

# PROSPECTUS

for  
M. Tech. Programme in  
"Conservation of Rivers & Lakes"  
(CRL)

Sponsored by  
National River Conservation Directorate  
Ministry of Environment & Forests  
Government of India

**Academic Session  
2005-2006**



**INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE**



National Workshop with stakeholders for consultation on M. Tech. programme in "Conservation of Rivers & Lakes" (March, 2004)



UASB Sewage Treatment Plant at Kankhal (Hardwar)



UASB Sewage Treatment Plant at Kankhal (Hardwar)



FAB STP-PUNE



Powai Lake Conservation - Mumbai



M.Tech. Students at Oxidation pond at Kankhal (Hardwar)

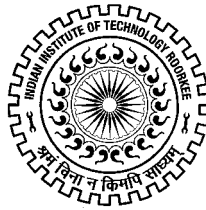
Only for sponsored candidates

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**INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE**  
**(UTTARANCHAL), INDIA**

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# 1.0 INTRODUCTION

## 1.1 NEED FOR THE PROGRAMME

The programme of pollution abatement of rivers was started by the Government of India in the Ministry of Environment & Forests with the launching of the Ganga Action Plan (GAP) Phase I in June 1985. A Central Ganga Authority under the Chairmanship of Prime Minister was constituted to finalize the policy framework and to oversee the implementation of the Action Plan. Chief Ministers of concerned States, Union Ministers and Secretaries of the concerned Central Ministries and experts were its members. This plan was a 100% Centrally Sponsored Scheme. Later in April 1993, Yamuna and Gomti Action Plans were approved under a new scheme of GAP Phase II. This was followed by approval of pollution abatement programmes of other polluted rivers of the country in July 1995 under the National River Conservation Plan. The Central Ganga Authority was reconstituted and named as the National River Conservation Authority under the Chairmanship of the Prime Minister. Both GAP Phase II and NRCP were approved as Centrally Sponsored Schemes with 50:50 cost sharing basis between the Central and the concerned State Governments. Ganga Action Plan Phase-II was later merged with NRCP in December 1996.

National River Conservation Plan at present extends to 157 towns along 31 polluted stretches of major rivers in 18 States. The various components included under the scheme are laying of sewers, construction of sewage treatment plants, pumping stations, management of solid waste, provision of low cost toilets and crematoria, shifting of dhobi ghats, improvement of bathing ghats, afforestation along rivers, public participation facilitate in improving the environment within the town. The share of the Central Government in the programme is now limited to 70% of the total cost of the new scheme with the remaining 30% cost coming from State Government/local bodies. The Operation & Maintenance of all assets is the responsibility of the State Government/local bodies.

Apart from this, the Ministry is implementing the National Lake Conservation Plan (NLCP) with a funding pattern of 70:30 between the Central & State Governments. The objective of the scheme is to take up conservation of urban lakes as they are seriously threatened with environmental degradation. The thrust under the plan is to undertake *in situ* remedial measures for the lakes such as interception, diversion and treatment of sewage discharged into the lakes, solid waste management, catchment area treatment and lake front development (beautification). So far 26 lakes have been taken up for conservation and improvement under NLCP.

The need to have adequate and properly trained manpower in the various scientific & technical, social, economic, administrative aspects of conservation of rivers and lakes has long been felt. The Ministry of Environment & Forests (MoEF), Government of India, have the responsibility of the National River/Lake Conservation programmes. Trained manpower is needed, among other items, to:

- Prepare and implement programme/projects / schemes of environmental conservation
- Operate and maintain the assets created under conservation of water bodies
- Monitor the environmental status of rivers and lakes

In order to move towards training manpower, the Ministry of Environment and Forests has sanctioned the funding of an interdisciplinary Master of Technology (M. Tech.) programme in “*Conservation of Rivers and Lakes*” at Indian Institute of Technology, Roorkee (IITR) for the officers from Central, State and local governments and their organisations involved in river and lakes conservation programme.

Departments including Alternate Hydro Energy Center (AHEC), Biotechnology, Chemical Engineering, Civil Engineering, Hydrology and Management Studies at IITR is offering this programme with the AHEC as the Coordinating Department.

## **1.2 ABOUT INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE (IITR)**

Roorkee is the oldest seat of technical education in the East. The erstwhile Thomason College of Engineering was founded in 1847 and was raised to the status of the University in 1949 having the distinction of becoming the first technical University in India. University of Roorkee has been converted to Indian Institute of Technology, Roorkee (IITR) on September 21, 2001. During the past 157 years, the Institute has played a leading role in development of the country through technical education, research and extension services. The faculty and alumni of the Institute have distinguished themselves in India and abroad through their contributions & achievements. Delivering the centennial address, Pandit Gobind Ballabh Pant, the first Chief Minister of Uttar Pradesh, described the then University of Roorkee (Now Indian Institute of Technology, Roorkee) as “the jewel in the Crown of Uttar Pradesh”.

The Institute has Engineering, Science & Humanities departments besides a number of centres of higher education and research. Roorkee has the added advantage of availing the facilities of State Irrigation Research Institute, the Bengal Engineering Group & Centre of the Army Corps of Engineers, National Institute of Hydrology and Central Building Research Institute.

## **1.3 ABOUT ROORKEE**

Roorkee (Latitude 29° 52'00" N and Longitude 77° 53' 52") is a small town in Haridwar district of newly created Uttaranchal State. Its elevation is 261m above mean sea level. On a clear day, it presents a fine view of snow clad Himalayan peaks. The place is within easy reach from New Delhi, the capital of India, the distance being about 180 kilometers by road. It is also connected by Rail.

The temperature ranges from 5°C to 20°C in winter (October to March) and from 25° to 40°C in Summer (April to September). The average annual rainfall is 1100 mm & bulk of it occurs from middle of June to middle of September.

IITR is a fully residential Institute. The course participants will be provided accommodation in the bachelor hostels (called Bhawans) of the Institute. However, limited family accommodation, as and when available, may also be provided.

## **1.4 ABOUT PARTICIPATING DEPARTMENTS**

### **1.4.1 Alternate Hydro Energy Centre**

AHEC has been imparting training to the field engineers and technologists through short term training courses to create trained human resource in the field of renewable energy. AHEC offers a four semesters Master of Technology (M.Tech.) course in ‘Alternate Hydro Energy Systems’ open to engineers, technologists, officers and scientists drawn from India and other developing nations. AHEC also offers two elective subjects on Renewable Energy to engineering bachelor students of the Institute.

The Centre has vast experience of working on various aspects of Small Hydro Power (SHP) projects in the country. The center is also engaged, since its inception, in the area of environment & handled a number of projects. Assignments on Environment Impact Assessment of small hydro projects and eco-restoration of water bodies like preparation of conservation and management plan of Dal & Nagin lake in Srinagar (J&K), Nainital & 4 lakes in Uttaranchal etc. have been carried out.

Faculty of AHEC drawn from multi disciplinary fields of Civil, Mechanical, Electrical, Chemical, Electronics and Computer Engineering have gained excellent expertise in the entire gamut of activities related to renewable energy and Eco-restoration. AHEC has been awarded a Citation by Indian Renewable Energy Development Agency Limited (IREDA), a Govt. of India Enterprise (in 1997) and Surya Award (2nd Prize) by Indian Institute of Rural Development and Social Sciences (in Sept. 2002) in appreciation and recognition of its commendable and outstanding contribution in Renewable Energy sector. AHEC has also been honoured in Jan. 2004 by Solar Energy Society of India, with SESI Business leadership award for Hydropower for the year 2003.

AHEC has signed Memorandum of Understanding (MoU) to work as an expert organisation for SHP development with Uttaranchal State Government, Bihar State Hydroelectric Power Corporation Himurja (Govt of Himachal Pradesh) and J & K State Power Development Corporation. Recently it has set up instrumentation laboratory to provide independent performance testing of small hydropower plants as the sole certifying testing organisation.

A real time digital SHP simulator is being established at AHEC to design, simulate and impart training for small hydropower plants

#### **1.4.2 Department of Biotechnology**

A center of Bio-sciences was started in 1980 and was upgraded to a full-fledged academic Department of Bio-sciences and Biotechnology in 1986. It has been renamed as Department of Biotechnology in the year 2002. It has teaching and research programmes, which draw heavily on the basic knowledge of modern biology, biochemistry, biophysics and chemical engineering, particularly at cellular and molecular levels. The Ministry of Human Resource Development (MHRD) has created a strong infrastructure base for advanced research in “Bio-conversions” in the Department.

The Govt. of India has recognized the Department by sponsoring the M. Sc. (Biotechnology) course. At present, the research focus is on microbial biotechnology, DNA-drug interactions, reproductive endocrinology, genetic engineering of nitrogen fixation and molecular biology.

#### **1.4.3 Department of Chemical Engineering**

The Department of Chemical Engineering was established in 1963 with the Undergraduate programme in Chemical Engineering. Currently the Department is running a B. Tech. (Chemical Engg.) programme and I.D.D. programme in B.Tech. (Chemical/M.Tech. Hydrocarbon) alongwith three M. Tech. (Chem. Engg.) programmes, namely Computer Aided Process Plant Design Industrial Pollution abatement and Industrial safety and Hazard Management. The

department has well qualified faculty to undertake research activities in the traditional and emerging areas of Chemical Engineering-process integration, process intensification, clean technology, modeling and simulation, control, biochemical engineering, hydrocarbon engineering and environmental engineering. Five centers of advanced research in various areas have been established in the department. The Department is actively engaged in providing consultancy to chemical and allied industries.

#### **1.4.4 Department of Civil Engineering**

The Department of Civil Engineering, the oldest in the country and perhaps in Asia is a worthy successor of the Thomason College of Civil Engineering of 1847 vintage. Apart from the Bachelor’s degree programme, the Department offers Master’s degree programme in eight different specializations with a possibility of diversification in three different streams and a strong research programme leading to Ph.D. in various areas of Civil Engineering. Ten centers of advanced research covering various facets of Civil Engineering, viz., Structures, Hydraulics, Transportation, Geotechnical, Environmental Engineering, Computer Aided Design, Wind Engineering and Remote Sensing, have been established in the Department with assistance from various agencies. The Department also provides consultancy to industries and agencies involved in various kinds of civil works.

#### **1.4.5 Department of Hydrology**

The Department of Hydrology came into existence with the inception of International PG course in Hydrology in 1972 with the assistance from UNESCO, Govt. of India & IDRC, Canada. The course aims to award M. Tech. degree in hydrology and to impart training to engineers and scientists from Asia, Africa & other developing countries. In the field of floods, ground water and watershed management, the department has made significant contributions. Some important investigations include hydrological estimates on the failure of Macchu Dam II in Gujarat, design floods of 21 sub-basins of the Sone river, studies on ground

water modeling and subsurface drainage studies in command areas of Sardar Sarover and Narmada Sagar projects, respectively.

#### **1.4.6 Department of Management Studies**

The MBA programme was launched in 1998 by the Institute to meet the needs of present-day dynamic business and economic scenario. It takes the onus to prepare a breed of managers who have the courage, skills and resilience to excel in the corporate world.

The MBA at IIT Roorkee is designed to help students to develop essential management skills in leadership and working in teams. At IIT Roorkee, education stretches beyond class room sessions. The emphasis is on creating an environment for students to explore, experiment, discover and realize their potential. A number of activities like Marketing Fair (Consol), National Level Students Paper Presentation Context (Jigyasa), National Seminar and a bi-monthly in-house magazine (@doms.edu) have been evolved for the students of the Department targeted at developing in them the spirit of teamwork, trust and to create in them the ability to synchronize their individual objectives with the group objectives.

Students also assist the academic coordinator in scheduling all academic activities, test, examinations, faculty evaluation, attendance, discipline, faculty coordination, course restructuring and so on. The Institute has a proven track record of placing its students to the best of organizations like TCS, Eicher, SBI, ICICI Bank, IDBI Bank, IBP Co. Ltd., BPCL to name a few.

#### **1.5 ABOUT THE PROGRAMME**

A multi disciplinary course “*Conservation of Rivers & Lakes*” with Alternate Hydro Energy Centre as the coordinating department with Deptt. of Hydrology, Deptt. of Management, Civil Engg. Deptt., Chemical Engg. Deptt. & Biotechnology Deptt. as participating departments has been sponsored by Ministry of Environment & Forests for capacity building of the state, local, central government officers for conservation of water bodies and maintaining the ecology of their systems.

#### **1.6 FINANCIAL OBLIGATIONS**

1.6.1 The items of expenditure that would be met by the IITR out of the sponsorship amount of the NRCD/MoEF include, among other items, the following:

- A monthly allowance of Rs. 2500/-. This will be in addition to salary and allowances that the candidate’s parent organization will be paying to the candidate.
- A one time book expenditure (on approval from faculty supervisor) upto Rs. 5000/- will be reimbursed to each candidate.
- Tuition fee, statutory deposits and hostel fee.

1.6.2 Other items

- Mess and other dues will be borne by the candidates directly. (about Rs. 16,000/- annually).
- Hostel/Mess and other facilities will be available as for other candidates of the Institute.
- Married accommodation will be provided only if available for which additional charges may be levied.
- The candidates will be entitled to medical facilities as admissible to other M. Tech. students of IITR.

#### **1.7 CONSERVATION RELATED INDUSTRIAL CONSULTANCY PROJECTS CARRIED OUT BY AHEC**

**Some of such projects carried out by AHEC include:**

Integrated Sewerage and Solid waste Management for Abatement of pollution of Rivers Kaukhai and Daya at Bhubneshwar Sponsored by BDA, Bhubneshwar (Orissa).

Engineering Service for Execution of Special Works - Nainital Lake.

1.7.1 Assignments projects sponsored by National River Conservation Development (NRCD), MoEF, Govt. of India and completed:

- \* Review of NRC D Xth & XIth Plan proposals from states sponsored by MoEF, GOI
  - \* Preparation of Detailed Project Report for Conservation and management plan of Dal-Nagin Lake in Srinagar (J&K)
  - \* Preparation of a Vision document of NRC D's work for 10<sup>th</sup> Plan and its Restructuring
  - \* Review of Eco-restoration, Conservation and Management Plan of Kodai Kanal Lake in Tamil Nadu.
  - \* Review of Eco-restoration, Conservation and Management Plan for Hussain Sagar Lake, Hyderabad
  - \* Preparation of Detailed Guidelines of NRC D for preparing the Proposals.
  - \* Evaluation of Works Carried under Yamuna Action Plan (YAP).
  - \* Preparation of Detailed Project Report for Conservation and Management of Nainital and 4 lakes in district Nainital.
  - \* Review of 10<sup>th</sup> & 11<sup>th</sup> plans proposals.
- 1.7.2 EIA of Rural Roads under Improving Rural Infrastructure sponsored by Uttaranchal Government.
- 1.7.3 DPR for Integrated Sewage & Solid Waste Management of Bhubaneshwar city for Government of Orissa.
- 1.7.4 Preparation of PFR for use of solar, tobacco waste and small hydropower energy sources in ITC factory, sponsored by ITC, Saharanpur.
- 1.7.5 Emission Control System for Cupolas sponsored by Sterling Co., Agra.
- 1.7.6 Energy and Environment Auditing of Sugar Mills (Jagraon), sponsored by Jagraon Sugar Mills.
- 1.7.7 Intensive Air Quality Monitoring of Doon Valley for Carrying Capacity Evaluation sponsored by MoEF/NEERI.

#### **1.7.8 PROJECT WITH INTERNATIONAL COLLABORATIONS**

- \* EU Funded research project on

“Development of an Assessment System to Evaluate the Ecological Status of Rivers in Hindus-Kush Himalayan Region” with 9 countries co-ordinated by University of Natural Resources & Applied Life Sciences Viena, Australia.

- \* Centre for Ecology & Hydrology (CEH) (U.K.) Regime Estimation for Regional Small Hydro Power Assessment
  - Estimation of Low Flows and Verification.
  - International Hydrological Training Programme of UNESCO.
  - Dissemination workshop on REFRESHA.
- \* International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal
- \* Assessment of River Quality using Biological Indicators of Rivers of Hindu Kush Himalayan Regions- EC funded project.
- \* Water and Energy Commission Secretariat, HMG Nepal for small Hydro Projects.

### **1.8 INSTITUTIONAL FACILITIES**

#### **1.8.1 Lodging & Boarding**

The Institute provides bachelor's accommodation to all sponsored students. However, the family accommodation may be provided as & when available.

#### **1.8.2 Club**

The students will be entitled to become members of the staff club of the Institute on payment of membership fee and can avail themselves of the facilities of card room & lounge, tennis, squash & badminton court and the television which are available at the hostel. The facilities like Swimming Pool, and Cinema of the Institute can also be used by the members of the club.

#### **1.8.3 Central Library**

The library provides necessary infrastructure facilities in the form of books, advanced treatises, works of reference and bibliographical nature, current and back volumes of journals, thesis's and other kinds of monographs. It has well bound collection of more than 2.75 lakh volumes to meet the growing and varied requirements of its clientele consisting of undergraduate and postgraduate

students, research scholars, faculty members. The library strives to provide physical facilities with calm and cozy atmosphere conducive to study for long hours and subscribes to over 475 current journals in all branches of Engineering, Physical Sciences, Bio-sciences and Humanities & Social Sciences. In addition, the library has also adopted new technologies like VIS, E-mail, CD-ROM workstation and is commissioning a VSAT link for global communication and information through internet.

#### **1.8.4 Information Superhighway Centre**

The Institute has acquired INTERNET connectivity through VSAT as well as by optical fibres. This facility is being used extensively by the faculty and the students for their educational and research needs and provides an avenue for the exchange of Information with other libraries and the centres of research and education. Computers are available in the AHEC for use by the students.

#### **1.8.5 Other Facilities**

Well-equipped hospital, dairy and bakery are available in the campus. A post office as well as branches of the State Bank of India and Punjab National Bank, with foreign exchange facility, are also located in the campus. An Indian Railway Reservation Counter is also located in the Institute Campus.

### **1.9 ACADEMIC PROGRAMME**

#### **1.9.1 Medium of Instruction**

The medium of instruction at the Institute is English.

#### **1.9.2 M. Tech Programme**

The M. Tech. Programme comprises:

##### **1.9.2.1 Courses**

The M.Tech. programme consists of two semester teaching and practical work and another two semester for working for seminar, project and dissertation/thesis on special problems. The teaching includes lectures, and laboratory work. The lectures are supplemented by tutorials and through the

writing of concept/review papers and group discussions to illustrate the application of various principles and also to judge the extent to which the ideas have been imbibed by the students. The course has been framed to provide up to date knowledge of basic principles of the subjects. The student can select one/two subject of their choice in second semester depending upon their background & requirements as minor elective from other departments.

The academic session starts from **July/August** each year.

##### **1.9.2.2 Field Trips**

The field trips shall be organized to appropriate sites on Rivers & Lakes. Lectures may also be delivered at the sites by local officers connected with the project site. Discussion will be oriented to identification, understanding of and finding solution to various problems encountered at the project site. The students will also be required to prepare study tour reports which will be evaluated, during the 3<sup>rd</sup> semester.

##### **1.9.2.3 Seminar**

Every student is required to give presentations in seminar/s on topic/s of his own interest selected in consultation with the participating Departments. The students will be required to collect field data and prepare drawings etc. for preparation and proper presentation at the seminar using slides, projectors and computers.

##### **1.9.2.4 Project**

Each student shall be required to prepare a project report based on the field data gathered by and or supplied to him/her for rivers/lakes projects.

##### **1.9.2.5 Dissertation work**

Each student will take up dissertation work to fulfill the requirement of M. Tech. degree. The work of dissertation will be on the subject of practical and theoretical importance and will be carried out under the supervision of faculty member (s).

While deciding the Seminar/Project Work/ Dissertation of a candidate, the views, if any, of the NRC D/parent organization, will also be taken in to consideration. A list of project work/dissertation topics will normally be announced by the concerned faculty in consultation with NRC D.

**The existing provisions of the IITR enable a candidate to do part his/her dissertation work (during II year) out side the institute subject to conditions prescribed in this behalf. (entirely or in part at the NRC D or the State project sites)**

### **1.9.3 Number of Seats in the Programme**

Total number of seats are ten (10) only for each year under this sponsored programme.

### **1.9.4 Eligibility for Admission:**

**The candidate seeking admission must possess:**

A recognized degree in Civil / Electrical / Mechanical / Industrial / Chemical / Agricultural / Environmental Engineering / Architecture / Town Planning or its equivalent with at least **60% marks** or a CGPA of 6.75 on a 10 point scale at the Bachelor's level. **OR Masters of Science with Mathematics at graduation level limited to 30% of total seats.**

*Plus*

A minimum of **two years** of professional experience in an organization/department /institution dealing in water and/or waste water /environmental engineering, or pollution monitoring/control, or environmental conservation, or management of natural resources, area/regional/town planning or environmental impact assessment.

### **1.9.5 Grading of the Students**

The students shall be graded for their academic performance on a 10 point grade system as per Regulation in force.

### **1.9.6 Course Credits and Evaluation**

#### **1.9.6.1 Credit (Cr) and Weekly contact Hours**

Each course has a number of credits which depend on the academic load and weekly contact hours

for Lecture (L), Tutorial (T), Practical (P) and/ or Drawing (D). One Credit is normally assigned to one hour of lecture or two hours of tutorial or practical per week.

### **1.9.6.2 Performance Evaluation**

As per regulations in vogue, the evaluation of academic performance of students is done on continual basis throughout the semester. In the credit and grading system of evaluation, passing and failing is coursewise (Subjectwise). Promotion of a student to the next semester is linked to his obtaining a certain minimum grade point average and his earning of certain minimum number of credits in a semester and up to that semester. The award of degree is also linked with the earning of total number of credits along with other requirements, as specified for each programme.

A student is evaluated for his academic performance through tutorials, practicals, class work, home work assignments, terms papers, field work, quizzes, tests, examination, viva-voce etc. in each semester, as per regulations. Evaluation in every course (subject) is based on weightage of marks/grades assigned to various course as per curricular structure. The components for evaluation of academic performance are CWS (Class Work Sessional), MTE (Mid Term Examination), ETE (End Term Examination), PRS (Practical Sessional) and PRE (Practical Examination). The marks earned by a student in a course (subject) are converted into letter grades, the value of which is on a 10 point scale.

### **1.9.7 INTERPRETATION OF IIT REGULATIONS**

- (i) Dispute if any, arising out of or relating to any matter whatsoever concerning the admission and or academic programme of M.Tech., AHEC shall be subject to the exclusive jurisdiction of courts at Roorkee/ Uttaranchal State.
- (ii) In case of any dispute or difference of opinion in interpretation of IIT regulations or any other matter not covered in this brochure, the decision of the

Chairman, Senate shall be final and binding.

- (iii) Notwithstanding anything contained in the regulations, the Chairman of the Senate may, in emergent situation, take such action on behalf of the Senate, as he deems appropriate and report it to the next meeting of the Senate for its approval.

### **1.9.8 GENERAL & IMPORTANT**

The admission, studentship fee and related matters are subject to ordinances / regulation of the institute in vogue from time to time. Continuation of registration and award of Diploma/Degree etc. are governed by certain minimum academic performance & other regulations of the institute in vogue from time to time. All students shall be governed by ordinances/regulations in force.

### **1.9.9 PROCEDURE FOR ADMISSION**

Application should be submitted in the prescribed form available in this brochure completed in all respects and duly endorsed by the employing organization/government. The application may be sent to :

Assistant Registrar (PGS & R), Indian Institute of Technology, Roorkee - 247 667, Uttaranchal.  
E-mail: adap@iitr.ernet.in, Tel. 01332-285200, 285098, Fax: 01332-285200, 273560

For any details/information, following may also be contacted:

Head, Alternate Hydro Energy Centre,  
Indian Institute of Technology, Roorkee-247 667,  
Uttaranchal.  
E-mail : ahec@iitr.ernet.in, ahec@vsnl.com  
Tel. 01332 - 285213, 274254, Fax: 01332 - 273517, 273560



### Semester-IV (Spring)

Teaching Scheme					Contact Hours Per Week			Exam. Duration (Hrs.)		Relative Weightage (%)			
Sl. No.	Course No.	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE
1.	AH-603	Dessertation (continued from III Semester)	PG-20	20	-	-	-	-	-	-	-	-	-
<b>Total</b>				<b>20</b>									

**TOTAL**

**90 credits**

Relative weightage of each course may change as per the decision of institute senate in vogue.

### Major Elective Subjects

Sl. No.	Course No.	Course Title	Subject Area	Credits	Contact Hours per Week			Semester
					L	T	P	
1.	AH-542	Energy Conservation and Management	PG-14	4	3	1	-	Spring
2.	CH-508	Biochemical Engineering	PG-14	4	3	1	-	Spring
3.	CE-524	Solid Waste Management	PG-14	4	3	1	-	Autumn
4.	CE-624	Industrial Waste Management	PG-14	4	3	1	-	Spring
5.	CE-626	Hazardous Waste and Risk Management	PG-14	4	3	1	-	Spring/ Autumn
6.	CE-656	Geo Informatics for Land Use/Land Cover Mapping and Analysis	PG-14	4	3	-	2	Spring
7.	CE-551	Principles of Remote Sensing	PG-14	4	3	-	2	Autumn
8.	HY-527	Ground Water Hydrology	PG-14	4	3	1	-	Autumn
9.	HY-537	RS & GIS Application in Hydrology	PG-14	4	3	1	-	Spring
10.	HY-542	Urban Hydrology	PG-14	4	3	1	-	Autumn
11.	HY-538	Hydrological Data Collection Processing and Analysis	PG-14	4	3	1	-	Autumn
12.	BT-607	Ecology & Environmental Biotechnology	PG-14	4	3	1	-	Autumn/ Spring

Any other courses of AHEC, Biotechnology, Chemical Engg., Civil Engg., Hydrology and Management Study may be offered for which guidance will be provided by the Deptt./Centre/Concerned teacher(s).

### Minor Elective Subjects

1.	BT-615	General Biology & Micro-biology	PG-15	4	3	2/2	2/2	Autumn
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### 3.0 DETAILS OF COURSES CONTENTS

#### **MA-501B Advanced Mathematics (L-3, T-1, P-0)**

**Numerical Methods** : Newton-Raphson and iterative methods for finding roots of a non-linear equation. Cholesky LU-decomposition, Jacobi and Gauss-Seidel method for a system of linear equations. Numerical differentiation. Gaussian Quadrature. Solution of first and second order differential equations using Euler, modified Euler and Runge-Kutta methods Finite difference approximations to two point boundary value problems, Numerical solution of parabolic and elliptic partial differential equations using finite difference approach. Method of weighted residuals. Collocation method of least squares and Galerkins method, Numerical solution of ordinary and partial differential equations using these methods.

**Probability and Statistics** : Concept of probability, Random Variable, Distribution. Some special distributions such as Binomial, Poisson, Negative Binomial, Geometric, Uniform, Normal, Exponential, Gamma, Beta, Weibull, Log normal and Pearsons. Moments, Moment generating functions. Sampling Techniques, Sampling Distributions. Point and interval estimation. Testing of hypothesis, Analysis of Variance. Concept of design of experiments. Bivariate distributions, Independence, Correlation and Regression.

#### **AH-521B Modelling, Simulation & Computer Application (T-1, P-2/2)**

Introduction to C++, Control Structure functions, Classes and data abstraction, Pointer and Strings inheritance, Virtual function and polymorphism. C++ Stream input/output.

Models: Models classifications (Physical, analog and Mathematical); Deterministic, Probabilistic and Empirical models; Transport Phenomena based models (linear & non-linear, Steady state & unsteady state, Lumped parameter & Distributed parameter); Population Balance model.

Simulation: Design of experiments; Experimental simulation and Mathematical simulation; Monto Carlo method based simulation; Numerical Methods used for simulation and exposure to available Computer Softwares; Parameter estimation for models and sensitivity analysis.

Case Studies; Modeling of Waste treatment and other pollution mitigation system; Monto Carlo simulation for Risk analysis of conservation of Rivers and Lakes, lake water balance and simulation, modelling for dependable yields from a lake.

#### **HY-531 Watershed Behaviour & Conservation Practices (L-3, T-1, P-0)**

Watershed behaviour – Physical elements of watershed, effects of land use changes on hydrological cycle component, Concept of vegetative management of water yield and quality, Watershed experiments, extrapolation of results from representative and experimental basins, regional studies. Inventory techniques for precipitation runoff, soil timber, range-land and wild life. Water harvesting techniques-element, development of modern harvesting techniques. Estimation of peak runoff rate. Land capability classification. Erosion process-factors affecting erosion, types of erosion, assessment of erosion control measures for erosion. Conservative practices-objectives and general practices, land and soil classification, identification of critical areas.

#### **AH-523 Water Quality Assessment (L-3, T-1, P-2/2)**

Types of water pollution, objectives and standards. Water quality criteria. Natural water quality. Sources of water pollution, point and non-point sources. Water quality monitoring, schedules, data generation, quality assurance, data validation, method development and evaluation. Grab, integrated, composite sampling, preservation of samples, expression of results. Fundamentals of

Chemistry in water and waste water. Quality characterisation. Importance of quantitative measurements. Standard methods of measurements, volumetric, gravimetric, colorimetric techniques. Physical methods of analysis, turbidimetry Nephelometry. Optical methods of measurement, potentiometry, Chromatography, Spectroscopy. Measurement of turbidity, color, pH, Acidity Alkalinity, Hardness, Chloride and Chlorine residuals, dissolved oxygen, B.O.D., C.O.D., Nitrogen in various forms, solids, Fe and Mn, Trace contaminants phosphorus as phosphates, sulphur as sulphates, fluorides, oil and grease, volatile acids. Biological and Bacteriological parameters, Phytoplankton, Zooplankton, indicator organisms. MPN, MF methods of coliform and Streptococcus measurements. River and Lake pollution. Water quality indices. Case histories of ongoing National Conservation programmes.

**AH-526 Environmental Laws, Public Participation & Institutional Development (L-3, T-1, P-0)**

Genesis of environmental acts. Main national laws and overview. Water (prevention and control of pollution) Act-1974-Title and definitions. Constitution of central and state boards. Prevention and control of water pollution. Water (prevention and control of pollution) rules, cess act, cess rules. Environment (protection) act rules 1986 powers of central govt., prevention control and abatement of environmental pollution. Hazardous wastes (management and handling rules 1989). Municipal and solid waste (management and handling) rules 2000. biomedical waste rules 1998 and chemical accidents rule 1998. National Environmental Tribunal Act and Appellate Authority. Environment Audit: Concept and procedure. Case laws principles and statutory interpretations. International Protocol, Treaties and Conventions. Awareness: need, concept & significance. Modes of awareness generation- Information, Education, communication. Costing of awareness. Sustainability and impact assessment. Civil Society: Concept and components.

- a) Role of civil society in awareness generation
- b) Stages of Public Participation
- c) Forms of Public Participation,

Concept and role of Institutions;

- a) Evaluation of existing institutions
- b) Design of institutions
- c) Case studies
- d) Laws related to institutions

**CH-524 Environmental Impact Assessment (L-3, T-1, P-0)**

Environmental Impact Assessment Historical perspective and evolution of guidelines. Development and economic activities and their impact on environmental quality-concept of sustainable development and carrying capacity of environment. Environmental Impact Assessment. Parametric analysis, environmental indices and indicators, operational framework, rapid and comprehensive EIA. Environmental Components-air, water, land, vegetation, wild life, socioeconomic, social development and aesthetics, noise. Environmental domain and its divisions : Base line and impacted valuation and composite impact analysis. Environmental management plan; protective and preventive planning, cost-benefit analysis, disaster management plan and post project monitoring.

**AH-522 Waste Water Collection, Treatment and Disposal (L-3, T-1, P-0)**

Waste Water Engineering, overview, quality sources and effluent standards, waste load and its evaluation, Flow rates. Water Supply data. Actual measurement, waste water sources, domestic and industrial, analysis of flow data. Natural drainage system and waste water disposal. Waste water collection, sewerage systems and sewage pumping, Software for sewer design and estimating. Waste water treatment objectives, methods and implementation strategy, centralised and decentralised system.

- Physical operations, screening, grit removal, flow equalisation, sedimentation.

- Biological processes: Aerobic and anaerobic attached and suspended growth processes. Pond system, combination and / or alternatives.
- Design of treatment units.
- Life Cycle Cost

Polishing of treated waste water, disinfection, nutrient removal, Natural treatment systems. Treatment of sludge. Disposal of treated effluent & sludge. Resource generation

#### **AH-525 Ecology and Limnology(L-3,T-1,P-2/2)**

Ecology, its relevance to human welfare, subdivisions, principles and scope. Ecosystems, structure and functions, biotic and abiotic components, productivity and energy flow, cycling of materials, energy efficiency, limiting factors, development and evolution. Trophic levels, food chain and food webs, ecological pyramids, competition, population ecology. Natural and man-made ecosystems. Lakes, wetlands and rivers, structure and functions, usefulness. Aquatic biodiversity and its importance. System analysis, approach to development of models. Stressed ecosystems, homeostasis, ecological succession. Pollution of lakes and rivers, eutrophication. Conservation and management of lakes, wetlands and rivers. Principles and application of restoration methods, technologies. Catchment rehabilitation, wastewater treatment, biomanipulation, bio-remediation, removal of sediments, aeration, siphoning of hypolimnion, maintaining minimum dependable water flow, flood-plain restoration, use of constructed wetlands for upgrading water quality, improvement in hydrology, selective use of weed removal, stabilisation of shores. National/international perspectives, policies etc. Ramsar Convention, NLCP, NRCD. Case histories of Dal Lake, Nainital

Lake, Chilka and Loktak wetlands, River Ganges etc.

#### **AH-527 Laboratory Course(P-2)**

Solid and liquid waste characterization. Soil characteristics, importance & relevance of waste treatment, sludge characterisation, disposal and solid waste disposal: permeability, porosity LL, PL, grain size distribution, soil classification and resistivity. Leak detection. Flow measurement techniques: 'V' notch, flume etc. Sediment Analysis. Performance evaluation of various waste water treatment systems:

- a) Lagoons
- b) Oxidation, anaerobic and facultative Ponds
- c) ASP
- d) UASB & other treatment technologies

#### **AH-544 Project Formulation & Implementation (L-3, T-2/2, P-0)**

Programme and Project objectives. Preparation of reports; PFR, DPR, Cost Estimates. Project Implementation methods: Self management, Project management Agencies etc. Tendering procedures. Procurement. Internal Rate of Return, Cost Benefit Analysis. Financial Management. Resource Generation. Sustainability of the Project. Project planning - Effective planning, background of network charts, network elements, drawing the network, PERT and CPM comparison and application., monitoring and control. Management concepts: Planning - organizing, staffing, directing and controlling. Effective object planning, background of network charts, network elements, drawing the network, PERT and CPM comparison and application. Use of application softwares in project management.

ONLY FOR SPONSORED CANDIDATES

## APPLICATION FORM

Application Form for Admission to Master of Technology  
(M.Tech.) Degree Course in "Conservation of Rivers and Lakes".

### INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE (INDIA)

(Photocopy format may also be used)

1. Name.....  
(in Block letters)                      (Surname)              (Middle name)              (First name)

2. Father's Name.....

3. Present address.....  
.....  
.....

Tele. : ..... Fax No.....

E-mail : .....

4. Residential address.....  
.....  
.....

Tele.: ..... Fax No. : .....

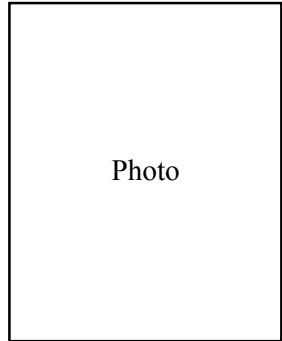
5. Place of birth .....

6. Date of birth .....

7. Marital Status : Married/Unmarried.....

8. Qualification  
Academic qualifications (beginning from High School/Metric)

Name of College University	Degree or Exam. passed	Year	Division with percentage of marks/CGPA	Position/ distinction	Main Subjects



9. Employment record and Experience:

Name of Employing Department / firm	Position held	Period	Details of work	Remarks

10. Membership of Professional societies.

11. Research work & any other special attainments (Attach additional sheets, if required)

**Declaration**

I hereby declare that the information furnished above by me is true to the best of my knowledge and belief.

Date : .....

Full Signature of the Applicant

Place : .....

Recommended and forwarded:

Approval for nominating the candidate has been obtained from the competent authority.

The officer, if selected to the programme, will be paid salaries and allowances as may be admissible during the period, he pursues his Master's programme at the IIT, Roorkee.

After the candidate has completed the M. Tech. programme, he will be posted on assignments where the skills acquired as a result of his undergoing this programme will be directly used.

Signature, name and designation of the officer forwarding the application

Date : .....

Name of the employing Organisation  
with seal

Place : .....

**CANDIDATES ADMITTED TO M.TECH. (CRL) I BATCH 2004-05**



**Bantehsong Lang Blah War**



**B. Karutha Pandian**



**Bhaskar Jyoti Das**



**Dhwajendra Nath Das**



**Vinay Shivaji Nikam**



**Mousmi Bardalia**



**Rajesh Baruah**



**S. Balaji**



**S. Sudhaker Rao**



**Manas Mukhopadhyay**



**For further details please contact**

Assistant Registrar (PGS & R)  
Indian Institute of Technology, Roorkee-247 667, Uttaranchal  
Tel. : 01332-285098, Fax : 01332-285200, 273560  
E-mail : adap@iitr.ernet.in  
Web site : [www.iitr.ernet.in/admissions](http://www.iitr.ernet.in/admissions)

Head  
Alternate Hydro Energy Centre  
Indian Institute of Technology, Roorkee-247 667, Uttaranchal  
Tel. : 01332-285213, 274254 Fax : 01332-273517, 273560  
E-mail : [ahec@iitr.ernet.in](mailto:ahec@iitr.ernet.in), [ahec@vsnl.com](mailto:ahec@vsnl.com)  
Web site : [www.iitr.ernet.in/acads/centers/ahec](http://www.iitr.ernet.in/acads/centers/ahec), [www.ahec.org.in](http://www.ahec.org.in)