

**INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE**

**DEPARTMENTAL OF CHEMICAL ENGINEERING**

**1. Name of Department/Center:** Department of Chemical Engineering

**2. Reviewers:**

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**Dr. S.K. Gupta**

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**3. Date of Review:** April 12, 2014

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**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.
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## I. ACADEMICS

I.1	Undergraduate	Remark	Score
1.	<p>Curriculum</p> <ol style="list-style-type: none"> <li>i. Curricular Structure</li> <li>ii. Course Syllabi</li> <li>iii. Flexibility</li> </ol>	<p>Department offers courses leading to B.Tech. (Chemical Engineering) with or without Minor specialization or Honours. In B.Tech. (Chemical Engineering) program without Minor Specialisation/Honours, student has to earn 167 credits out of which 39 credits (11 courses) are for institute core courses; 79 credits (20 courses) for program core courses; 27 credits (7 courses) for elective courses and 16 credits for Training/Seminar/Project including Technical communication. Thus, out of 161 credits, 27 credits (i.e. 17% of the credits) are flexible. Similarly, in B.Tech. (Chemical Engineering) program with minor Specialisation/Honours, 26% of the credits are flexible.</p>	8
2.	<p>Formal Academic Load on Students</p> <ol style="list-style-type: none"> <li>i. Teaching</li> <li>ii. Laboratory/Practical</li> <li>iii. Projects (Minor/Major)</li> </ol>	<p>On an average, students are having 15, 3.5 and 3.5 hours per week of academic load for Lectures, Tutorials and Laboratory/Practicals, respectively. Also, students have 4 and 8 h/week of project load in 7<sup>th</sup> and 8<sup>th</sup> semester, respectively. Out of the total load, 68% of the credits account for Lecture classes, 22% for tutorials/laboratory/practical and rest 20% for seminar and project.</p>	7
3.	<p>Evaluation Process</p> <ol style="list-style-type: none"> <li>i. Continuing Evaluation</li> <li>ii. Mid-term Evaluation</li> <li>iii. End-term Evaluation</li> </ol>	<p>Each student is evaluated for his/her academic performance in a course through tutorials, practicals, home work assignments, term papers, field work, seminars, quizzes as Class Work Sessionals (CWS) and Practical Sessionals (PRS), Mid Term Examinations (MTE), End-Term Examination (ETE), and Practical Examinations (PRE) as applicable.</p>	7
4.	Academic Ambience	Good, conducive environment for learning.	8

5.	Opportunity for Peer-Based Learning	Yes, students interact with faculty in projects, Summer Undergraduate Research Awards (SURA) projects, etc.	6
6.	Opportunity for Further Learning (Breadth and Depth) <ul style="list-style-type: none"> <li>i. Elective Courses Specialization</li> <li>ii. Minor with Major Discipline</li> <li>iii. Honors Programme in Major Discipline</li> </ul>	Each student in B.Tech. (Chemical Engg.) program is given in a opportunity (depending) upon his/her credit at the end of third year to opt for any one of the among following three options (a) B.Tech. (Chemical Engg.) degree with minor specialisation in other Branch of Engineering. (b) B.Tech. (Chemical Engg.) degree with Honours.	8
7.	E-Assisted Learning <ul style="list-style-type: none"> <li>i. Availability of Library Resources and Major Search Engines (like Scopus, Web of Science)</li> <li>ii. Multi-Media Assisted Teaching</li> </ul>	<ul style="list-style-type: none"> <li>• All research based search engines like Scopus, Web of Science, Sci Finder, etc. are available to each student through Institute Library. It is one of the best Libraries in the Country with huge collections of Text and Reference books with large subscription of Journals, Periodicals, etc. It has more than 3,50,000 documents in all media.</li> <li>• All the lecture rooms of the Department are equipped with multi-media facilities. Teachers use this facility for teaching.</li> </ul>	8
8.	In –Curriculum Research/Exploration Opportunity to Students	Within each course, students are generally given projects and field work, seminars as Class Work Sessionals (CWS) providing them opportunities to explore beyond the course-work.	8
9.	Technical Societies/ Colloquium for Students <ul style="list-style-type: none"> <li>i. Departmental Society</li> <li>ii. Student Chapter(s) of Professional Societies</li> </ul>	“ChESS”, The Chemical Engineering Student's Society, is a student's organization of the Department of Chemical Engineering, I.I.T. Roorkee. In addition to ChESS, department also has Student Chapter of IChE.	8
10.	Faculty –Student Interaction	A ‘Consultative Committee’ having faculty members from the department and the students from each class help in Faculty–Student Interaction. It acts as an interface between the students and the faculty.	7

		thereby, removing the gap between them. Meetings are then held to discuss various problems faced and the ways and means to remove them.	
11.	Faculty Mentoring of Students	Student of each year in a program are mentored by an Advisor. The Advisor also does counseling for courses to be taken by a student and other academic requirements. Besides, the students mentoring is carried out during projects.	6
12.	Faculty Advisor System for Students/Class of Students	ChESS also deals with the problems of the students, analyzes them and puts them before the faculty for their advice. There is a representative of every year from B.Tech. and M.Tech. to handle the corresponding problems and the queries of the students. Besides, each year of the program has a faculty advisor. Student-mentoring is robust.	6
13.	Self Study Courses for Student	One self study course may be offered under special circumstances from the list of regular courses of study to a student in his/her final semester or thereafter.	
14.	Effective Teaching Mechanism for Enhanced Number of Students in Various Classes	Using multi-media facility along-with teaching assistants and class board-driven teaching (as and when necessary) help in effectively teaching enhanced number of students in various classes.	7
15.	Effectiveness of Assisted Learning: Tutorial System for B.Tech. Students/ Seminars	Seminars and presentations and class room tutorials are highly effective for helping students in the learning. Students solve the problems in the tutorial classes itself and the presence of teachers comes handy to them so as to understand the complexities of the problems.	6

Same as for undergraduate, except item 11.

I.2	Graduate Programmes (Masters)	Remark	Score
1.	<p>Curriculum</p> <ol style="list-style-type: none"> <li>i. Curricular Structure</li> <li>ii. Course Syllabi</li> <li>iii. Flexibility</li> </ol>	<p>Department offers M.Tech. (Chemical Engineering) with specialization in 'Computer Aided Process Plant Design' and 'Industrial Pollution Abatement'. In each program, student has to earn 68 credits out of which 20 credits (5 courses) are for program core courses (PCC) and 16 credits (4 courses) for program elective courses (PEC) and 32 credits for Seminar/Dissertation. Thus, out of 68 credits, only 20 credits (i.e. 29% of the credits) are fixed and rest credits are flexible.</p>	
2.	<p>Formal Academic Load on Students</p> <ol style="list-style-type: none"> <li>i. Teaching</li> <li>ii. Laboratory/Practical</li> <li>iii. Seminar/Dissertation</li> </ol>	<p>On an average, students are having 13.5, 3 and 4 hours per week of academic load for Lectures, Tutorials and Laboratory/Practicals, respectively. Out of the total load, 40% of the credits account for Lecture classes, 13% for tutorials/laboratory/practicals and rest 47% for seminar and dissertation.</p>	
3.	<p>Evaluation Process</p> <ol style="list-style-type: none"> <li>i. Continuing Evaluation</li> <li>ii. Mid-Term Evaluation</li> <li>iii. End-Term Evaluation</li> </ol>	<p>Each student is evaluated for his/her academic performance in a course through tutorials, practicals, home work assignments, term papers, field work, seminars, quizzes as Class Work Sessionals (CWS) and Practical Sessionals (PRS), Mid Term Examinations (MTE), End-Term Examination (ETE), and Practical Examinations (PRE) as applicable.</p>	
4.	Academic Ambience	Good, conducive environment for learning.	
5.	Opportunity for Peer-Based Learning	Yes, students interact with faculty in M.Tech. dissertations, etc.	
6.	Opportunity for further Learning (Breadth and Depth) Elective Courses (Specialization Electives)	Each student has to pass five program core courses (PCC) and four program elective courses (PEC). A student can select four PEC courses among ten courses which are offered.	
7.	<p>E-Assisted Learning</p> <ol style="list-style-type: none"> <li>i. Availability of Library Resources and Major</li> </ol>	<ul style="list-style-type: none"> <li>• All research based search engines like Scopus, Web of Science, Sci Finder, etc. are available to</li> </ul>	

	<p>Search Engines (like Scopus, Web of Science) ii. Multi-Media Assisted Teaching</p>	<p>each student through Institute Library. It is one of the best Libraries in the Country with huge collections of Text and Reference books with large subscription of Journals, Periodicals, etc. It has more than 3,50,000 documents in all media.</p> <ul style="list-style-type: none"> <li>All the lecture rooms of the Department are equipped with multi-media facilities. Teachers use this facility for teaching.</li> </ul>	
8.	In-Curriculum Research/ Exploration Opportunity to Students	<p>Within each course, students are generally given projects and field work, seminars as Class Work Sessionals (CWS) providing them opportunities to explore beyond the course-work.</p>	
9.	<p>Technical Societies/ Colloquium for Students</p> <p>i. Departmental Society ii. Student Chapter(s) of Professional Societies</p>	<p>“ChESS”, The Chemical Engineering Student’s Society, is a student’s organization of the Department of Chemical Engineering, I.I.T. Roorkee. In addition to ChESS, department also has Student Chapter of IICChE.</p>	
10.	Faculty-Student Interaction	<p>A ‘Consultative Committee’ having faculty members from the department and the students from each class help in Faculty-Student Interaction. It acts as an interface between the students and the faculty, thereby, removing the gap between them. Meetings are then held to discuss various problems faced and the ways and means to remove them.</p>	
11.	Faculty Mentoring/Supervising of Students	<p>Student of each year in a program are mentored by an Advisor. The Advisor also does counseling for courses to be taken by a student and other academic requirements. Besides, the students’ mentoring is carried out during their M.Tech. dissertations.</p>	8
12.	Faculty Advisor System for Students/Class of Students	<p>ChESS also deals with the problems of the students, analyzes them and puts them before the faculty for their advice. There is a representative of every year from B.Tech. and M.Tech. to handle the</p>	

		corresponding problems and the queries of the students. Besides, each year of the program has a faculty advisor. Student-mentoring is robust.	
13.	Effectiveness of Assisted Learning: Home Assignments / Seminars/ Presentations	Seminars and presentations and class room tutorials are highly effective for helping students in the learning. Students solve the problems in the tutorial classes itself and the presence of teachers comes handy to them so as to understand the complexities of the problems.	

I.3	Doctoral (Ph.D) Programmes	Remark	Score
1.	Pre-Ph.D Courses and Evaluation Process	Each Ph.D. student is required to take courses with total of 8-12 credits. At least 2 credits are to be earned by delivering a seminar. A student has to earn 'B' (7 grade) for passing all examinations.	
2.	Comprehensive Courses Examination	Comprehensive written and oral examinations are conducted. The written examination is conducted just like Semester Examination.	
3.	Breadth and Depth of Knowledge of Students	Judged through comprehensive examinations and seminars conducted in courses and also before the SRC.	
4.	Seminar/Presentations and Technical Communication	Each research student needs to take a course on 'Seminar'. Besides, they present a number of Seminars before SRC/research group.	5
5.	Average No. of Research Students/ Faculty	3:1	8
6.	Average No. of Research Papers of Ph.D. Students	3	9
7.	Average Duration to Complete Ph.D. (years)	4 Years	8

## II. RESEARCH

		Remark	Score
1.	Research Ambience in the Department	Very conducive for the research. The labs are open for 24x7 every week.	5
2.	Research Awareness among Doctoral Students	Through search engines, the students keep themselves abreast with latest in their areas of research.	7
3.	Competence Level of Doctoral Students for Research	The level is average.	6
4.	Quality of Research	Very good, largely due to the efforts of faculty supervisors.	7
5.	Quality of Publications	Department is publishing papers not only in traditional Chemical Engineering Journals but also in various high impact inter-disciplinary journals of leading Societies and publishing groups. A number of papers are published in journals of American Institution of Chemical Engineers, American Chemical Society, American Society of Civil Engineers, Royal Society of Chemistry, etc.	9
6.	Impact of Publications	Average impact factor of papers in ISI impact factor journals is 2.15.	9
7.	Relevance of Research to Knowledge Generation	Research is highly relevant to new knowledge generation and data for interpretation.	9
8.	Societal Relevance of Research	Department is doing a lot of research in the area of pollution abatement particularly from industries. In addition, a number of faculty members are doing research in the area of energy, fire, etc. which have a lot of societal relevance.	8
9.	Exposure of Researchers to the International State of Art	A number of faculty members are exposed to international state-of-the-art.	8
10.	Student Exposure to Attending Quality Conferences/Symposia	Every year large number of students attend conferences and symposia in India. Few students attend conferences and symposia abroad also with	2



			funding from various funding agencies in India.	
11.	Growth in Ph.D. Programme		Number of Ph.D. students joining the department have increased from 6 (during 2006-2007) to 30 (during 2012-2013) i.e. approximately intake becoming 5 times in 6 years.	8
12.	Quality of Research Infrastructure		Department has good research infrastructure with good number of sophisticated instruments and computational facilities.	8
13.	Utilization of Existing Research Infrastructure	<i>Please see note</i>	Research infrastructure available in the department is being utilized to the maximum. Because of the utilization of the research facility, number of publications is growing steadily in the Department.	4
14.	Department Initiative on Faculty Hiring		A faculty search committee is being constituted.	8
15.	Breadth and Depth of Research in the Department			8
16.	Research Intensity of Faculty Members			8

**Futuristic Areas For Hiring Faculty Members:** *Nano technologies*  
*Materials*

**Research Areas for Improvement**

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

**Strength:**

**Weakness:**

**Suggestions for improvement:**

## II. Departmental Infrastructure

		Remark	Score
1.	Adequacy of Class Rooms and Multi-Media Facility	Classes are adequate and all the lecture rooms have multi-media facility.	9
2.	Availability of Laboratories	Department has three categories of laboratories: (i) Central Facilities, (ii) Research Laboratories and (iii) Undergraduate Laboratories. Sufficient numbers of laboratories are available in the department.	8
3.	Availability of Conference/Seminar Room, etc.	Department has sufficient number of conference and seminar rooms.	9
4.	Availability of Seating Space for Research Students	Department has a number of research labs with adequate space for doing experimental and theoretical work in various research areas.	9
5.	Availability of Internet Services in Research Labs and Class Rooms	Internet services are available in all research laboratories and faculty rooms with wi-fi connectivity.	9
6.	Departmental Library and E-Resources	Department has its own library with constant purchase of new books. E-resources like journals, books, etc. are available through Institute library.	
7.	Computing Facilities and Software	Department has two computing labs one for undergraduate students (CAD centre) and other for PG and research students (high computing research lab) with many high-end computers and blade servers. Department has a number of software relevant to Chemical Engineering for teaching and research such as ASPEN suite, ANSYS, CFX, MATLAB, etc.	9
8.	Adequacy of Offices and Furnishing for Faculty	All faculty members have been provided with separate rooms for working and doing their academic and day-to-day work. In addition each faculty member has separate lab space for carrying out research.	9
9.	Faculty- Student Ratio	1 : 27 (approx)	5
10.	Support Staff (Technical/Administrative) Adequacy	Inadequate skilled technical staff. <i>See detailed note</i>	5

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

**Strength:**

*W.M.*

*Accepted*

*Please see*

**Weakness:**

**Suggestions for improvement:**

### III. Admissions of Ph.D. Students

	Remark	Score
1. Intake of Ph.D. Students	Intake of Ph.D. students takes place twice in a year i.e. both in the Autumn and Spring semester. Recently Institute has introduced a dual degree M.Tech + Ph.D. programme with the provision of admitting M.Tech. students with CGPA $\geq 7.5$ CGPA after M.Tech. 1 <sup>st</sup> year to Ph.D. program.	8
2. Admission Process	Students are selected via interviews conducted by the Department Research Committee (DRC).	8

**Suggestions:**

#### IV. Outcomes

		Remark	Score
1.	Placements i. Placement of B. Tech/IDD Students ii. Placement of Masters Student iii. Placement of Ph.D Students	Average of last 5 years 80% 18% They move out to koin PDF positions/academics/research labs. <i>See note</i>	7
2.	Average No. of Ph.D.s Awarded per Year (average for last 6 years)	4.5	7
3.	Publications per Faculty in ISI Indexed Journals/Year (average for last 6 years)	2.4	9
4.	Average Citations per Faculty/Year (Web of Science/Scopus) (Last-Three Years)	66 Citations per Faculty/Year (Scopus) 57 Citations per Faculty/Year (Web of Science)	9
5.	Recognitions; Awards (National/International) to Faculty/ Students	<ul style="list-style-type: none"> <li>Department of Chemical Engineering, IIT Roorkee was ranked 1<sup>st</sup> among all the Chemical Engineering Departments in India, 7<sup>th</sup> in Asia and within top 50 in the World by QS World Engineering Rankings-2010 &amp; 2011.</li> <li>Department of Chemical Engineering, IIT Roorkee is currently ranked within 151-200 rank among all Chemical Engineering Departments of the World; and 7<sup>th</sup> among all the Chemical Engineering Departments in India. However, it is ranked 1<sup>st</sup> in India in 'h-index' and 2<sup>nd</sup> rank in 'Research Citations per Paper' in India.</li> <li>Department of Chemical Engineering, IIT Roorkee and Engineers India Ltd. were jointly awarded by FICCI at the International Conference and Exhibition on Chemicals, Petrochemicals and Gas organized by FICCI on 25<sup>th</sup> Oct., 2013 in Ahmedabad for Process Innovation in Petrochemicals, Chemicals and Gas sector.</li> <li>Prosper.Net-Scopus Young Researcher Award – First Runner-up Prize, IEI Young Engineer Award, INAE Young Engineers Award, INSA Young Scientist Medal, Amar Dye-Chem Award, etc.</li> <li>Faculty Members are Members, Editorial Board of various Journals such as Journal of the Institution of Engineers (India): Series E, International Journal of Chemical Product and Process Modeling, Journal of Nonlinear Dynamics, International Journal of Aerospace</li> </ul>	9

	Consultancy and Projects	Sciences, etc.	
6.	Faculty members are involved in a number of sponsored and consultancy projects. <i>See Note</i>		7
7.	No. of Ph.D. graduates who took Academics as Career (Based on Data of Last 5 Years)	70% (approx.)	7

**Comments and Suggestions for improvement:**

*Mathur*

**Dr. Ajay Mathur**  
 Director General,  
 Bureau of Energy Efficiency  
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 India.

*S.K. Gupta*

**Dr. S.K. Gupta**  
 Professor,  
 University of Petroleum & Energy Studies  
 (Ex-Professor, Department of Chemical  
 Engineering, IIT Kanpur)  
 Dehradun, Uttarakhand, India.

*V.K. Srivastava*  
 12/09/2019

**Dr. V.K. Srivastava**  
 Ex-Dean R&D & Ex-Professor,  
 Department of Chemical Engineering  
 Indian Institute of Technology Delhi  
 Hauz Khas, New Delhi - 110016, India.

# Notes on Review of Department of Chemical Engineering, <sup>38</sup>

IIT-Roorkee

1. Enhancement of assistantship of Masters & Doctoral students. The fees should be an additional sum that is provided with the assistantship.
2. The participation of PG students in Departmental activities & advisory bodies should be enhanced and strengthened.
3. The lab/central equipment faculty hours should be extended beyond 9 AM to 5 PM. Students could be used to manage the labs beyond these hours.
4. On an urgent basis, the financial support for students to present papers abroad should be facilitated.
5. Teaching loads should be reduced and rationalized to about 1 course/semester. The role of PG students may be enhanced.
6. The subjects & scope of B Tech projects should be modernized and expanded.
7. Facilitate short-term learning for software packages.
8. There is an urgent need for a placement cell in the Department, with strong participation from

39  
both B Tech, as well as MTech & Ph D students.

9. Technical staff may be provided with 1-2 week long training programmes on the operation & management of main equipment.
10. Faculty should be encouraged to have upto at least two projects at a time.
11. Student research grant of Rs. 10,000 per year per student is grossly inadequate, and Institute should find means to enhance this grant.
12. The participation of MTech students in extra curricular activities at the Institute level should be enhanced, & encouraged.
13. Technical staff strength needs to be enhanced.

Amal  
12.4

Shripte  
12/4/17

GK  
12/04/2019

## Notes on Review of Department of Chemical Engineering, IIT Roorkee

1. Enhancement of assistantship of Masters & Doctoral studies. The fees should be an additional sum that is provided with the assistantship.
2. The participation of PG students in Departmental activities and advisory bodies should be enhanced and strengthened.
3. The lab/central equipment facility hours should be extended beyond 9 a.m. to 5 p.m. Students could be used to manage the labs beyond these hours.
4. On an urgent basis, financial support for students to present papers abroad should be facilitated.
5. Teaching loads should be reduced and rationalized to about 1 course/semester. The role of PG students may be enhanced.
6. The subjects and scope of B.Tech. projects should be modernized and expanded.
7. Facilitate short term learning for software packages.
8. There is an urgent need for a placement cell in the Department, with strong participation from both B.Tech. as well as M.Tech. and Ph.D. students.
9. Technical staff may be provided with 1-2 week long training program on the operation of management of main equipment.
10. Faculty should be encouraged to have at least two projects at a time.
11. Student research grant of Rs.10,000 per year for student is grossly inadequate and Institute should find means to enhance this grant.
12. The participation of M.Tech. students in extra curricular activities at the Institute level should be enhanced and encouraged.
13. Technical staff strength needs to be enhanced.

Sd/-

Dr. Ajay Mathur

Sd/-

Dr. S.K. Gupta

Sd/-

Dr. V.K. Srivastava