

INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE

DEPARTMENTAL REVIEW TEMPLATE

1. Name of Department/Center : Department of Hydrology

2. Reviewers :

1. Prof. P. P. Mujumdar, IISc. Bangalore
2. Prof. Rajendra Singh, IIT Kharagpur
3. Shri. R. D. Singh, NIH, Roorke

3. Date of Review: 01 March 2014

GRID FOR ASSESSMENT

NOTE:

- i. Please grade in the box provided for the following parameters in the range of 1-10 with 10 being the highest.
- ii. Leave 'blank' for 'No Comment'.
- iii. Kindly give your opinion on the strength and weakness of the Department/ Center and your suggestions for future growth.

I. ACADEMICS

I.1	Undergraduate (NOT Applicable)	Score
1.	Curriculum <ol style="list-style-type: none"> i. Curricular Structure ii. Course Syllabi iii. Flexibility 	
2.	Formal Academic Load on Students <ol style="list-style-type: none"> i. Teaching ii. Laboratory/Practical iii. Projects(minor/major) 	
3.	Evaluation Process <ol style="list-style-type: none"> i. Continuing Evaluation ii. Mid-term Evaluation iii. End-term Evaluation 	
4.	Academic Ambience	
5.	Opportunity for Peer-Based Learning	
6.	Opportunity for Further Learning(Breadth and Depth) <ol style="list-style-type: none"> i. Elective Courses Specialization 	

	ii. Minor with Major Discipline iii. Honors Programme in Major Discipline	
7.	E-Assisted Learning i. Availability of Library Resources and Major Search Engines (like Scopus, Web of Science) ii. Multi-Media Assisted Teaching	
8.	In –Curriculum Research/Exploration Opportunity to Students	
9.	Technical Societies/ Colloquium for Students i. Departmental Society ii. Student Chapter(s) of Professional Societies	
10.	Faculty –Student Interaction	
11.	Faculty Mentoring of Students	
12.	Faculty Advisor System for Students/Class of Students	
13.	Self Study Courses for Student	
14.	Effective Teaching Mechanism for Enhanced Number of Students in Various Classes	
15.	Effectiveness of Assisted Learning: Tutorial System for B.Tech Students/ Seminars	

I.2	Graduate Programmes (Masters)	Score
1.	Curriculum i. Curricular Structure ii. Course Syllabi iii. Flexibility	07 07 06 (07, for the proposed curriculum)
2.	Formal Academic Load on Students i. Teaching ii. Laboratory/Practical iii. Seminar/Dissertation	07 06 07
3.	Evaluation Process i. Continuing Evaluation ii. Mid-Term Evaluation iii. End-Term Evaluation	06 -- 08
4.	Academic Ambience	08
5.	Opportunity for Peer-Based Learning	06
6.	Opportunity for further Learning(Breadth and Depth) Elective Courses (Specialization Electives)	07 07
7.	E-Assisted Learning i. Availability of Library Resources and Major Search Engines (like Scopus, Web of Science) ii. Multi-Media Assisted Teaching	08
8.	In –Curriculum Research/Exploration Opportunity to Students	06

9.	Technical Societies/ Colloquium for Students i. Departmental Society ii. Student Chapter(s) of Professional Societies	
10.	Faculty –Student Interaction	06
11.	Faculty Mentoring/Supervising of Students	07
12.	Faculty Advisor System for Students/Class of Students	06
13.	Effectiveness of Assisted Learning: Home Assignments/Seminars/Presentations	07

I.3	Doctoral (Ph.D) Programmes	Score
1.	Pre-Ph.D Courses and Evaluation Process	08
2.	Comprehensive Courses Examination	08
3.	Breadth and Depth of Knowledge of Students	
4.	Seminar/ Presentations and Technical Communication	06
5.	Average No. of Research Students/Faculty	07
6.	Average No. of Research Papers of Ph.D Students	06
7.	Average Duration to Complete Ph.D (years)	06

II. RESEARCH

		Score
1.	Research Ambience in the Department	08
2.	Research Awareness among Doctoral Students	07
3.	Competence Level of Doctoral Students for Research	07
4.	Quality of Research	07
5.	Quality of Publications	07
6.	Impact of Publications	
7.	Relevance of Research to Knowledge Generation	07
8.	Societal Relevance of Research	
9.	Exposure of Researchers to the International State of Art	07
10.	Student Exposure to Attending Quality Conferences/Symposia	05
11.	Growth in Ph.D Programme	06

12.	Quality of Research Infrastructure	08
13.	Utilization of Existing Research Infrastructure	06
14.	Department Initiative on Faculty Hiring	06
15.	Breadth and Depth of Research in the Department	06
16.	Research Intensity of Faculty Members	08

Futuristic Areas For Hiring Faculty Members

We believe that for a full-fledged academic Department, the current faculty strength is sub-critical. The Department should have at least six more faculty members to sustain its status as an independent Department of the IIT. The areas of research of the current faculty broadly cover Surface Water Hydrology, Groundwater Hydrology including Geo-hydrology & Geophysics, Hydro-informatics, Stochastic Hydrology, and Environmental Hydrology. While this is a fairly comprehensive list of research areas in hydrology, the number of faculty members working in any of these areas is currently limited to a maximum of two, and as a result, the research contributions of the Department remain confined to rather narrow topics. A recent superannuation of a faculty member working in the area of water resources systems has left a void in that area, which needs to be filled up on priority. The newer and challenging areas of satellite hydrology, climate hydrology, lake hydrology, forest hydrology, environmental systems modeling and urban hydrology are rather weak in the Department, and need to be strengthened by adding faculty members. Additionally, glacial hydrology is an area not well developed in the country today, and the Department of Hydrology at IIT Roorkee, by its location, is ideally suited to develop this area. The area of Isotope Hydrology, is also extremely important for the country's needs today, and IIT Roorkee should play a leading role in developing this area, initially by building collaboration with the neighboring National Institute of Hydrology where facilities exist, and subsequently, over a period of next 5 to 7 years, developing its own facilities and recruiting faculty in the area. In general, the committee is of the impression that the Department has been rather conservative in its recruitment policy, by sticking to traditional areas and is also restrictive in its outlook on the number of faculty members in each area. A general objective of the Department should be to recruit bright young candidates working in newer, challenging areas. The two recent recruitments have met this objective well, and the committee places on record its appreciation of these two recent recruitments.

Research Areas for Improvement: Discussed above

Comments (not more than 100 words for each given below)

Strength: The following are the main strengths of the Department in Research :

- (i) It is the only full-fledged Department of an IIT, dedicated fully to research in Hydrology.
- (ii) Although rather small in number, the faculty is highly talented and work in diverse areas of Hydrology, thus being in a position to generate knowledge in a wide ranging topics.

- (iii) The Department enjoys excellent facilities for research and infrastructural support from the Institute.
- (iv) The Department attracts adequate number of good quality students fully supported financially by Government of India.

Weakness:

- (i) For an academic Department of an IIT, the current strength of faculty is sub-critical. As a result, the Department has not made its presence felt in a big way in the international research arena.
- (ii) Collaborative research with teams both within the Department and outside is rather marginal.
- (iii) Areas of research are rather restrictive because of the faculty strength and their interests.
- (iv) High value journal publications must be enhanced.
- (v) Rather water-tight administrative structure within the Department.

Suggestions for improvement:

- (i) Develop international collaborations, as a team and not only at individual levels.
- (ii) Identify top journals (e.g., Water Resources Research, Advances in Water Resources, Environmental Science and Technology, Chemosphere etc), and keep publishing in these journals about once every two years.
- (iii) Develop a full-fledged post-doctoral programme in the Department. There are a number of PhDs from other institutes such as the NITs and universities waiting to get benefited by the good research culture in the IITs, and the Department must facilitate this. To further attract PhDs to the post-doctoral programme, the Department must consider providing an enhanced, high value fellowship for the post-doctoral fellows.
- (iv) Increase research vibrancy in the Department through faculty seminars, student seminars and visitors seminars.
- (v) Stimulate intra-departmental collaboration, by taking up large collaborative research projects, and allowing free access to all labs for faculty and students,
- (vi) The appointment of Heads of the Labs must be on rotation; more relaxed and flexible system of sharing of laboratory resources must be put in place.

III. Departmental Infrastructure

		Score
1.	Adequacy of Class Rooms and Multi-Media Facility	07
2.	Availability of Laboratories	06
3.	Availability of Conference/Seminar Room, etc.	08
4.	Availability of Seating Space for Research Students	07
5.	Availability of Internet Services in Research Labs and Class Rooms	07
6.	Departmental Library and E-Resources	
7.	Computing Facilities and Software	07

8.	Adequacy of Offices and Furnishing for Faculty	08
9.	Faculty- Student Ratio	08
10.	Support Staff (Technical/Administrative) Adequacy	07
<p>Comments (not more than 100 words for each given below)</p> <p>Strength:</p> <ul style="list-style-type: none"> (i) Good infrastructure; Since there is no UG teaching by the Department, there is no stress on the infrastructure at present. (ii) Faculty-student ratio is good. (iii) Research infrastructure is also developed continually by the faculty through sponsored research and consultancy projects. <p>Weakness:</p> <p>There is too much of a bureaucratic structure in the administration of the labs. This must be relaxed consciously and all aspects of the administration of the labs must be opened up, to provide free access to all facilities within the Department to all faculty members and their students, specifically to the younger faculty and their students. The Heads of the Labs seem to enjoy an unquestioned authority over the facilities created in the respective labs - this rigid administrative structure is not healthy in the long run, and will lead to stagnation.</p> <p>Suggestions for improvement:</p> <ul style="list-style-type: none"> (i) Administrative structure within the Department must be made less bureaucratic, and more flexible. Heads of the Labs must be chosen on rotational basis, for a period of about three years. (ii) Remote sensing and GIS lab which also caters largely as computational facility in the Department, must be upgraded to have high internet connectivity and high-end computational resources, including a cluster for intense data crunching operations. (iii) As suggested under item, 'II. Research' above, the Department must consider widening the scope of its research to include glacial hydrology and isotope hydrology. Apart from faculty recruitment in these areas, it will also be necessary to generate laboratory facilities to address important research problems in these areas. The currently active area of Remote Sensing and GIS must be strengthened and the group should address more advanced and currently topical areas of satellite hydrology, that include soil moisture retrieval from satellite data, discharge measurements in large streams etc. These are all possible only with recruitment of new faculty members and creating additional laboratory infrastructure. (iv) The Department must also consider developing a field hydrologic observatory. There are very few hydrologic observatories in the country today – the two that the Committee is aware of are both located in South India, one very well instrumented and maintained by IISc Bangalore in the Kabini basin and the other, just being developed by ATREE in the Western Ghats. Apart from providing a basic scientific understanding of the hydrologic processes, such observatories also help in developing water management options. (v) The senior professors of the Department must play the role of statesmen and while they put the major effort in creating facilities, must ensure that the fruits of their 		

efforts are shared by everyone in the Department. Once such magnanimous attitude from the senior faculty members is demonstrated, the Department is bound to build an atmosphere of mutual trust and admiration, which are essential for the overall growth of the Department.

IV. Admissions of Ph.D Students

		Score
1.	Intake of Ph.D Students	07
2.	Admission Process	07
<p>Suggestions:</p> <ul style="list-style-type: none"> (i) Develop external research programme for industry-interaction (ii) Apart from the QIP window, the Department may also consider admitting teachers of engineering institutes for the PhD programme, who may join with about three to three and half years of study leave from their parent organizations. (iii) The number of PhDs from the Department is rather low and must be enhanced by admitting more number of PhD students and reducing the time to submission of the PhD theses. The MTech students must be enthused to take up PhD. This may be achieved through involving the MTech students in high end research projects, introducing seminars and short projects in the elective courses and creating opportunities for the students to participate in national and international conferences. The MTech dissertation work itself should be brought to a publishable quality. 		

V. Outcomes

		Score
1.	Placements <ul style="list-style-type: none"> i. Placement of B.Tech/IDD Students ii. Placement of Masters Student iii. Placement of Ph.D Students 	Remarks: Adequate data not available; The Masters students, in their interactions with the committee, indicated that the placement is poor.

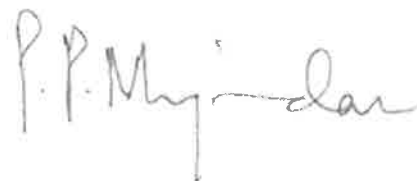
2.	Average No. of Ph.D.s Awarded per Year	08
3.	Publications per Faculty in ISI Indexed Journals/Year	07
4.	Average Citations per Faculty/Year (Last-Three Years) (Web of Science/Scopus)	07
5.	Recognitions; Awards(National/International) to Faculty/Students	05
6.	Consultancy and Projects	07
7.	No. of Ph.D. graduates who took Academics as Career(Based on Data of Last 5 Years)	06

Comments and Suggestions for improvement:

1. The number of sponsored and consultancy projects in the Department is quite high and point to the fact the most faculty members are active.
2. The average no. of PhDs awarded – interpreted from slid 46 of 57 of the HoD's presentation to the Committee – is quite good, and can be enhanced with increase in faculty strength in the Department.
3. The Department's recognition through National and International awards and hours is, however, rather marginal. The Department faculty must strive to achieve Fellowships of the Indian Academies (e.g., Indian National Academy of Engineering), Swarna Jayanthi Fellowships (for the younger faculty members) and prestigious international awards such as the von Humboldt Fellowship, Fulbright Fellowship etc.
4. The senior faculty members of the Department must effectively play the role of mentors to the younger members and motivate them to achieve higher recognition by focusing more on the quality of output rather than the quantum. A minimum number of publications is of course necessary for the younger faculty members to achieve career growth, but they must be mentored to realize the importance of high quality journal publications in journals such as Water Resource Research, Advances in Water Resources, Journal of Hydrology, Environmental Science and Technology, Chemosphere etc. The Department may decide on a list of such high end journals in which the best of the global peers publish and aim to publish in such high end journals (irrespective of their varying impact factors from year to year) once in every two to three years. The international recognition of the Department may be enhanced primarily through such repeat appearance of the Department's name in high end international journals.
5. Given the dire need for high quality faculty in the country today – especially in the areas related to hydrology and water resources - - the Department must play a leading role in supplying such faculty to other institutes. Towards this end, it is necessary to first generate high quality PhDs and simultaneously motivate the PhD students to take up academic jobs after graduation. The Department must put some thought into this aspect and should encourage the PhD students to travel abroad to the best of the universities for short visits, participate in international conferences, have discussion meetings amongst themselves on cutting edge areas of research in their field, and in general stimulate a healthy and vibrant research ambiance for the PhD students to stimulate them to take up academic career after graduation.
6. The average time taken for completion of PhD seems to be around four and half years to five years. The Department must put conscious efforts to bring down this time to around three and half to four years.
7. The number of international visitors to the Department over the last about six years, is

rather small. Presence of highly acclaimed international researchers in the Department even for short periods of about two weeks, is bound to enthuse the faculty and students alike. The Department must become pro-active in inviting the international peers to the Department, both for shorter duration visits as well as for longer term sabbatical visits. The Department faculty must also make short to long duration visits to universities abroad to enhance the research interactions.

8. The Department must benefit from other groups in the Institute working in related areas. The Department of Civil Engineering has a strong group in Hydrology but there is hardly any collaboration between the Department of Hydrology and the Department of Civil Engineering. There is an overlap of research activities also with the Department of Water Resources Development & Management, but that Department's historical objectives and the growth path being much different from that of Department of Hydrology, the committee recommends that the Department of Hydrology retain its individual identity while developing close collaboration with the Department of Civil Engineering, with which the broad objectives and work culture have a good match.



Date: 14 April 2014

**(Signature of the Reviewer)
(on behalf of all the three committee members)**

**Prof. P. P. Mujumdar,
Indian Institute of Science, Bangalore
(Name and Address of the Reviewer)**