Khalid

Course outline:

The course is designed to give the students knowledge about causes and sources of damage to the forests and understand the measures required for the protection of forests. The course will help the students in understanding the problem and prospects in forest protection and the measures adopted for minimising the damage to the forests.

Evaluation procedure:

- Assignments & Presentations : 20%
- 2 minor tests : 15%+15%
- 1 major test (end semester) : 50%

Details of course content & allotted time

Topic	***Allotted time (hours)***		
	L	***T***	***P***
Introduction: Agencies causing forest damage – fires, man, cattle, insects and pathogens, history of forest protection in India	2		
Nature and extent of damage: **Human induced damage:** Causes and preventive measures for damage to forests by man through Deforestation, Illicit felling and removal of forest produce, Forest fire, Faulty forest management **Nature induced** environmental & other causes etc.; Financial aspect of the damage and preventive measures;	8		6 + 6* (Visit to forest areas for identification of damage categories; important damages by animals and insects, Forest fires, Forest diseases etc)
Damage by animal: Causes and preventive measures for damage to forests through domestic & wild animals- a few case studies	4		
Injuries due to diseases and Insects: Types and symptoms of important plant and seed diseases caused by fungi, bacteria and viruses; types and symptoms of the damage done to plants and seeds by insects; Integrated Pest Management (IPM); Biological control. Financial losses from disease and insects and nematodes: some case studies; detection & preventive measures against injuries by Insects etc; Financial aspect of the damage and preventive measures; Quarantine measures; Diseases peculiar to monoculture/plantation crops etc.	7		4 (Visit to quarantine laboratories of NBPGR in Delhi/ Faridabad/ Rangpuri)
Physiological disorders in plants; preventive measures etc.	1		

Topic	*Allotted time (hours)*		
	L	*T*	*P*
Damage by plants: Mechanical & Physiological Casual organisms, identification and control; Types of injuries due to weeds/exotic plants	2		
Forest and Climate Change: Impacts on forest biodiversity, biomass productivity, carbon sink and/or carbon uptake etc, adaptation measures; mitigation potential and quantification.	6		
Management aspects 1: Physical and Social Fencing Types of physical fences, design and its effectiveness in forest protection; Live fencing and its effectiveness; Social fencing-Concept, effectiveness, problems etc.	2		
Management aspects 2: Incentives, penalties and compensation; JFM Institutions: Incentives for protection, Penalties for violation of rules, Compensation for crop/ plantation damages by animals, injuries/death for patrol staff/forest villagers caused by animals; JFM institutions and its role in forest management	2		

* Specialised lectures and demonstrations by experts would be arranged at FRI, Dehradun

Basic textbooks:

1. Khanna, L. S. 1998. ***Forest Protection***. Khanna Bandhu, Dehradun.
2. B.K. Bakshi, ***Forest Pathology***. Govt. of India Publication (Available in TERI library)
3. Joshi K. C., ***Handbook of Forest Zoology and Entomology***. (http://www.biblio.com/books/7346486.html)
4. Edmonds, R.L., Agee, J.K., and Gara, R.I. 2000. **Forest Health and Protection**. McGraw Hill.

Suggested readings:

1. Ghosh R. C., Kaul R. N. and Subba Rao B. K. ***Environmental Effects of Forests in India.***
2. Paul D. Manion 1981. **Tree Disease Concepts**. Printics Hall Inc.. USA.
   IPCC 2003. **Impact of climate change on Biodiversity**. Special edition of IPCC

Course No.:	NRS 143
Course title:	**Resource economics**
Number of credits:	3 (2-1-0)
Number of lectures-tutorial-practicals:	28-14-0
Course coordinator(s):	Dr Meeta K Mehra and Dr Vikram Dayal

Course outline:

The course constitutes an elective to be offered to M.Sc. (Natural Resources). It begins by exposing students to basic concepts in differential and integral calculus and relevant introductory topics in microeconomics (such as asset markets). Hands-on problem solving and simulation using select software will accompany this. Different categories of natural resources (depletable and renewable) will be covered separately. Numerical problems of resource allocation will be taken up for specific resources, largely using discrete time period analysis and this will be supplemented with economic intuition. The course will also include two additional modules — one relating to the sustainable development concepts and relevant indicators (such as genuine savings and natural resource accounting) and another to the economics of property rights regimes (with focus on common property rights). It is expected that the course will help bridge the gap between theoretical models and empirical study of resource allocation and management issues in a real-world context.

Evaluation procedure:

- Class discussion : 5%
- Tutorials/assignment : 5%
- Term paper : 10%
- 2 Minor Tests (15% each) : 30%
- 1 Major test (end semester) : 50%

Details of course content & allotted time

No.	Topic	Allotted time (hours)		
		Lectures	**Tutorials**	**Practicals**
1.	Basics concepts in dynamics: Exponential, logarithms, differentiation & integration, difference equations & excel, differential equations & vensim, asset markets, financial and economic analysis	8	3	
2.	Introduction: renewable, non-renewable and environmental resources; issues of discounting. Optimisation: static to dynamic in discrete time period, use of Lagrange multipliers for dynamic optimisation, use of excel solver for exposition of a simple resource allocation problem.	3	3	
3.	Renewable resources (e.g. fish, forests, water): basic optimal	7	3	

No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
	harvest problem; economics of fishery exploitation (static and dynamic models of open access); economics of forestry.			
4.	Non-renewable resources (e.g. coal, hydrocarbons, minerals): basic optimal depletion problem (refresher of resource allocation over a two periods); Hotelling's rule.	3	2	
5.	Issues of sustainability: intergenerational well-being, wealth & well-being (concept of genuine investments), discounting future consumption, natural resource accounting	4	1	
6.	Economics of property rights regimes	2		
7.	Simulating with econometrics: computer tutorial on simple estimation of econometric models and interpreting economic output	1	2	
	Total	**28**	**14**	

Suggested readings:

1. Conrad J M.1999. Resource Economics. Cambridge University Press.
2. Tietenberg T. 2003. Environmental and Natural Resource Economics. Sixth Edition. Addison Wesley.
3. Varian H L. 2003. Intermediate Microeconomics: A Modern Approach. East West Press. Sixth Edition.
4. Kerr J M, Marothia D K, Singh Katar, Ramasamy C., Bentley W M. Natural Resource Economics: Theory and Applications in India. 1997. Oxford and IBH Company Private Limited.
5. Kadekodi ch and Singh & Hegde ch; Kadekodi G K (Ed). 2004. Environmental Economics in Practice. Oxford University Press.
6. Strogatz S. 1994 Nonlinear Dynamics and Chaos Reading, MA: Addison-Wesley
7. Dasgupta P. 2001. Human well-being and the environment. New York: Oxford University Press.
8. Chapter by Ostrom in Sankar U (edited). 2001. Environmental Economics. OUP.
9. Joseph Buongiorno and J Keith Gilles. 2003. Decision Methods for Forest Resource Management. Academic Press.
10. Sydsaeter and Hammond. Mathematics for Economics. LPE.
11. Alpha C. Chiang. 2004. Fundamental Methods of Mathematical Economics. McGraw-Hill College.

Course No.: NRS 171
Course title: **Environmental modelling**
Number of credits: 3 (2.5-0.5-0)
Number of lectures-tutorials-practicals: 35-7-0
Course coordinator: Dr T S Panwar, Mr. Kapil Narula

Evaluation procedure:

- Assignments : 20%
- 2 minor tests : 30%
- Major test : 50%

Course outline (Air pollution):

Sources and effects of air pollutants, air quality standards, emission inventory, meteorological aspects related to air pollution, air quality modelling and its application, trans-boundary air pollution

Details of course content & allotted time

Sr. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
1.	Introduction to the course; Sources and effects of air pollutants, air quality standards/emission inventory	1		
2.	Meteorological aspects related to air pollution (wind circulation, lapse rate, stability conditions, turbulence, Richardson number, boundary layer structure, mixing height, plume behaviour, heat island effect, wind rose)	5		
3.	Air Quality modelling and its application (Model classification, box model, Gaussian dispersion model, dispersion parameters, plume rise, removal mechanisms, point/line/area sources, long term and short term dispersion models))	6	3	
4	Case studies and model applications	2		
5.	Trans-boundary air pollution	1		
	Total	**15**	**3**	

Course outline (Noise pollution):

Sources and effects of noise pollution, Noise standards, Basics of sound propagation, noise modelling and its application.

Details of course content & allotted time

Sr. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
1.	Sources and effects of noise pollution, Noise standards	1		
2.	Basics of sound propagation, noise scales and rating methods	2		
3.	Noise modelling and its application	2	1	
	Total	**5**	**1**	

Course outline (Water pollution):

Sources and effects of water pollutants, introduction to principles of water quality modelling, distribution of water quality in rivers, estuaries and lakes, contaminant transport in groundwater, water quality modelling applications and discussion of case studies.

Details of course content & allotted time

Sr. No.	Topics	Lectures	Tutorials	Practicals
1.	Sources and effects of water pollutants: Indian context	1		
2.	Principles of water quality modelling: River hydrology and derivation of stream equation; conservative and non conservative pollutants; physical laws	3		
3.	Distribution of water quality in rivers and estuaries; characteristics of lakes; evaluating and assessing BOD/DO in rivers; Eutrophication analysis and basic mechanisms of Eutrophication	4	1	
4.	Contaminant transport in groundwater; basics on fate and transport of pollutants; Hydrodynamic dispersion; Decay; Reactive processes; Site specific groundwater quality problems in Indian context	4	2	
5.	Water quality modelling and its applications: Model set-up, calibration, and validation procedures; Selection; Case studies and applications of water quality modeling	3		
	Total	**15**	**3**	

Suggested readings:

Air and Noise pollution

1. Boubel, R W, Fox, D L, Turner, D B (Ed.) and Stern, A C (Ed.) (1994) *Fundamentals of Air Pollution*, 3rd edition, Academic Press Inc.
2. Turner, D B (1994) *Workbook of Atmospheric Dispersion Estimates: An introduction to dispersion modelling*, 2nd edition, Lewis publishers.
3. Wark, K, Warner, C F, and Davis, W T (1997) *Air Pollution- Its origin and control*, Addison Wesley Longman, Inc.
4. Rao C S (1991), *Environmental pollution control engineering*, New Age International (P) Ltd., Publishers, New Delhi.
5. Pasquill, F and Smith, F B (1983) *Atmospheric Diffusion*, Ellis Horwood Ltd., Chichester.
6. Heinsohn R J and Kabel R L (1999) *Sources and control of air pollution*, Prentice hall, NJ
7. Rau, J.G. (1980) *Environmental Impact analysis handbook*. McGraw Hill, New York

Water pollution

1. Chapra, S: **Surface Water-quality modelling**, Tata McGraw-Hill, 1997.
2. Thomann, Robert V., John A. Mueller. **Principles of Surface Water Quality Modeling and Control**. HarperCollins Publisher Inc., New York, 1987
3. Bouwer, H. **Groundwater hydrology**. Mc-Graw Hill International Editions (Civil Engineering series), 1978
4. Todd, D.K. **Groundwater hydrology**. John Wiley and Sons, 1980
5. Freeze, A., Cherry, J.A. **Groundwater**. Prentice Hall, 1979.
   Zheng, C and Bennett, G.D. **Applied Contaminant Transport Modeling: Theory and Practice**. Van Nostrand Reinhold. 1995

Course No.:	NRS 181
Course title:	**Sustainable resource management**
Number of credits:	3 (2-1-0)
Number of lectures-tutorial-practicals:	28-14-0
Course coordinator:	Dr Vishal Narain

Course outline:

This course seeks to expose students to issues in studying sustainable resource management. Students are exposed to the different dimensions of sustainability- social, environmental and economic. They are exposed to driving forces that impinge upon sustainable natural resource use and to the impacts of natural resource depletion.

Resource use and sustainability are seen in the context of a sustainable livelihoods approach. Students learn to examine the spiral of resource degradation in the context of demographic processes and trends, poverty, food security and international global trends. Finally students are exposed to the case study method of studying sustainable resource management. They are familiarised with approaches to sustainable resource management, both by view of direct interventions in resource management as well as by approaches that impact upon the drivers of sustainability.

The pedagogy comprises a mix of lecture and interactive sessions. Students are urged to read carefully the case readings and study material for each session.

Evaluation procedure:

- Term Paper: 30%
- Minor Tests : 20%
- Tutorial : 20%
- Final Exam : 30%

Details of course content & allotted time

Topic	**Allotted time (hours)**	
	Lectures	**Tutorials**
Module 1: Theoretical and conceptual issues Introduction: The concept of sustainability; social, environmental and economic dimensions. The international context: the Brundtland commission on Environment and Development. The concepts of carrying capacity and ecological footprint.	1	
The Sustainable livelihoods framework. The capital assets framework. The PSIR framework.	3	1
Indicators for sustainable development	1	
Module 2: Driving forces for sustainability Population, poverty and the Environment. Indian and global trends.	3	3
Urbanisation and the Environment	1	
Globalisation, trade and the environment. Impacts of recent international developments such as the WSSD	1	

Topic	Allotted time (hours)	
	Lectures	Tutorials
Module 3: Governance and management of natural resources. Alternative paradigms. Changing role of state and decentralisation. Emphasis on local organisations and partnerships	8	4
Module 4: Property rights and sustainable livelihoods. Impacts of natural resource depletion. Natural resource use sustainability and agrarian change. Case study on the Green Revolution.	4	2
Module 5: Public Policy for sustainable resource management. Policy objectives for natural resource management. Equity, efficiency and sustainability. Policies for population, poverty alleviation, and food security. Indian and international context. Country and state level experiences.	6	4
Total	**28**	**14**

Suggested readings:

1. Carney, D. Ed. 1998. Sustainable Rural Livelihoods. What contribution can we make?
2. Thomas, J.W. and Grindle, M.S. 1990. After the decision: implementing policy reforms in Developing Countries. *World Development* 18(8): 1163-1181
3. Bac, M. 1998. Property Rights Regimes and the management of resources. *Natural Resources Forum*. Vol. 22(4): 263-269
4. Bromley, D.W. 1989. Property relations and Economic Development. The other land reform. *World Development. 17(6): 867-877*
5. Folke, C and Berkes, F. 1995. Mechanisms that link property rights to Ecological Systems. In Susan Hanna and Mohan Munasinghe eds. Property Rights and the Environment. Social and Ecological Issues. The Beijer Institute of Ecological Economics and the World Bank. Environmentally Sustainable Development Series.
6. Rethinking the mosaic: investigations into local water management. Edited by Marcus Moench, Elisabeth Caspari and Ajaya Dixit. 1999.
7. Chambers, R and Conway, G. 1992. Sustainable rural livelihoods: practical concepts for the 21st Century. IDS Discussion paper No. 296
8. Scoones, I. 1998. Sustainable Rural Livelihoods. A framework for analysis. IDS Working Paper No. 72.
9. Meinzen-Dick, R. and Adato, M. 2001 Applying the sustainable livelihoods framework to impact assessment in natural resource management. Paper presented at the workshop on Integrated Management for Sustainable Agriculture, Forestry and Fisheries. 28-31 August, 2001. Cali, Colombia.
10. Spiertz, HLJ. 2000. Water rights and legal pluralism: some basics of a legal anthropological approach. In B.R. Bruns and R.S.Meinzen-Dick eds. Negotiating water rights.Vistaar Publications.
11. Singh, K. 1994. Managing common pool resources: principles and case studies. Delhi: Oxford University Press.
12. Edwards, V.M. and Steins, N.A. 1999. A framework for analysing contextual factors in common pool resource research. Journal of Environmental Policy and Planning. 1(3): 205-221.
13. Hardin, G. 1968. The tragedy of the commons. Science. 162: 1243-48.

14. Bardhan, P. 1993. Analytics of the institutions of informal cooperation in rural development. World Development. 21 (4): 633-639
15. Bardhan, P. 1993. Symposium on management of local commons. Journal of Economic Perspectives. 7(4): 87-92
16. Cernea, M.M. 1993. Culture and organisation. The social sustainability of induced development. Sustainable Development 1 (2): 18-29
17. Jodha, N.S. 1992. Common property resources. A missing dimension of development startegies. Washington, D.C. The World Bank.
18. Runge, C.F. 1986. Common property and collective action in economic development. World Development 14(5): 623-635
19. Jodha, N.S. 1986. Common Property Resources and Rural Poverty in dry regions of India. Economic and Political Weekly 21 (27): 1169-81
20. Jodha, N.S. 1985. Population Growth and the Decline of Common Property resources in Rajasthan. Population & Development Review 11 (2)
21. Dasgupta, P. 1992. Population, resources and poverty. Ambio 21 (1): 95-101

Students are encouraged to browse through issues of international publications such as the *World Development Report*, the *Human Development Report*, and *Global Environment Outlook*.

Final set

Course No.:	NRS 183
Course title:	**Soil and land management**
Number of credits:	3 (2.5-0-0.5)
Number of Lectures-Tutorial-Practicals:	35-3-8
Course coordinator:	Dr S Sreekesh

Course outline:

The main objective of this course is to providestudents with the knowledge of fundamentals of soil science and key aspects of sustainable use and management of land resources with practical approaches for managing soils for their sustained productive use and conservation. The course would cover :

- Fundamental aspects of soil resources observation, inventory and characterization for practical purposes.
- Different approaches and procedures for the interpretation of soil information and for the design of appropriate soil management strategies based on suchsoil information and knowledge.
- The procedures and techniques for soil/land degradation assessment, and to technical aspects related to land capability classification and soil conservation measures.
- Contemporary fields of inquiry related to soil processes, e.g. soil and land degradation at multiple scales, issues related to soil contamination etc.

The course has formal lectures, tutorials, practical/demonstration sessions and discussions. Lectures form the core of the course and will place an emphasis onthe concepts. Discussions are centered around the student's seminar on selected topics.

Evaluation procedure:

Following methods will be employed to evaluate the students performance

- 2 minor tests : 20% marks
- Practical : 15% marks
- One term paper (with presentation) : 15% marks
- 1 major test (end semester) : 50%

Details of course content & allotted time

Topics	Allotted time (hours)		
	Lectures	**Tutorials**	**Practicals**
Introduction, Factors of soil formation, Soil properties	2	0	0
Soil survey and soil profile; Soil taxonomy	2	0	2
Soil moisture, its measurement and management; Soil drainage and drainage network design, soil water management issues and solutions	5	0	2
Soil organic matter and carbon sequestration	2	0	0
Soil fertility – soil nutrients and plant needs, nutrient uptake from soil, role of fertilizers, soil health issues; soil quality index	3	0	2
Soil erosion and land degradation – agents, types, causes and factors affecting erosion, Methods of soil erosion estimation, erosion control techniques, role of erosion in productivity	4	1	2

Topics	Allotted time (hours)		
	Lectures	Tutorials	Practicals
Land degradation – types (chemical, physical and biological), assessment techniques and distribution in India;	4	0	0
Different types of wastelands and there distribution in India	2	1	0
Soil and land conservation- Agronomic and other measures with special reference to in India,	3	0	0
Land-use planning and land use classification in India	3	0	0
Land evaluation, land quality indicators and land capability and suitability classificationwith special reference to India	2	1	0
Land management: drivers of change and practices	2	0	0
Role of information system in soil-land conservation	1	0	0

Basic textbooks:

1. Indian Society of Soil Science Fundamentals of soil science
2. Brady, N C and R R Weil 2002 The nature and properties of soil. 13th edition. Pearson Education Inc
3. Narayana, Dhruva V V 1993 Soil and water conservation in India, ICAR, New Delhi
4. Miller Raymond W and Roy L Donahue 1990 Soils: An introduction to soils and plant growth Prentice-Hall of India, Private Limited
5. Barrow C J, 2001 Land degradation: Development and breakdown of terrestrial environments. Cambridge University Press,
6. Young, A. (1998). Land Resources: Now and for the future, Cambridge University Press.
7. Seghal J 1994 soil degradation in India: Status and Impact, Oxford & IBH publishing, New Delhi
8. Das, D K and Mukherjee Soil conservation.
9. Baver L D and Gardner W H 1972 Soil Physics, 4t editions, John Wiley & sons New York.

Suggested readings:

1. Morgan, R P C, ed. 1981 Soil conservation: problems and prospects. John Wiley, UK
2. FAO 1993 Guidelines for land-use planning, FAO Development series N 1, Rome
3. FAO 1984 Guidelines for land evaluation for Rainfed Agriculture FAO Soil Bulletin No 52
4. USDA 1993 Soil survey manual(Indian edition) Scientific publishers
5. USDA 1964 A manual on conservation of soil and water (Indian edition) Oxford & IBH publishing co., New Delhi
6. Davidson, D.A. 1992. The Evaluation of Land Resources. Longman, London.
7. Roberts, J. C. 1979. Principles ofland use planning. Chapter 3 in Beatty, M. T., G. W. Peterson and L. W. Swindale. 1979. Planning the uses and management of land. Monograph 21, American Society of Agronomy, Madison, WI.
8. Cook, R. L. and B. G. Ellis.1987. Soil management. John Wiley and Sons, Inc., New York, NY.

Course No.:	BBT 153
Course title:	**Environmental bioremediation**
Number of credits:	3 (1-0-2)
Number of lectures-tutorial practicals:	16-0-52
Course coordinator:	Dr Banwari Lal

Course outline:

The course on Hydrocarbon bioremediation would take the students through the general introduction to the general microbiology of aerobic and anaerobic microbes, isolation of these microorganisms, Characterization of the purified microbes using phenotypic methodologies and their preservation techniques to their practical utilization in bioremediation. During this entourage the students would be introduced to advanced methods of identifying microorganisms to serotype level, studying their metabolism when grown on xenobiotics and environmental pollution and to evaluate their metabolisms when grown on substrate like Polycyclic aromatic hydrocarbons (PAHs). The study enriches the knowledge of the students on the biodegradative pathways and the role of different enzymes in these pathways.

This course gives more emphasis to practicality of the knowledge gained through lectures and discussions. There are 16 lecture hours and 62 practical hours in this course.

Evaluation procedure:

- Class participation and assignment : 10%
- Performance in lab work : 30%
- Minor tests : 10%
- Final examination : 50%

Details of course content and allotted time

Sr. No.	Topics	Time Allotted (hours)
1.	**Types of microbes and their isolation and preservation** Aerobic and anaerobic microbes, isolation procedure, growth media, purification of mixed culture, gram negative, gram positive microbes, preservation techniques. **<u>Practical</u>** Isolation of microbes from soil contaminated with crude oil	4 12
2.	**Characterisation and identification of microbes** Procedure of characterisation of microbes, biochemical characterisation, substrate utilisation profile, Identification of microbes by fatty acid methyl ester analysis and sequence of 16S rDNA. **<u>Practical</u>** Characterisation of purified microbes by substrate utilisation profiles and 16S rDNA sequence	4 16

Sr. No.	Topics	Time Allotted (hours)
3.	**Degradation of different fractions of total petroleum hydrocarbon** Degradation of alkane fraction and pathway of degradation of alkanes Degradation of polycyclic aromatic hydrocarbons (PAH), pathway of degradation of PAHs **<u>Practical</u>** Degradation of total petroleum hydrocarbons Analysis by different fraction of TPH by GC and GC-MS	4 12
4.	**Screening of microbes for degradation of PAHs by PCR based techniques** **<u>Practical</u>** Screening of microbes for degradation of PAHs by gene specific probe	4 12

Suggested readings:

1. Microbiology by L M Prescott, J P Harley, D A Klein
2. ATCC Technical Bulletin on Preservation of Microorganisms
3. Bergeys Manual of Determinative Bacteriology (Ed.1994).
4. Bergey , John G. Holt , Noel R. Krieg , Peter H.A. Sneath , D. Bergy
5. Biodgradation and Bioremediation, Martin Alexander
6. Microbial Processes for Bioremediation (Bioremediation, 3(8).) by Robert E. Hinchee (Editor), et al
7. Microbial Transformation and Degradation of Toxic Organic Chemicals by Lily Y. Young (Editor), Carl Cerniglia (Editor)
8. Manual of Industrial Microbiology and Biotechnology, AL Demain J E Davies, ASM Press
9. R M Atlas, Microbial Biodegradation of Petroleum Hydrocarbons, In: Microbial reviews, pp 45: 180-209, 1981.
10. Bioremediation of Contaminated Soils, D L Wise, D J Trantolo, E J Cichon, H I Inyang, U Stottmeister
11. Cerniglia C E, Heitkamp M A. 1989.
12. Biodegradation of PAH Current Opinion in Biotechnology 4: 331-338.
13. Schaackmann A, Muller R. 1991. 34:809-813 Applied Microbial Biotechnology
14. Higson F K. 1992. Microbial Degradation of Non-aromatic compounds. Advances in Applied Microbiology. 37: 1-19.

Course No.: NRS 133

Course title: **Environmental pollution monitoring and auditing**

Number of credits: 3 (3-0-0)

Number of lectures-tutorials-practicals: 38-4-0

Course coordinator: Dr Nandini Kumar

Course outline:

The course will introduce students to the techniques commonly used in chemical and biological monitoring of the environment. It will communicate why monitoring of the environment is important, and describe sampling and analytical methodologies while emphasizing good working practice in terms of quality assurance and safety procedures. The section on auditing is meant to describe the principles of the environmental auditing process. It aims to reveal the role of the environmental management system in managing the environmental effects of industrial activities. Case studies will be used extensively to illustrate these aspects.

Evaluation procedure:

- 2 minor tests : 15%+15%
- 1 major test (end semester) : 50%
- Assignments : 10%
- Term paper : 10%

Details of course content & allotted time

Topic	Allotted time (hours)		
	Lectures	**Tutorials**	**Practicals**
Introduction to pollution monitoring and its objectives	1	-	-
Types of monitoring	2	-	-
Source monitoring, ambient environment monitoring			
Prerequisites for monitoring	4	-	-
Monitoring protocol, meteorological data, source inventory, suitability of analytical techniques, environmental quality standard			
Duration and extent of survey	4	-	-
Duration of survey and frequency of sampling, methods of reducing sampling frequency, number of sampling sites			
Sampling methods	5	-	-
Air, water and soil, sediment sampling methods			
Presentation of data	2	-	-
Environmental auditing			
Introduction to environmental auditing The principles and practice of environmental auditing, objectives, procedures, benefits, environmental auditing as a management tool.	2	-	-

Topic	Allotted time (hours)		
	Lectures	**Tutorials**	**Practicals**
Designing an audit programme			
Identifying environmental effects, monitoring and performance indicators, sources of evidence, specialist audit skills, selecting auditing goals, defining the boundaries, designing a reporting process.	6	-	-
Techniques of environmental auditing			
Pre-audit activities and audit planning, protocols and questionnaires, field work, working papers and audit record keeping, evaluating findings and conducting exit interviews, audit reports.	6	-	-
Introduction to integrated environmental management systems, industrial ecology, the ISO 14000 series and environmental labelling, concepts of lifecycle and risk assessment.	6		-
Case studies		4	-
Total	**38**	**4**	**0**

Basic textbooks:

1 *Hazardous Waste Management*, M D LaGrega, P L Buckingham, J C Evans, McGraw-Hill International Edition (chapters on environmental audits, risk assessment)
2 *Environmental Chemistry* S E Manahan (chapter on industrial ecology, resources and energy)
3 *Understanding our environment: an introduction to environmental chemistry and pollution* R M Harrison (selected chapters), Royal Society of Chemistry
4 *Pollution: sources, effects and control*, edited by R M Harrison (selected chapters), Royal Society of Chemistry

Suggested readings:

1 *Environmental Auditing*, Humphrey N and Hadley M, Palladian Books
2 *Environmental Auditing: Fundamentals and Techniques,* J Ladd Greeno, G S Hedstrom, and M DiBerto, John Wiley and Sons
3 *Environmental auditing for the non-specialist* (The Chandos Series on the environment) by Chris Hoggart, Chandos Publishing, Oxford Ltd.
4 *Environmental monitoring* G Bruce Wiersma CRC Press 2004
5 B*asic concepts of environmental chemistry* Des W. Connell, Lewis Publishers
6 *Environmental analytical chemistry* edited by F W Fifield and P J Haines, Blackie Academic &Professional.

Course No.:	NRS 147
Course title:	**Environmental economics**
Number of credits:	3 (2.5-0.5-0)
Number of lectures-tutorial-practicals:	35-7-0
Course coordinator:	Dr Meeta K Mehra

Course outline:

The course will introduce key contemporary issues in environmental economics and introduce the tools and methodologies that are in general applied to analyse environmental problems and policies. The course comprises lectures cum discussions, 1 presentation per student plus 1 term paper to be submitted. Students are also expected to search for currently debated environmental problems and policies in India and other countries that would trigger discussions in the class, especially during tutorials. The course relies on select mathematical methods and techniques such as differentiation, select methods in econometrics.

Evaluation procedure:

- Class participation : 5%
- Tutorials : 5%
- 1 Term paper : 10%
- 1 Presentation by students : 10%
- 2 minor tests : 30% (15% each)
- 1 major test (end semester) : 40%

Details of course content & allotted time

Sr. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
1.	**A refresher in basic mathematical analysis/ econometrics**	5	1	0
	- Differential and integral calculus - Select concepts in econometrics (handy for valuation methods)			
2.	**Markets and efficiency**	4	1	0
	Market failure - Incomplete markets - Externalities - Non-exclusion and the commons - Non-rivalry & public goods (including newly emerging concept of global public goods) - Non-convexities - Asymmetric information			
3.	**Theory of non-market valuation and methods of valuing environmental costs and benefits (including case studies)**	12	2	0
	- Revisiting measures of economic value – use values and non-use values			

Sr. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
	- Environmental quality as a factor input - Valuing longevity and health - Property value models - Hedonic wage models - Recreational use of natural resource systems (travel cost models) - Constructed market models of valuation - Economics of biodiversity conservation & valuing biodiversity			
4.	**Green accounting (simultaneously with the course in Resource Economics)**	2	0	0
5.	**Environmental policy instruments**	8	2	0
	- Pigouvian fees - Regulating pollution - Emissions fees and marketable permits - Regulation with unknown control costs - Audits, enforcement and moral hazard - Incentives for investment in technological development - Porter's hypothesis			
6.	**International trade and environment**	4	1	0
	- International trade and environment linkages - International and interregional Competition - WTO and environment			
	Total	**35**	7	**0**

Suggested readings:

1. Nick Hanley, Jason F Shogren and Ben White. Environmental Economics in Theory and Practice. MacMillan 1997.
2. Tietenberg, T. (1994) Environmental and Natural Resource Economics, Harper Collins.
3. Kolstad Charles D. Environmental Economics. Oxford University Press. 2003.
4. Freeman Myrick A. The Measurement of Environmental and Resource Values: Theory and Methods. Second Edition. 2003. Resources for the Future.
5. Baumol William J. and Oats Wallace E. The Theory of Environmental Policy. Second Edition. Cambridge University Press. 1994.
6. Stavins Robert N. Economics of the Environment: Selected Readings. Fourth Edition. W.W. Norton and Company. 2000.
7. Kerr J M, Marothia D K, Singh Katar, Ramasamy C., Bentley W M. Natural Resource Economics: Theory and Applications in India. 1997. Oxford and IBH Company Private Limited.

8. Kadekodi G K (Ed). 2004. Environmental Economics in Practice. Oxford University Press.
9. Pearson Charles S. Economics of the Global Environment. Cambridge University Press. 2000.
10. Copelan Brian R. and Taylor M Scott. Trade and the Environment. Princeton University Press. 2003.
11. Sterner Thomas. Policy Instruments for Environmental Protection. RFF. 2002
12. Murty M N and Surendra Kumar. Environmental and Economic Accounting for Industry, Forthcoming, Oxford University Press, New Delhi.
13. Markandya Anil and M N Murty. Cleaning-Up the Ganges: A Cost-Benefit Analysis of the Ganga Action Plan, Oxford University Press, 2001. New Delhi.
14. Select articles from journals: at least the non-mathematical parts.

Course No.:	NR 135
Course title:	**Climate change, ecosystems and society**
Number of credits:	3 (2.5-0.5-0)
Number of Lectures-Tutorial-Practicals:	36-6-0
Course coordinator(s):	Dr Vivek Kumar and Dr Sudip Mitra

Course outline:

This course will provide an introduction to climate system and its inter-relationship with different ecosystems, human systems, and socio-economic systems. The course will discuss causes of climate changes, natural as well as anthropogenic and its impacts on different systems. The course will also cover the response measures to combat climate change both at policy as well as at implementation level. The inter-linkages of the UNFCCC with other international conventions will also be introduced through this course.

Evaluation procedure:

The course is spread over three Slots. The break-up of marks will be as follows:

- Final exam 40 marks
- Term Paper 20 marks
- 1st minor test 10 marks
- 2nd minor test 10 marks
- Tutorials (two) 10 marks each

Details of course content & allotted time

Sr. No.	Topic	Allotted time (hours)
1.	**The climate system**	2
	Structure and composition of earth's atmosphere, Energy budget of earth's atmosphere, general circulation and horizontal and vertical energy transfers	1
	Other components of climate system viz oceans, cryosphere, biosphere and geosphere; their inter-relationship	1
2.	**Science of climate change**	4
	Greenhouse effect, greenhouse gases, their sources and sinks, clouds, aerosols and ozone layer and greenhouse effect, radiative forcings and global warming potential	2
	Natural causes of climate change, past climatic changes	1
	Anthropogenic activities and rising concentration of GHGs in the atmosphere	1
3.	**Tools to study climate change**	4
	Climate construction using instrumental records	1
	Palio-climate analysis using proxy data	1
	Climate simulation through modeling, climate change projections from different models	1
	Uncertainties in climate change projections	1

Sr. No.	Topic	Allotted time (hours)
4.	**Impacts of climate change,** case studies from India & S. Asia	12
	Sea level rise, vulnerability of coastal areas and island states	3
	Water resources and glacier retreat	2
	Agriculture, forestry, and biodiversity	3
	Extreme events	2
	Human health	1
	Infrastructure, industry	1
5.	**Policy responses to climate change**	4
	IPCC, its establishment, purpose, organisation and climate change projections	1
	UNFCCC, its evolution, objective, highlights of various articles, Indian negotiating stance	1
	Developing country commitments under the UNFCCC	1
	Existing policies and legal framework, enabling activities such as ALGAS and reporting requirements e.g. NATCOM	1
6.	**Approaches and programmes responding to climate change**	8
	Clean and energy efficient technologies for climate change mitigation	1
	Climate change mitigation programmes, Indian initiatives	1
	Forests and CO_2 sequestration, LULUCF	1
	CO_2 sequestration opportunities for India	1
	Adapting to climate change, integration of traditional wisdom with climate change adaptation, case studies	2
	Adaptation and sustainable development linkages	1
	Linking climate change mitigation and adaptation	1
7.	**Linkages of UNFCCC with other international conventions such as CBD, CCD, Ramsar Convention, MDG**	2
8.	**Tutorials (2 in number) and Term-paper (1), discussion and presentation by students**[+]	6

[+] Students will be asked to select a topic of their interest and prepare a short term-paper on that. This may be presented during one of the lectures. In addition, there will be two tutorials, which may involve an analysis of an article/news item or presentation of a case study.

Suggested readings:

1. Bhandari P., Gupta S, Pachauri R.K., Srikanth S.B., Srivastava L.; 1999; Climate of Concern: Bridging the Divide; Tata Energy Research Institute
2. Climate Change 2001: Impacts, Adaptation and Vulnerability; from Working Group 2 of the IPCC
3. Climate Change 2001: Mitigation; from Working Group 3 of the IPCC
4. Climate Change 2001: The Scientific Basis; from Working Group 1 of the IPCC
5. Gupta, S. and Bhandari P.; 2000; CDM and its Implications for Developing Countries; In Climate Policy and Development – Flexible Instruments and Developing Countries; edited by Axel Michaelowa and Michael Dutschke; Edward Elgar Publishing Limited, UK
6. Hardy, John; 2003; Climate Change: Causes, Effects and Solutions; John Wiley & Sons
7. Henderson Sellers, A & K McGuffie (1996) A Climate Modeling Primer. Chichester : Corley, (2nd Edition)
8. Houghton, John T.; 1997; Global Warming: The Complete Briefing; Cambridge University Press
9. http://unfccc.int/cop7/issues/lulucf.html
10. http://unfccc.int/resource/beginner_02_en.pdf
11. http://unfccc.int/resource/docs/convkp/conveng.pdf
12. http://unfccc.int/resource/docs/convkp/kpeng.pdf
13. http://unfccc.int/resource/guideconvkp-p.pdf
14. http://unfccc.int/resource/iukit/infokit_02_en.pdf
15. http://www.doc.mmu.ac.uk/aric/gccsg/4-1.html
16. http://www.geic.or.jp/climgov/index.html
17. http://www.natcomindia.org/presentations/cc_impacts.pdf
18. http://www.teriin.org/climate/impacts.htm
19. http://www.teriin.org/reports/rep152/rep152.htm
20. http://www.unu.edu/inter-linkages/eminent/papers/WG2/Sanwal.pdf
21. Lonergan, S. 1998; Climate warming and India; In *Measuring the Impact of Climate Change on Indian Agriculture*, edited by A Dinar, et al. Washington DC: World Bank. [World Bank Technical Paper No. 402]
22. Mintzer, I.M.; 1992; Confronting Climate Change: Risks, Implications and Responses; Cambridge University Press
23. Pathak M., Srivastava L., and Sharma S.; 1999; CDM Opportunities and Benefits in India; In Opportunities for Financing Sustainable Development via the Clean Development Mechanism; edited by D Austin and P Faeth; World Resources Institute, Washington, DC
24. Ravindranath N H and Sukumar R.; 1998 Climate change and tropical forests in India; *Climatic change* 39(2-3): 563-581
25. Ruddiman, W.F.; 2000; Earth's Climate: Past and Present; W H Freeman & Co.
26. TERI; 1996; The Economic Impact of a One Metre Sea Level Rise on the Indian Coastline: method and case studies; Report submitted to the Ford Foundation

The reading list should be further supplemented by current articles in standard journals.

Course No.:	NRS 145
Course title:	**Integrated impact assessment: environment, health and social impacts**
Number of credits:	3 (3-0-0)
Number of lectures-tutorial practicals:	42-0-0
Course coordinator:	Mr P V Sridharan

Course outline:

The course would cover key perspectives and approaches to integrated impact assessment, which put equal emphases on environment, health and social impacts. The course will review the framework, tools procedures and methods in current environmental assessments. Concept of the ecosystem approach to impact identification will also be introduced. Suitable case studies would be presented.

Evaluation procedure:

- Minor tests : 30%
- Assignments : 15%
- Class discussion : 5%
- Final examination : 50%

Details of course content & allotted time

Topic	Allotted time (hours)		
	Lectures	**Tutorials**	**Practicals**
Introduction: Definition and scope of Environment, social & health impact assessment. Linkages between EIA, Social and Environmental Health Impact Assessment.	2		
Environmental Impact assessment: ***a.*** Objectives of EIA, Evolution of EIA and current practice in India, EIA techniques, QA/QC, impact prediction, Impact analysis ***b.*** EIA and development planning, EIA inputs to the project cycle, legislative aspects, Risk and uncertainty in EIA, Economic analysis, EMP & Preparation of EIA repots, Future trends in EIA-Strategic EIA, Policy EIA **c.** Tools for EIA such as Life cycle assessment, cost benefit analysis	3 4 2		
Health impact: Health hazards due to pollution, Environmental Health problems, pathway, exposure, dose response, epidemiology	8		

Topic	Allotted time (hours)		
	Lectures	Tutorials	Practicals
Social impact : overview and scope of social impact assessment, Methods for conducting social assessment, vulnerable groups (Involuntary resettlement, Indigenous people, Gender Analysis) Training on questionnaire development and group discussion	5		
Tools and Techniques for integrated Assessment: Assessment of various approaches such as ecological analysis, time series analysis, risk analysis for undertaking the integrated assessment. GIS applications in environmental health ***Ecosystem Approach:*** Fundamentals, and applications of ecosystem approach. Framework for ecosystem approach Case study	5 5 2		
Indicators: Definitions, Role of indicators, Development of indicator. Indicator reporting and analysis	4		
Seminar	2		

Suggested readings:

1. Canter 1998. Environmental impact assessment.
2. Asian Development Bank 1997. Environmental impact assessment for developing countries in Asia, Vol I & II. ADB Publication
3. British Medical Association 1998. Health and Environmental Impact Assessment- an integrated approach. Earthscan
4. Vanclay F and Bronstein D A 1995. Environmental and Social Impact assessment, Wiley publishers.
5. Linkage methods for environment and health analysis – General guidelines. Edited by D Briggs, C. Corvalan, M. Nurminen, World Health Organization, Geneva , 1996. 136 p
6. Handbook of Environmental Impact Assessment. R.R. Bathwal. New Age International Publishers.

Course No.:	NRS 149
Course title:	**Governance and management of natural resources**
Number of credits:	3 (2-1-0)
Number of lectures-tutorial-practicals:	28-14-0
Course coordinator:	Dr Vishal Narain

Course outline

This course seeks to familiarise students with the concepts and practice of the governance of natural resources. Students are exposed to theoretical and conceptual issues in analyses of governance and management of natural resources, as well as to changing paradigms in NRM and governance. Through case study-based learning and interactions, they are exposed to practical issues and problems in natural resource management.

Evaluation procedure

- Term paper : 30%
- Minor tests : 20%
- Tutorials : 20%
- Final exam : 30%

Details of course content & allotted time

Topic	Allotted time (hours)	
	Lecture	Tutorials
Block 1: Overview of conceptual issues and approaches Establishing the rationale for NRM regimes: Introducing concepts of carrying capacity, ecological foot-print, resilience, tragedy of the commons. Conceptual distinctions and nuances 1) Institutions and organisations 2) Governance and Government 3) Management and Governance Theoretical approaches to governance and contribution of different disciplines: 1) Rational Choice and New Institutional Economics 2) Public Administration and Management 3) Socio-technical Perspectives 4) Legal Anthropological Approaches, legal pluralism in governance 5) Influence of neo -liberal ideologies on governance	4	2
Block 2: The Bureaucracy and Natural Resource Management The relevance and appropriateness of the bureaucratic set-up for NRM (Weberian conceptions). Understanding accountability and transparency; rent-seeking perspectives. Reform of public institutions. Role of the bureaucracy in reform processes. Lessons from water, forestry and pollution control.	4	2

Block 3: Decentralisation and changing role of the state Distinction between decentralisation and devolution. The participation paradigm. Understanding resource user organisations. Lessons from JFM and Irrigation Management Transfer in India. The 73rd and 74th Amendments to the Constitution of India.	8	3
Block 4: Collective Action and Management of common property resources The emergence and survival of common property institutions Understanding conditions for collective action. Collective action as a socially embedded process; understanding social, power and gender relationships in Natural Resource Management. Mainstreaming gender and equity considerations in Natural Resource Management. Case studies/lessons from water-surface and groundwater, land and forestry.	8	4
Block 5: Markets as a form of natural resource allocation Equity, efficiency and sustainability implications. Market creation as a reform strategy. Issues and perspectives.	2	1
Block 6: Role of NGOs and civil society in Natural Resource Management The emphasis on partnerships for sustainable development Issues and lessons for replication.	2	2

Suggested readings:

Module 1

1. North, D.C. 1990. Institutions, institutional change and economic performance. Cambridge University Press
2. Ostrom, E. (1990). Governing the commons. The evolution of institutions for collective Action. Cambridge University Press. Cambridge.
3. Folke, C and Berkes, F. 1995. Mechanisms that link property rights to Ecological Systems. In Susan Hanna and Mohan Munasinghe eds. *Property Rights and the Environment. Social and Ecological Issues*. The Beijer Institute of Ecological Economics and the World Bank. 1995
4. Bac, M. Property Rights Regimes and the Management of resources. *Natural Resources Forum*. 22(4): 263-269
5. Merry S.E. 1998. Legal Pluralism. Law and Society Review 22(5): 869-896

Module 2

1. Wade, R. 1988. The management of irrigation systems: how to evoke trust and avoid prisoners' dilemma. *World Development* 16(4): 489-500
2. Paul, S. 1992. Accountability in public services: exit, voice and control. World Development. 20 (7): 1047-1060
3. World Bank, 2003. Reforming Public Institutions and strengthening governance. A World Bank Strategy Implementation Update.
4. Korten, David C. 1989. From bureaucratic to strategic organisation. In: Frances C Korten and Robert Y Siy, Jr. edited Transforming a bureaucracy.

Module 3

1. Esman, M.J., and Uphoff, N.T. 1984. Local Organisations as intermediaries. Chapter 1 in Local Organisations. Intermediaries in Rural Development. Cornell University Press. Ithaca, pp. 15-41
2. Mollinga, P.P. 2001. Power in Motion: A critical assessment of canal irrigation reform, with a focus on India. IndianPIM working paper No. 1
3. Guha, Sumit, 1999. Communities, Kings and Woodlands: Historical reflections on Joint Forest Management, pp. 55-70, in Jeffrey, R and Nandini Sunder, (eds.) A new moral economy for India's forests ? Discourses of Community and Participation. Sage Publications. New Delhi.
4. Vira, B. 1999. Implementing Joint Forest Management in the Field: Towards an understanding of the community-bureaucracy interface, pp. 254-275, in Jeffrey, R and Nandini Sunder, (eds.) A new moral economy for India's forests ? Discourses of Community and Participation. Sage Publications. New Delhi.
5. Poffenberger, M and C. Singh, 1996. Communities and the state: re-establishing the balance in Indian Forest Policy, in M.Poffenberger and B McGean, eds. Village Voices, Forest Choices: Joint Forest Management in India. Delhi: Oxford University Press.
6. Poffenberger, M. 1990. Facilitating change in forest bureaucracies in M. Poffenberger, ed. Keepers of the Forest. West Hartford, C.T: Kumarian Press.

Module 4

1. Wade, R. 1988. Village Republics. Cambridge: Cambridge University Press
2. Agrawal, A.2001. Common Property Institutions and Sustainable Governance of Resources. World Development 29(10): 1649-1672
3. Meinzen-Dick, R. 1996. Policy trends in farmer participation. Paper presented at Workshop on Institutional Reform in Indian Irrigation. National Council of Applied Economic Research. New Delhi. November 6, 1996.
4. Agrawal, A & Gibson, C. C. 1999.Enchantment and disenchantment: the role of community in natural resource conservation. *World Development* 27(4): 629-649
5. Shah, A. 2002. Women, water, irrigation. Respecting Women's Priorities. Economic and Political Weekly. October 26, 2003. 4413-4420.
6. Van Koppen, B. 2001. Gender in integrated water management: an analysis of variation. *Natural Resources Forum* 25: 299-312
7. Locke, C 1999. Women's representation and roles in 'Gender' Policy in Joint Forest Management, pp. 235-253, in Jeffrey, R and Nandini Sunder, (eds.) A new moral economy for India's forests ? Discourses of Community and Participation. Sage Publications. New Delhi.
8. Kumar, S. 2002. Does "participation" in common pool resource management help the poor ? A social cost-benefit analysis of Joint Forest Management in Jharkhand, India. World Development 30(5): 763-782

Module 5

1. Moore, M. 1989. The fruits and fallacies of neo-liberalism: the case of irrigation policy. World Development 17(11): 1733-1750
2. Bauer, C.J. 1997. Bringing water markets down to earth: the political economy of water rights in Chile, 1976-95. World Development 25(5): 639-656

Module 6

1. Shashidharan, E.M. 2000. Civil society organizations and irrigation management in Gujarat, India. In *Water for food and rural development. Approaches and initiatives in South Asia,* ed. P.P. Mollinga, pp. 247-265. New Delhi: Sage Publications
2. Blair, H. 2000. Participation and accountability at the periphery: democracy and local governance in six countries. *World Development* 28(1): 21-39

Students are actively encouraged to regularly browse through a number of policy and governance oriented journals such as *World Development, Public Administration Review, The Economic and Political Weekly*, and *Natural Resources Forum.*

Course No.:	NRS 187
Course title:	**Solid and hazardous waste management**
Number of credits:	3 (2.5-0-0.5)
Number of lectures-tutorial-practicals:	36-0-12
Course coordinator:	Dr Suneel Pandey

Course outline:

The course would cover - general introduction including definition of solid wastes – municipal waste, biomedical waste, hazardous waste, e-waste; legal issues and requirements for solid waste management; sampling and characterization of solid waste; analysis of hazardous waste constituents including QA/QC issues; health and environmental issues related to solid waste management; steps in solid waste management - waste reduction at source, collection techniques, materials and resource recovery/recycling, transport, optimization of solid waste transport, treatment and disposal techniques (composting, vermi-composting, incineration, non-incineration thermal techniques, refuse derived fuels, land-filling); economics of the onsite vs. offsite waste management options (individual vs. common treatment/disposal practices, integrated waste management; and waste minimization and concepts of industrial symbiosis and industrial ecology. The course would comprise of 36 lectures and 12 hours of laboratory work.

Evaluation procedure:

- Class participation and assignment : 10%
- Performance in lab work : 10%
- 2 minor tests : 30%
- Final examination : 50%

Details of course content & allotted time

Topic	Allotted time (hours)	
	Lectures	**Lab work**
1. General introduction including definitions of solid waste including municipal, hospital and industrial solid waste; legal issues and requirements for solid waste management and health and environmental issues related to solid waste management.	3	
2. Sampling and characterization of solid waste	3	12
3. Analysis of hazardous constituents in solid waste including QA/QC issues	3	
4. Health and environmental issues related to solid waste management	2	
5. Waste reduction at source – municipal and industrial wastes	2	
6. Material and resource recovery/recycling from solid wastes	2	
7. Methods of waste collection, collection techniques, waste container compatibility, waste storage requirements, transportation of solid wastes	2	
8. Treatment and disposal techniques for solid wastes – composting, vermin-composting, autoclaving, microwaving, incineration, non-incineration thermal techniques, use of refused derived fuels, land-filling	7	
9. Economics of on-site vs. off-site waste treatment and disposal (individual vs. common disposal)	4	
10. Waste minimization and concept of industrial ecology and industrial symbiosis	4	
11. Integrated waste management practices	4	
Total	**36**	**12**

Suggested readings:

1. SW-846, Test methods for evaluating solid wastes, USEPA.
2. The safe disposal of hazardous wastes-the special needs and problems of developing countries, The World Bank Technical Paper No. 93, Volume I, II, and III, 1989. Authored by Barstone, R. Smith, J. E. (Jr.), and Wilson, D.
3. Standard Handbook of Hazardous Waste Treatment and Disposal, Freeman, H. M. (Ed.), McGraw Hill Book Company, New York, 1988.
4. Manual on Municipal solid waste management, Central Public Health and Environmental Engineering Organisation (CPHEEO), New Delhi, 2000.
5. Safe management of wastes from health-care activities, A. Pruss, E. Giroult and P Rushbrook, World Health Organisation, Geneva, 1999.
6. Solid waste engineering, P. A. Vesilind, W. A. Worrell and D.R. Reinhart, Thomson Books
7. Integrated Solid Waste Management, G. Tchobanoglous, H. Theisen and S.M. Vigil, Mc Graw Hills.