

**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

FOR

M. Tech (ENVIRONMENTAL ENGINEERING)
(with effect from 2012-2013)



**Department of Civil Engineering
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.**

ACADEMIC REGULATIONS 2009 FOR M.TECH (REGULAR) DEGREE COURSE

(Effective for the students admitted into first year from the academic year 2009-2010)

The M.Tech Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS:

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by the University from time to time.

Admissions shall be made on the basis of merit rank obtained by the qualifying candidate at an Entrance Test conducted by the University or on the basis of any other order of merit approved by the University, subject to reservations prescribed by the university from time to time.

2.0 AWARD OF M. TECH. DEGREE:

2.1 A student shall be declared eligible for the award of the M.Tech degree, if he pursues a course of study and completes it successfully for not less than two academic years and not more than four academic years.

2.2 A student, who fails to fulfil all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M.Tech course.

2.3 The minimum instruction for each semester 90 clear instruction days.

3.0 A. COURSE OF STUDY:

The following specializations are offered at present for the M.Tech course of study.

1. Advanced Manufacturing Systems
2. Aerospace Engineering
3. Bio-Technology
4. CAD/CAM
5. Chemical Engineering
6. Communication Systems
7. Computer Networks
8. Computer Networks and Information Security
9. Computer Science
10. Computer Science and Engineering
11. Computers and Communication Engineering.
12. Control Systems
13. Design for Manufacturing/ Design and Manufacturing
14. Digital Electronics and Communication Engineering.
15. Digital Electronics and Communication Systems
16. Digital Systems and Computer Electronics
17. Electrical Power Engineering
18. Electrical Power Systems
19. Electronics and Communication Engineering
20. Embedded Systems
21. Embedded Systems and VLSI Design
22. Highway Engineering
23. Image Processing
24. Industrial Engineering and Management
25. Information Technology
26. Machine Design
27. Neural Networks
28. Parallel Computing
29. Power and Industrial Drives

30. Power Electronics
31. Power Electronics and Electrical Drives
32. Power Engineering and Energy Systems
33. Power System with Emphasis H.V. Engineering / H.V. Engineering
34. Real Time Systems
35. Software Engineering
36. structural Engineering
37. VLSI
38. VLSI and Embedded Systems
39. VLSI Design
40. VLSI System Design
41. Web Technology
42. Wireless and Mobile Communication

and any other course as approved by the authorities of the University from time to time.

3.0 B. Departments officering M.Tech Programmes with specializations mentioned below:

ECE	Communication Systems Computers and Communication Engineering. Digital Electronics and Communication Engineering. Digital Electronics and Communication Systems Digital Systems and Computer Electronics Electronics and Communication Engineering Embedded Systems Embedded Systems and VLSI Design VLSI VLSI and Embedded Systems VLSI Design VLSI System Design Wireless and Mobile Communication
CSE	Computer Networks Computer Networks and Information Security Computer Science Computer Science and Engineering Image Processing Information Technology Neural Networks Parallel Computing Real Time Systems Software Engineering Web Technology
ME	Advanced Manufacturing Systems CAD/CAM Design for Manufacturing/ Design and Manufacturing Industrial Engineering and Management Machine Design
EEE	Control Systems Electrical Power Engineering Electrical Power Systems Power and Industrial Drives Power Electronics Power Electronics and Electrical Drives Power Engineering and Energy Systems Power System with Emphasis H.V. Engineering/ H.V. Engineering
Aeronautical Engg.	Aerospace Engineering

Bio-technology	Bio-Technology
Civil Engg.	Highway Engineering Structural Engineering
Chemical Engg.	Chemical Engineering

4.0 ATTENDANCE:

The programs are offered on a unit basis with each subject being considered a unit.

- 4.1 A candidate shall be deemed to have eligibility to write end semester examinations in a subject if he has put in at least 75% of attendance in that subject.
- 4.2 Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by the College Academic Committee on genuine and valid reasons on representation by the candidate with supporting evidence.
- 4.3 A candidate shall get minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M.Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.
- 4.4 Shortage of attendance below 65% shall **in no case be condoned**.
- 4.5 A stipulated fee shall be payable towards condonation of shortage of attendance.

5.0 EVALUATION:

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

- 5.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination, 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the better of the marks secured in the two Mid Term-Examinations conducted one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a duration of 120 minutes with 4 questions to be answered out of 6 questions.
- 5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations, 40 marks shall be awarded based on the day-to-day performance as Internal Marks.
- 5.3 There shall be two seminar presentations during I year I semester and II Semesters. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the Department in a report form and shall make an oral presentation before the Departmental Committee. The Departmental Committee consists of Head of the Department, supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% to be declared successful.
- 5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he/she studies during the M.Tech course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-Voce
- 5.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- 5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to reappear for the End Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and he has failed in the end

examination. In such case candidate must re-register for the subject(s) and secure required minimum attendance. The attendance of re-registered subject(s) shall be calculated separately to decide upon the eligibility for writing the end examination in those subject(s). In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified.

Conditions to avail the benefit of Improvement of Internal Marks:

- (i) The candidate should have completed the course work in the College.
 - (ii) The candidate should pass all the subjects for which the internal marks secured are more than 50%, before availing the benefit of Improvement of Internal Marks.
 - (iii) The candidate will be given only one chance for each subject for improvement of internal marks for a maximum of three subjects provided the internal marks secured are less than 50% in each subject and the candidate has failed in the end examination.
 - (iv) In the event of availing improvement of internal marks, the internal marks and the end examination marks, secured in the previous attempt are cancelled.
- 5.7 In case the candidate secures less than the required attendance in any subject(s), he shall not be permitted to appear for the End Examination in that subject(s). He shall re-register the subject when next offered.
- 5.8 Laboratory examination for M.Tech courses must be conducted with two Examiners, one of them being Laboratory Class Teacher and second examiner shall be other Laboratory Teacher.

6.0 EVALUATION OF PROJECT / DISSERTATION WORK:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the Project Review Committee.

- 6.1 A Project Review Committee (PRC) shall be constituted with Principal as chair person Heads of all the Departments which are offering the M.Tech programs and two other senior faculty members.
- 6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).
- 6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Committee for its approval. Only after obtaining the approval of Departmental Committee the student can initiate the Project work.
- 6.4 If a candidate wishes to change his supervisor or topic of the project he can do so with approval of Departmental Committee. However, the Departmental Committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- 6.5 A candidate shall submit status report (in a bound-form) in two stages at least with a gap of 3 months between them.
- 6.6 The work on the project shall be initiated in the beginning of the second year and the duration of the project is for two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal (through Head of the Department) and shall make an oral presentation before the PRC.
- 6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College / School / Institute.
- 6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, Principal of the College shall submit a panel of 5 examiners, who are eminent in that field with the help of the concerned guide and head of the department.
- 6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as described by PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

6.10 If the report of the examiner is favourable, viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report candidates work as:

- A. Excellent
- B. Good
- C. Satisfactory
- D. Unsatisfactory

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

If the report of the viva-voce is unsatisfactory, the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination, he will not be eligible for the award of the degree.

7.0 AWARD OF DEGREE AND CLASS:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

8.0 WITH-HOLDING OF RESULTS:

If the candidate has not paid any dues to the university or if any case of in-discipline is pending against him, the result of the candidate will be withheld and he will not be allowed into the next higher semester. The issue of the degree is liable to be withheld in such cases.

9.0 TRANSITORY REGULATIONS:

Candidate who have discontinued or have been detained for want of attendance or who have failed after having undergone the course are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to 5.5 and 2.0

10.0 GENERAL:

- 10.1 The academic regulations should be read as a whole for purpose of any interpretation.
- 10.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 10.3 The University may change or amend the academic regulations and syllabus at any time and the changes and amendments made shall be applicable to all the students with effect from the date notified by the University.
- 10.4 Wherever the word he, him or his occur, it will also include she, her and hers.
- 10.5 There shall be no transfers within the constituent colleges of Jawaharlal Nehru Technological University.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical

	after the examination.	examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class-work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination center from the college to another college for a specific period of not less than one year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH (ENVIRONMENTAL ENGINEERING)
COURSE STRUCTURE AND SYLLABUS

I YEAR I SEMESTER

Code	Group	Subject	L	P	Credit
		Computer Programming and Numerical Methods	3	0	3
		Environmental Chemistry and Microbiology	3	0	3
		Advanced Water Supply Systems	3	0	3
		Waste Treatment Systems	3	0	3
	Elective –I	Watershed Management Environmental Hydrology Environment and Ecology	3	0	3
	Elective –II	Environmental Sanitation Environmental System Engineering Climatology	3	0	3
	Lab	Environmental Engineering Lab-I	0	3	2
		Seminar	-	-	2
		Total Credits (6 Theory + 1 Lab.)			22

I YEAR II SEMESTER

Code	Group	Subject	L	P	Credit
		Air Pollution and Control	3	0	3
		Industrial Waste Water Treatment	3	0	3
		Solid Waste Management	3	0	3
		Environmental Impact Assessment	3	0	3
	Elective –III	Ground Water Contamination and Remediation Disaster management Water Quality Modeling	3	0	3
	Elective -IV	Environmental Geotechnology Remote Sensing and GIS Environmental Biotechnology	3	0	3
	Lab	Environmental Engineering Lab-II	0	3	2
		Seminar	-	-	2
		Total Credits (6 Theory + 1 Lab.)			22

II YEAR - I Semester

Code	Group	Subject	L	P	Credit
		Comprehensive Viva	-	-	2
		Project Seminar	0	3	2
		Project work	-	-	18
		Total Credits			22

II YEAR - II Semester

Code	Group	Subject	L	P	Credit
		Project work and Seminar	-	-	22
		Total Credits			22

COMPUTER PROGRAMMING AND NUMERICAL METHODS

Unit I:

Programming language-Introduction-An over view of programming in C-variables and data types-Declaration of variables-Initialization of variables-operators-arithmetic operators-precedence and associability-Input and output-Character I/O-Formatted output. Printf ()-Formatted input scanf ()-Examples. C Programming Language-Control structures-If statement-Switch statement-loops-nested loops-while and for, Do-While-continue statement-Go to statement-Examples.

UNIT II:

C Programming Language-Arrays-One dimensional Arrays-Two Dimensional Arrays - pointer operators - pointer arithmetic - pointers and arrays - Matrix manipulations using arrays and pointers - pointers to functions - data files - basic operations - reading and writing and file accessing files - examples. Computer Graphics – introduction - applications graphic devices - display devices - output and input devices-two dimensional geometric transformations-homogeneous co-ordinates - world co-ordinates-device co-ordinates-window to view port-transformations-clipping operations.

Unit III

Solution of higher order algebraic equations and transcendental equations – Direct iteration method and Newton Raphson method. Solution of Simultaneous linear algebraic equations, Gauss elimination, Gauss Jordan elimination, matrix inversion and Cholesky's methods – Gauss Sidel iteration method

UNIT IV.

Finite Differences : Forward, backward and central differences – Gregory Newton and Lagrangian interpolations – Numerical integration : trapezoidal, Simpson's 1/3rd and 3/8 rules.

UNIT V

Solution of Differential equations : Ordinary Initial value problems, Taylor series, Euler Gauss, Runge Kutta, Milnes and Adams methods – Solutions of partial differential equations of Laplace and Poisson types using Gauss-Sidel iteration.

TEXT BOOKS

Programming C by Balaguru Swamy- Tata Mc-Graw Hill Publishing Co.Ltd.-New Delhi
Numerical Methods by Raja Raman V - PHI Learning (2008)

REFERENCE BOOKS:

Salvadori and Baion : Numerical Methods in Engineering - Prentice-Hall publishers
Froberg C.E. : Introduction to Numerical Analysis - Addison-Wesley Pub. Co.publishers
Mc. Craken D.C. and Pron W.S. : Numerical Methods and Fortran Programming.
Let us C – Yashwant Kanetkar - BPB Publications

ENVIRONMENTAL CHEMISTRY AND MICTO BIOLOGY

UNIT-I

Introduction – Water and Waste Water Characteristics, Principles of Analysis – Valency – Oxidation State and Bonding – Instrumentation Techniques.

UNIT II.

Concepts of Equilibrium Chemistry – Le-Chatlier's principle, Factor influencing equilibrium – Activity Coefficient- Variations of the equilibrium relationship -Oxidation Reduction reactions – Gas laws – acids and bases – buffers – solubility of salts

UNIT III.

Action kinetics – rate of reactions – factors effecting, order of reactions – biodegradation – BOD, COD.

UNIT IV.

Cell Kinetics – Energy (Aerobic and anerobic) reactions – Effects of Physical and Chemical agents on Cell control study of Protozoa, Bacteria, Viruses, Algae and fungi and their classification and significance – Enzyme Reaction.

UNIT V.

Applied Microbiology of water, waste water, soil, food and air. Applications in the field of environmental engineering

TEXT BOOKS:

1. Environmental Pollution Control Microbiology (Civil and Environmental Engineering) by McKinney - Marcel Dekker Inc publishers
2. Chemistry for Environmental Engineers by sawyer and McCarty - Tata McGraw-Hill Education(2003)

ADVANCED WATER SUPPLY SYSTEMS

UNIT I

Principles of Sedimentation – Classes of Sedimentation Factors affecting efficiency concepts of tube settlers, flow dispersion patterns, sludge removal devices, coagulation-stability of colloids -theory of coagulation – coagulant aids -dosing and mixing devices - velocity gradients - design of clarifloculator units- flotation - diffused air flotation and dissolved air flotation.

UNIT II

Theory of filtration – Hydraulics of flow through porous media, backwashing, different types of filters, components and appurtenances. Filtrability index, mathematical modeling, Design of filters slow / rapid / multimedia filters – filter kinetics.

UNIT III

Theory of disinfection – factors affecting disinfection – kinetics of disinfection – types of chlorine compounds – chlorination chemistry.

UNIT IV

Advanced treatment systems – principles of aeration - theories of adsorption – Principles of mass transfer, adsorption Isotherms, rate of Sorption, activated carbon, ion exchange process – materials, reactions, operatic methods and applications, removal of Hardness, Iron, requirement of Chemicals.Membrane processes – separation – Reverse osmosis practical uses, Dialysis.Corrosion control and water conditioning

UNIT V

Water distribution systems – Design of distribution Networks using software techniques. Hardy cross methods – equivalent pipe method – Analysis of networks

TEXT BOOKS:

1. Water and Wastewater Engineering: Water Supply and Wastewater Removal- by Fair, Geyer and Okum. - John Wiley & Sons Canada, Limited
2. Physicochemical Processes: For Water Quality Control by W.J. Weber - John Wiley & Sons, 1972

REFERENCE BOOKS:

1. Unit operations of Sanitary Engineering by linvil rich- Wiley, New York, 1961
2. Water And Wastewater Technology by Hammer Mark J., Hammer Mark J.- Prentice- Hall New Arrivals

WASTE TREATMENT SYSTEMS

UNIT I

Waste Water - Characteristics - Waste treatment, Unit operations, general principles and layout, BOD – COD Kinetics.

UNIT II

Primary treatment – Screens, Grit chamber – Skimming tanks - operations / unit designs – Primary Settling tanks – design principle – Operation and maintenance.

UNIT III

Secondary treatment - Aerobic, anaerobic units, Design and working of Activated sludge units – loading aeration requirements, methods of Aerations and modifications, sludge volume index, variations in activated sludge units – principles of obtaining kinetic parameters such as U_m , K_s , k , y_T , k_d as per randall - Design and operations of Trickling filters, loading efficiency – requirements, recirculation, highrate filters, rotating biological discs.

UNIT IV

Tertiary treatment – Nitrogen and Phosphorous removal – Heavy metals removal – Refractory organics – Waste water disinfection.

UNIT V

Sludge treatment and disposal - conditioning digester and sludge disposal systems. Design considerations – Principles of Up flow Anerobic Sludge bBanket (UASB)

TEXT BOOKS:

1. Wastewater Engineering by Metchal and Eddy- Tata McGraw-Hill Education
2. Environmental Systems Engineering by L.G. Rich - Tata McGraw-Hill
3. Water and Wastewater Engineering: Water Supply and Wastewater Removal- by Fair, Geyer and Okum. - John Wiley & Sons Canada, Limited
4. Biological Process Design for Wastewater Treatment (Prentice-Hall series in environmental sciences) by Clifford W. Randall, Larry W. Benefield - Prentice Hall (1980-01)
5. Water and Waste Treatment by E.D. Schrodler - Tata McGraw-Hill Education

WATERSHED MANAGEMENT
(ELECTIVE -I)

UNIT - I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multi-disciplinary approach for watershed management.

UNIT – II

Characteristics and principles of Watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds. Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

UNIT - III

Measures to Control Erosion and water harvesting: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion. Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT – IV

Land & Ecosystem Management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils. Role of Ecosystem, crop husbandary, soil enrichment, Inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

UNIT – V

Planning of watershed management activities: peoples participation, preparation of action plan, administrative requirements.

TEXT BOOKS:

1. Land and Water Management by VVN Murthy, Kalyani Publications.
2. Watershed Management by JVS Murthy, New Age International Publishers.
3. Water Resource Engineering by R.Awurbs and WP James, Prentice Hall Publishers.

ENVIRONMENTAL HYDROLOGY
(ELECTIVE -I)

UNIT I

Uniform and Non-uniform flow in sewers and channels, gradually and rapidly varied flow in channels,

UNIT II

Hydrologic Cycle and its interaction with human activity, systems concepts, hydrologic model classification.

UNIT III

Hydrologic Processes, Reynolds Transport theorem, Continuity equation, discrete time continuity momentum equations, energy balance, Transport processes, Porous medium flow, open channel flows.

UNIT IV

Atmospheric and Subsurface water, atmospheric circulation, water vapour, Precipitation, Evaporation, Infiltration, Unsaturated flow.

UNIT V

Surface water - Stream flow hydrograph, excess rainfall and Direct runoff, abstractions using infiltration equations.

TEXT BOOKS:

1. Chow, V.T. (1979) "*Open Channel Hydraulics*", McGraw Hill Inc. N.York.
2. Chaudhry M.H. (1994), "*Open-Channel Flow*", Prentice Hall of India, N.Delhi.
3. Chow, V.T., Maidment, D.R. and Mays, L.W., "*Applied Hydrology*", McGraw Hill Inc., 1988.
4. Singh, V.P., "*Hydrologic Systems*", Prentice Hall Inc., 1986.
5. Viessman, W., Lewis, G.L. and Knapp, J.W., "*Introduction to Hydrology*", Harper & Row Publications Inc., Singapore, 1989.
6. Raudkivi, A.J., "*Hydrology*", Pergamon Press, 1979.

ENVIRONMENT AND ECOLOGY
(ELECTIVE -I)

UNIT I

Environment, Ecology and Sustaining the Earth; Nature and Humans: Earth, population, environment.

UNIT II

Ecosystems; Ecosystems, ecology of populations, human population dynamics – growth and urbanization; environmental economics and politics.

UNIT III

Ecological Balances – Material cycles in ecosphere, Matter and Energy Resources; Energy flow in ecosystems; bio-geochemical systems.

UNIT IV

Air, Water and Soil Resources: Air Resources, pollution, global warming, ozone depletion; water resources – surface and groundwater, sources of pollution; soil resources – conservation, contamination, salt water intrusion, hazardous wastes.

UNIT V

Living Resources Food resources, pesticides, pest control: land resources – forests, wetlands, wilderness, national parks; wild plants and animal resources, Energy and Mineral Exploitation: perpetual and renewable energy; non-renewable energy; non-renewable mineral resources, solid and hazardous wastes.

TEXT BOOKS:

1. Environmental Science by Tyley Miller- Brooks Cole(2012)
2. Concepts Of Ecology by Edward J Kormondy - Phi Learning(2009)

ENVIRONMENTAL SANITATION
(ELECTIVE-II)

UNIT I

Epidemiology – Principles of protecting the environmental sanitation measures, Inspect and Rodent Control, community sanitation measures – sanitation of camps, festivals, schools, swimming pools etc.

UNIT II

Food and milk sanitation, hotel management with reference to sanitation – food preservation, pasteurisation methods and plants. Housing need – lighting and ventilation, natural and artificial provisions.

UNIT III

Solid wastes – characteristics, collection, disposal by landfill, composting, incineration and other methods. Handling and disposal of Hazardous Wastes. Industrial Hygiene – Occupational hazards – Various operations in industrial units, Engineering and safety measures. Radiological health – radioactive wastes and disposal.

UNIT IV

Noise Pollution and control – Engineering and medical divisions – various programmes. Rural sanitation various methods of collection and disposal of fecal matter – community toilets – septic tanks and soakpits – biogas plants.

UNIT V

Public Health – Occupational hazards, Industrial hygiene, Rural Water Supply and sanitation, biogas – community toilets

TEXT BOOKS:

1. Municipal and Rural Sanitation (Sanitary Science & Water Engineering) by V. M. Ehlers, Ernest W. Steel- Tata Mcgraw-hill Education(1977)
2. Environmental Sanitation by Joseph A. Salvato - John Wiley & Sons Inc
3. Environmental Protection by Emil T. Chanlett - Mcgraw-hill Inc.,us

ENVIRONMENTAL SYSTEMS ENGINEERING
(ELECTIVE-II)

UNIT-I

Physical – Chemical & biologic Phenomena: Gas transfer, Reaction Kinetics, Carbonate equilibrium, Organic materials, micro organisms

UNIT-II

Microbial growth kinetics, Microbiology and Ecology: Models, Time-Domain simulation, continuous flow microbiological systems-pesticide concentration, Eutrophication.

UNIT-III

Natural transport systems, Planning factors: Basic Models-DO system- streams-Estuaries-Transport-water quality criteria-Air Pollution-EIS

UNIT-IV

Population growth models, Engineered transport systems: Population Growth models-Regional growth models; Engineered transport systems-Pipe network analysis- water distribution system-Domestic waste water collection-storm water collection system

UNIT-V

Treatment process, Individual household systems: Treatment- Lagoon systems- Renovation systems

TEXT BOOKS:

1. Sincero and Gregoria, Environmental Engineering: A Design Approach, PHI Learning, 2009
2. Schnoor, J.L., Environmental Modelling: Fate and Transport of Pollutants in Water, Air and Soil, John Willey and Sons, 1996
3. Rich, L.G., Environemntal Systems Engineering, McGraw Hill Inc, 1975

CLIMATOLOGY
(ELECTIVE-II)

UNIT - I

Temperature: Temperature at the Earth's surface as a function of latitude, effect of land and sea on the temp distribution, Annual Variation of temp, diurnal variation of temp, temp distribution at higher altitudes.

UNIT - II

Wind and Pressure: wind and pressure distribution at the earth's surface, effect of land and sea on wind and pressure distribution, Monsoon circulation; wind and pressure distribution at higher levels

UNIT - III

Precipitation: Annual Precipitation over the Earth as a function of latitude, effect of continents and oceans on the distribution of precipitation, precipitation and altitude, annual variation of precipitation, diurnal variation of precipitation

UNIT - IV

Weather and Climate, factors on which climate of a place depend; classification of climates, Koeppen's climate classification, Thornthwaite's Climate classifications, Climatic regions of the world. SOI, El Nino, ENSO, IOD; Basic concepts of Global warming and climate change

UNIT - V

Indian Climatology: Four Meteorological seasons in India – Climatology. Mean M.S.L. pressure, Temperature, Rainfall and upper wind patterns. General Circulation of the Atmosphere

TEXT BOOKS:

1. An introduction to climate by G.T. Trewartha
1. Climatology by B. Haurwitz and J.M. Austin - McGraw-Hill Inc.,US
2. General climatology by H.J. Critchfield- Prentice-Hall, 1974

REFERENCE BOOK:

1. An introduction to climate by G.T. Trewartha- McGraw-Hill, 1968

ENVIRONMENTAL ENGINEERING LAB-I

Determination of the following parameters:

1. Chlorine in Bleaching powder
2. Break point chlorination
3. Fluoride
4. Iron
5. Manganese
6. Sulphate
7. Phosphate
8. Ammonical nitrogen
9. Nitrates
10. BOD
11. COD
12. Phenols

AIR POLLUTION AND CONTROL

UNIT I

Sources of Air pollution, effects of Air pollution on plants, animals, human health, classification of pollutants, properties of gaseous and particulate matter,

UNIT II

Atmospheric transport of pollutant – winds – wind profiles, inversions, plume behaviour, convective current – turbulence – Dispersion and diffusion of Air pollution – ground level concentrations gaussian model. Air sampling and analysis, theory and equipment ambient and Stack sampling, monitoring of quality emission standards – Indoor air pollution

UNIT III

Control of Particulate matter – Dusts, fumes, smoke, samples, settling chambers, cyclones, spray towers, electrostatic precipitators, etc. for control.

UNIT IV

Gaseous pollutants – absorption, adsorption, combustion and other methods of removal.

UNIT V

Automobile pollution – analysis and control of emissions. Air fuel ratio – types of flues - Air pollution legislation – Act and other provisions.

TEXT BOOKS:

1. Air pollution control theory by Martin Crawford - McGraw-Hill, 1976
2. Air pollution control by A.c. Sten.
3. Air pollution control by H.C. Perkins - McGraw-Hill, 1974
4. Air pollution control by Joe O. Ledbetter- Dekker, 1972
5. Air pollution: its origin and control by Kenneth Wark, Cecil Francis Warner, Wayne T. Davis - John Wiley & Sons Inc

INDUSTRIAL WASTE WATER TREATMENT

UNIT I:

Pollutants from industrial effluents – sources, effects on streams, sewers, land – organic load on rivers. Basic theories of Industrial waste water management. Inplant survey – composite sampling - Tolerance limits for effluents discharges into inland surface water's public sewers, and onland for irrigation – standards.

UNIT II

Volume and strength reduction, neutralization, equalization and proportioning, recovery and recycle of waste products and bye products – joint treatment of Industrial wastes and domestic sewage – discharge into water bodies, consequent problems.

UNIT III

Characteristics and composition of wastes from specific manufacturing units like, paper and pulp, textile, tannery, sugar industries.

UNIT IV

Treatment of Industrial waste from distilleries, dairy, fertilizer plant, steel plant.

UNIT V

Oil refiners, pharmaceutical plants, Thermal power plants and radioactive wastes. Treatment units for the above industrial effluents.

TEXT BOOKS:

1. Wastewater Treatment by M.N. Rao and A.K. Datta - Oxford I.B.HPublishers
2. Handbook of Industrial Waste Disposal by Richard A. Conway Richard Ross - Van Nostrand publisher(1980)
3. Industrial Waste Treatment: Contemporary Practice and Vision for the Future by Nelson Leonard Nemerow, Nemerow – Butterworth heinemann publisher (2006)

SOLID WASTE MANAGEMENT

UNIT I

Types and Sources of solid wastes – Need for solid and hazardous waste management – Legislations on management and handling of municipal solid wastes, hazardous wastes and biomedical wastes.

UNIT II

Waste generation rates – Composition – Hazardous Characteristics – TCLP tests – Waste sampling – Source reduction of wastes – Recycling and reuse.

UNIT III

Handling and segregation of wastes at source – Storage and collection of municipal solid wastes – Analysis of collection systems – Need for transfer and transport – Transfer stations – labeling and handling of hazardous wastes

UNIT IV

Waste processing – Processing technologies – biological and chemical conversion technologies – Composting – Thermal conversion technologies – Energy recovery – Incineration – Solidification and stabilization of hazardous wastes – treatment of biomedical wastes.

UNIT V

Disposal in landfills – site selection – design and operation of sanitary landfills – secure landfills and landfill bioreactors – Leachate and landfill gas management – Landfill closure and environmental monitoring - landfill remediation

Elements of integrated waste management

TEXT BOOKS:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw-Hill, New York, 1993
2. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000

ENVIRONMENTAL IMPACT ASSESSMENT

UNIT-I:

Basic concept of EIA and Methodologies : Initial environmental Examination, Elements of EIA, - factors affecting E I A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT-II:

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis.

UNIT-III:

Impact of Developmental Activities and Land use. Introduction, Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities. Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT-IV:

Prediction and Assessment of Impact: Quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

UNIT-V:

Environmental Audit & Environmental legislation: objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report. Post Audit activities : The Environmental pollution Act, The water ;Act, The Air (Prevention & Control of pollution Act.), Mota Act. Wild life Act. Case studies and preparation : of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCE BOOKS:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

GROUND WATER CONTAMINATION & REMEDIATION
(ELECTIVE -III)

UNIT I.

Introduction: The Hydrological Cycle, Ground water Contamination and Transport, Ground Water remediation, Sources and Types of Ground water contamination Introduction, Under Ground storage Tanks, Land fills, surface impoundment's, Waste disposal Injection wells Septic systems, Agricultural wastes, land applications, Radioactive contamination, other sources of contaminants, Data-collection methods: Introduction, Geological data acquisition, and hydrologic data acquisition, acquisition of soil and ground water quality data.

UNIT II.

Contaminant transport Mechanisms: Introduction, advection processes, diffusion and dispersion processes, Mass- transport equations, one dimensional model, Governing flow and transport equation in two dimensions, semi-analytical methods, test for dispersivity, Natural gradient field test for dispersion.

UNIT III.

Sorption and other Chemical Reactions: Introduction, the concept of sorption, factor influencing sorption, sorption Isotherm, Hydrophobic theory for organic contaminant's, sorption effects on fate and transport of pollutants, Estimation of sorption, Redox reaction, Hydrolysis, volatilization, Acid-Base reaction, Ion exchange, dissolution and precipitation of solids, complication reaction, models incorporating chemical reactions.

UNIT IV

Flow and Transport in the Unsaturated Zone: Capillarity, soil-water characteristics curves, unsaturated hydraulic conductivity, governing equation for unsaturated flow, measurement of soil properties.

UNIT V.

Nonaqueous- Phase Liquids: Introduction, Types of NAPLs, NAPL transport- General processes, NAPL transport- computational methods- Fate of NAPLs in the sub surface, characterizing NAPLs at remediation sites.

TEXT BOOK:

1. Ground water contamination (Transport and remediation) - Philip.B.Bedient, Hanadi.S. Rifai & Charles.J.Newell Publishers: Prentice Hall.

DISASTER MANAGEMENT
(ELECTIVE -III)

UNIT-I:

Overview of Natural disasters- Tropical cyclones, Floods, Droughts, Earthquakes & Tsunamis, Severe Thunderstorms & Tornadoes- Need for Disaster Management Plan;

UNIT-II: Cyclone warning system in India- cyclone disaster management plan, Floods-Flood management in India; Warning system for major river basins-Role of Central Water Commission; Water purification technologies in flood affected areas, Droughts-Meteorological drought and agricultural drought; monsoon long range Forecasts- Drought management plan-parameters & assessment; Drought Monitoring

UNIT-III:

Earthquakes-seismicity in India-status of prediction and disaster management; Tsunamis; Landslides and Avalanches; Volcanoes

UNIT-IV:

Hazards associated with convective clouds-Thunderstorms-Lightning; Tornadoes Waterspouts-Hail storms, Aviation hazards and safety measures.

UNIT-V:

Key Factors in Disaster management – Early warning, communications, Response by administration, Disaster Management & Mitigation- National Disaster Management Authority (NDMA) Govt of India.

TEXT BOOKS:

1. Natural Disaster Management: New Technologies and Opportunities by Subir Ghosh; Icfai University Press
2. Earth and Atmospheric Disasters Management by N.Pandharinath and C.K.Rajan, BS Publication

REFERENCE BOOK:

1. Natural Hazards and Disaster Management by R.B.Singh; Rawat Publication

WATER QUALITY MODELLING
(ELECTIVE -III)

UNIT-I:

Introduction: Water Quality, Water quality characteristics, sampling and analysis, Analytical methods, Automated analysis and remote monitoring.

UNIT-II:

Water quality monitoring: Water Pollution, Sources of Pollution, Nature of pollutants, Existing Approaches for Control/ - Abatement of Water Quality Degradation, Water Quality Monitoring in River Basins

UNIT-III:

Water quality modeling: Modelling and Monitoring, Evolution of Water Quality Models, Types of Water Quality Models, DO and BOD in streams, Transformation and transport processes, Oxygen transfer, Turbulent mixing, Non-Point Source Pollution, Modelling Approaches For Modeling Non-point Sources.

UNIT-IV:

Water Quality Management: Water quality objectives and standards, Water quality control models, Flow augmentation, River and Lake water quality Models, Groundwater quality Models, Wastewater Transport Systems.

UNIT-V:

Legal Aspects of Water quality: Water pollution control acts and Legislation.

TEXT BOOKS:

1. Tebutt, T.H.Y., (1998), "Principles of Water Quality Control", Pergamon Press, Oxford
2. Gerard Kiely, (1998), "Environmental Engineering", McGraw Hill Publications
3. Viessman, W. Jr and M.J. Hammer (1985), "Water Supply and Pollution Control", Harper and Row Publishers, New York.
4. Jerald L. Schnoor, (1996), "Environmental Modeling – Fate and Transport of Pollutants in Water, Air and Soil", John Wiley & Sons Inc., New York.

ENVIRONMENTAL GEOTECHNOLOGY
(ELECTIVE -IV)

UNIT I

Soil as a multiphase system; Soil-environment interaction; Properties of water in relation to the porous media; Water cycle with special reference to soil medium. Soil mineralogy – Soil behavior – Mineralogical characterization.

UNIT II

Mechanisms of soil-water interaction: Diffuse double layer models; Force of attraction and repulsion; Soil-water-contaminant interaction; Theories of ion exchange; Influence of organic and inorganic chemical interaction.

UNIT III

Introduction to unsaturated soil mechanics; Water retention property and soil-water characteristic curve; flow of water in unsaturated soil.

UNIT IV

Concepts of waste containment facilities; desirable properties of soil; contaminant transport and retention; contaminated site remediation.

UNIT V

Introduction to advanced soil characterization techniques; Volumetric water content; gas permeation in soil; electrical and thermal properties; pore-size distribution; contaminant analysis.

TEXT BOOKS:

1. Mitchell, J.K and Soga, K Fundamentals of Soil Behaviour, John Wiley and Sons Inc., 2005
2. Fang, H-Y, Introduction to Environmental Geotechnology, CRC Press, 1997.
3. Daniel, D.E, Geotechnical Practice for Waste Disposal, Chapman and Hall, 1993.
4. Rowe, R.K., Quigley, R.M. and Booker, Clay Barrier Systems for Waste Disposal Facilities, J.R., E & FN Spon, 1995.
5. Rowe, R.K., Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic publishers, 2001
6. Reddi, L.N. and Inyang, H.F, Geoenvironmental Engineering – Principles and Applications, Marcel Dekker Inc, 2000
7. Sharma, H.D, and Lewis, S.P, Waste Containment Systems, Waste Stabilisation and Landfills: Design and Evaluation, John Wiley & Sons Inc., 1994

REMOTE SENSING AND GIS
(ELECTIVE-IV)

UNIT I.

Introduction: Energy-electromagnetic radiation, radiation principles, electromagnetic spectrum, ideal remote sensing system, energy interaction with atmosphere, atmospheric windows, Energy interaction with earth surface feature, spectral signature, Multi concept of remote sensing.

UNIT II.

Sensor System: Various types of platforms, different types of sensors, Indian remote sensing systems, data acquisition, spatial, spectral & radiometric resolution, thermal sensors, fundamentals of microwave remote sensing.

UNIT III

Digital Image Processing: Operations involved in Digital Image Processing, source of image acquisition, data preprocessing – atmospheric, radiometric, geometric. Histograms, density slicing, grey level mapping, contrast stretching, filtering, principal component analysis, basic pattern recognition concepts, and discrimination functions. Data Products and Interpretation: Various data products, characteristics, principles of interpretation, ground control points, ground truth.

UNIT IV.

Geographic Information Systems: Definition, functions of GIS, types of data – spatial, non spatial, point, line, polygon, vector and raster. Database, digitizer, scanner, spatial analysis, overlay, query. Sample analysis, modeling in GIS, DEM, DTM, path analysis. Introduction to GIS packages.

UNIT V.

Application of Remote Sensing and GIS to Water Resources Land Use Land Cover mapping, determination of crop characteristics, ground water, pollutant mapping, snow mapping, rainfall measurement, weather monitoring, soil erosion, soil classification, water shed prioritization, solid waste collection, water supply.

TEXT BOOKS:

1. Meijerink M J, HAM de Brouwer , C M Mannaerts, C R Velenzuela, (1994), “Introduction to the Use of Geographical Information Systems for Practical Hydrology”, ITC publication no. 23, UNESCO, Paris
2. Lillesand T M and R W Keifer (1994), “Remote Sensing and Image Interpretation”, John Wiley & Sons, N York
3. Swain P H and S M Davis (1987), “Remote Sensing – The Quantitative Approach”, McGraw-Hill Pub. Co. N York
4. Agarwal C S and P K Garg (2000), “Textbook on Remote Sensing in Natural Resources Monitoring and Management”, Wheeler Publishing , Allahabad.

ENVIRONMENTAL BIOTECHNOLOGY
(ELECTIVE-IV)

UNIT I

Environmental Biotechnology – Principles and concepts –usefulness to mankind. Degradation of high concentrated toxic pollutants – halogenated non halogenated, petroleum hydrocarbons, metals- Mechanisms of detoxification – oxidation – dehalogenation- biotransformation of metals – biodegradation of solid wastes.

UNIT II

Biotechnological remedies for environmental pollution- decontamination of groundwater- bioremediation – Production of proteins- biofertilizers – Physical, chemical and microbiological factors of composting – health risk- pathogens- odor management.

UNIT III

Mircobial cell/enzyme technology – adapted microorganisms – biological removal of nutrients – algal biotechnology – extra cellular polymers – Biogas technology.

UNIT IV

Concept of rDNA technology – expression vectors – cloning of DNA mutation – construction of microbial strains – radioactive probes – protoplast fusion technology applications.

UNIT V

Environmental effects and ethics of microbial technology – genetically engineered organisms – Microbial containment – Risk assessment.

TEXT BOOKS:

1. Chaudhury, G.R. Biological degradation and bioremediation of toxic chemicals, Dioscorides Press, Oregon, 1994.
2. Martin. A.M. Biological degradation of wastes, Elsevier Applied Science, London, 1991.
3. Blaine Metting .F (Jr.,) Soil Microbiology Ecology, Marcel Dekker Inc., 1993.

ENVIRONMENTAL ENGINEERING LAB-II

- PART A:
1. Standard plate count test
 2. MPN
 3. Morphology of Algae, Fungi, Protozoa and Various insects.
- PART B: Experiments using the following instruments
1. Spectrophotometer
 2. Mercury Analyzer
 3. Flame Photometer
 4. High Volume Sampler
 5. Stack Monitoring Equipment
 6. Noise Level Meter
 7. Meteorological instruments.