

### EDUCATIONAL GOALS

Education in the Engineering stream should produce trained manpower for maintaining and advancing technological growth. The scope of engineering education should evolve based on the evaluation of technological growth for their usefulness and relevance to the prosperity of the country. The educational strategy in this context should help to develop a knowledge industry and the systems involved in this endeavor should strive for furtherance of knowledge.

The academic goals of the Indian Institute of Technology Kanpur from the viewpoint of its teaching programme are as the following:

- To prepare the students for the highest level of excellence in science, and technology and produce competent, creative and imaginative scientists and engineers.
- To promote a spirit of free and objective inquiry in different fields amongst the students and motivate them for higher studies and research.
- To foster inter-disciplinary approach. To promote the concept of virtual research departments by bringing together faculty and students into activities of mutual interest.

### TEACHING PROGRAMMES

The Institute offers instruction in various disciplines of science and engineering, both at undergraduate (UG) and postgraduate (PG) levels. These programmes are planned and implemented by the Academic Senate of the Institute. Micro-management of these programmes are carried out by the Senate Undergraduate Committee (SUGC) and the Senate Post-graduate Committee (SPGC), respectively.

#### Undergraduate Programme

The Institute offers the following undergraduate programmes:

- Four Year B.Tech. programs in Aerospace, Biological Sciences & Bio Engg., Chemical, Civil, Computer Science, Electrical, Material Science and Engineering, Mechanical Engg.
- Four Year BS programs in Physics, Chemistry, Earth Science, Mathematics & Scientific Computing and Economics.

The four-year undergraduate programme consists of two parts having duration of about four semesters each. The first part is primary the Core Programme common to all students, and is carefully planned to give the students a

strong base of basic education in Mathematics, Physics, Chemistry, Engineering Sciences, Technical Arts, Humanities and Social Sciences. The second part of the undergraduate programme consists of the Professional courses and a project in the chosen branch of specialization.

#### Two-Year M.Sc. Programme

The Institute also offer M.Sc. (2 years) programmes in Physics, Chemistry, Mathematics and Statistics, where the students with B.Sc. (Hons.) background are chosen through an all-India entrance examination known as JAM. These programmes have been largely responsible for the scientific manpower in Indian research institutes and universities.

#### Postgraduate Programme

The postgraduate programme is intended to prepare students to enter their professions with a perspective and breadth of knowledge related to the principal divisions of their respective fields of specialization through courses and specialized research experience. A postgraduate student is typically enrolled for three or four courses each semester until the student advances to a point where the principal requirements of the programme left to be fulfilled are research and thesis.

#### *M. Tech. Programme*

We have M.Tech. Programmes in all the core Engineering Branches as AE, BSBE, CHE, CE, CSE, EE, ME, MSE. In addition, there are M.Tech. programs in some interdisciplinary areas, such as IME, PSE, MS, NET and EEM. The M.Tech. students are chosen through an all-India examination (known as GATE) and further written test/interview in some cases.

#### *MBA Programme*

We have an MBA program offered by the Department of Industrial Management and Engineering (IME). The students to this program are selected through an all-India examination known as CAT followed by interview and group discussion.

#### *MDES Programme*

We have introduced an interdisciplinary program, namely, Master of Design. The students to this program are selected through an all-India examination known as CEED/GATE. In some cases further written test/interview may be taken.

#### *Doctor of Philosophy (Ph.D.)*

The academic programmes leading to the Degree of Doctor of Philosophy (Ph.D.) exists in all the engineering

departments and four interdisciplinary programmes, namely, Materials Science, Nuclear Engineering & Technology, Photonics Science & Engineering (earlier known as Laser Technology Programme), Design Programme. The Ph.D. programmes also exist in Chemistry, Earth Sciences, Mathematics & Statistics, Physics, Economics, English, Philosophy, Psychology and Sociology.

#### *MS By Research*

Senate recently approved post graduate programme (called 'MS by Research') in the following disciplines: Civil Engineering; Computer Science & Engineering; Chemical Engineering; Electrical Engineering; Environmental Engineering and Management; Mechanical Engineering and Photonics Science & Engineering. Objective of this program is to promote project based and industry sponsored research (Industrial sponsored projects based research)

#### *Ph.D. (Dual Degree)*

The Department of Physics offers a M.Sc.-Ph. D. dual degree program. The admission is through JAM (Joint Admission Test to Master of Science). In this program, it allows their M.Sc. students to continue for a Ph.D. degree.

The Ph.D. programme culminates in research on a selected topic leading to a thesis submitted in partial fulfillment of the requirements for the degree.

The M.Tech. and Ph.D. students receive financial assistance through research/ teaching assistantships.

#### **Research Environment in IIT Kanpur**

IIT Kanpur has demonstrated its excellence in research in many areas. To cite a few areas: Finite Element Methods Using Domain Decomposition, Flow Induced Vibrations, Wind Tunnel Testing of Large Scale Prototypes, Computational Chemistry, Nano-materials and Nano-technology, Geometric Optimization of Large Organic Systems, Genomics and Bio-Informatics, Electronic Structure Calculations, Aggregation and Etching, Molecular Dynamics, Thin Film Dynamics, Optical / EM Field Calculations, Computational Fluid Dynamics and Heat Transfer, Computer Aided Design and Rapid Prototyping, Tomography, Robotics, Multi-Body Dynamics, Geo-seismic Prospecting, Stress Analysis and Composite Materials, Vibration and Control, Semiconductor Physics, Photonics, Neural Networks and Genetic Algorithms, Earthquake Engineering, Spin Fluctuations in Quantum Magnets, Quantum Computation and so on. Early detection of cancer, high temperature superconductors, magneto optical imaging, organic semiconductors.

The most recent initiative of IIT Kanpur has been the

Formation of a Strong Research Group in the areas of Nanoscience and Nanotechnology, Aerosol Direct Efforts and Flexible Electronics.

#### **National Programme on Earthquake Engineering Education**

IIT Kanpur earnestly believes that every Institute of National Importance has an obligation to render necessary service to the country in a crisis. Our country is prone to strong earthquakes, and we need to contain the risks this involves. A trained manpower development programme for earthquake risk mitigation, known as NPEEE (National Programme on Earthquake Engineering Education), has been instituted by the Government of India. IIT Kanpur is the nodal agency for the entire gamut of NPEEE activities. The enthusiastic faculty members of the Institute have made enormous contribution in the Earthquake Engineering Education in the country. Their work in the Andaman Islands during the Tsunami calamity deserves deep appreciation.

#### **New Initiatives in Academic Courses**

NPTEL Phase IV has proposed several new activities which is in tune with the recently initiated scheme of MHRD called the Central Sector Scheme (CSS) and compliant with Massive Open Online Courses (MOOC) initiative. It is anticipated that the CSS of MOOC compliant e-contents under NPTEL IV will play an important role towards affordable, high-quality, online and open access education drive of MHRD.

The Institute experimented with blended mode teaching for a course with 400+ students under the Pandit Madan Mohan Malviya National Mission on Teachers and Teaching (PMMNMTT). Lectures were recorded and released at the beginning of a week. The classroom was used for discussions, clarifications and problem solving. It was found that the method worked quite well. A tool has been designed and implemented successfully to correct programming assignments in the first course on programming. A new MOOC management system, 'mooKIT' with special features for developing countries has been developed and utilized to teach about 12 MOOCs including one on Climate Change by the University of South Pacific Fiji and another on agriculture (under NPTEL with the help of agriculture experts).

#### **Activities Related to PG students:**

An annual event called Research Scholar day was held in each department and interdisciplinary program. The doctoral students showcased their research output through oral or poster presentations and engaged in extensive discussions with their peer and the faculty. This exercise was welcomed by the scholar community and added new vigor and enthusiasm in the academic community.

The Department of Biotechnology supported M.Tech. program of Department of Biological Sciences and Bioengineering was rated the best amongst 71 such programs in the country. This independent evaluation was done by the expert team in collaboration with the Biotech Consortium India Limited.

#### New UG and PG programs:

Institute has recently introduced following academic programs:

1. Bachelor of Science (BS) in Earth Sciences (4

year degree program)

2. MS by Research in Computer Science & Engineering (2 year degree program)

#### ADMISSIONS

##### Undergraduate

Admissions for all the B. Tech. and BS (4 -year) programmes at IIT Kanpur for the academic session 2015-2016 were made by the Joint Admission Committee for all IITs and IT-BHU.

The Joint Entrance Examination (JEE Advance)-2015 was held on May 24, 2015. The following offers of admission were made from IIT Kanpur:

Department/ Disciplines Programmes	Total Number of Candidates-Direct Admission								
	JEE-2015					Preparatory Course-2014			Total
	Gen	SC	ST	OBC	PH	SC	ST	PH	
<b>B.Tech.</b>									
Aerospace Engg.	25	08	05	14	-	-	-	-	52
BSBE	20	07	-	11	-	-	-	-	38
Chemical Engg.	38	12	06	20	01	-	-	-	77
Civil Engg.	53	16	08	28	05	-	-	02	112
Computer Sc. & Engg.	44	14	07	23	01	-	-	-	89
Electrical Engg.	66	20	11	35	03	-	-	01	136
Mechanical Engg.	50	15	07	28	01	-	-	-	101
Material Science & Engg.	45	14	04	24	02	-	-	01	90
<b>B.S. Programme (4 year)</b>									
Chemistry	18	05	02	09	-	-	-	-	34
Mathematics & Scientific Computing	25	08	05	13	-	-	-	-	51
Economics	19	06	03	10	-	-	-	-	38
Physics	15	05	02	09	-	-	-	-	31
<b>Total</b>	<b>418</b>	<b>130</b>	<b>60</b>	<b>224</b>	<b>13</b>	<b>-</b>	<b>-</b>	<b>04</b>	<b>849</b>

#### Two-Year M.Sc. Programme

Admissions to the 2-year M.Sc. and M.Sc.-Ph.D. (Dual Degree) programmes were made on the basis of JAM performance. Admission statistics for the M.Sc. (2 year) and M.Sc.-Ph.D. (Dual Degree) Physics programmes during 2015-2016 are as under:

S. No.	Department/Group	Numbers of Admission Offered	Number of Students Joined
<b>M.Sc. (2-year)</b>			
1	Chemistry	40	39
2	Mathematics	40	37
3	Physics	30	30
4	Statistics	50	39
<b>Total</b>		<b>160</b>	<b>145</b>
<b>M.Sc. – Ph. D. (Dual Degree)</b>			
1	Physics	11	11
<b>Total</b>		<b>171</b>	<b>156</b>

## Post Graduate

The number of students admitted to the Postgraduate Programme in the First and Second Semesters 2015-2016 is given below:

### ENGINEERING

Department / Group	First Semester			Second Semester		
	M.Tech.	Ph.D.	Total	M.Tech.	Ph.D.	Total
Aerospace Engg.	45	12	57	-	06	06
BSBE	08	17	25	-	06	06
Chemical Engg.	12	09	21	-	04	04
Civil Engg.	42	16	58	-	06	06
Computer Sc. & Engg.	44	02	46	-	06	06
Design (M.Des.)	18	04	22	-	03	03
Electrical Engg.	59	18	77	-	15	15
Mechanical Engg.	42	18	60	07	14	21
Materials Science & Engg.	10	09	19	-	08	08
IME	21	04	25	-	03	03
Photonics Science & Engg.	08	00	08	-	02	02
Material Science	21	06	27	-	0	00
NET	03	02	05	-	02	02
EEM	10	0	10	-	0	0
MBA	34	0	34	-	0	0
VLFM (IME)	39	0	39	-	0	0
<b>Total</b>	<b>416</b>	<b>117</b>	<b>533</b>	<b>07</b>	<b>75</b>	<b>82</b>

### SCIENCES

Department / Group	First Semester	Second Semester
	Ph.D.	Ph.D.
Chemistry	24	13
Mathematics	06	05
Physics	11	02
M.Sc.-Ph.D. Dual Degree in Physics	03	01
H.S.S.	05	10
Earth Sciences	08	03
<b>Total</b>	<b>57</b>	<b>34</b>

Department / Group	First Semester	Second Semester
Chemical Engg.	01	02
Civil Engg.	05	01
Electrical Engg.	15	09
Mechanical Engg.	14	11
Photonics Sc. & Engg.	02	0
Environmental & Engg. Mgt.	01	0
<b>Total</b>	<b>38</b>	<b>23</b>
<b>Grand Total</b>	<b>628</b>	<b>139</b>

**CURRENT STRENGTH**

The total department/programme wise strength of students in 2015-16 I Semester is given below:

Department / Group	Undergraduate				Postgraduate				Total (UG + PG)
	BT/B S/ MS-5	Dual Degree	M.Sc.-2 Yr	M.Sc.-Ph.D. (M.Sc.-Part)	M.Tech./MBA/DE S/ VLFM	MSR	Ph.D.	M.Sc.-Ph.D. (Ph.D.-Part)	
Aerospace	194	30	-	-	105	-	71	-	400
BSBE	147	10	-	-	24	-	93	-	274
Chemical	307	38	-	-	30	01	94	-	470
Chemistry	80	16	80	-	-	-	214	-	390
Civil	417	56	-	-	87	05	93	-	658
CSE	400	37	-	-	86	-	32	-	555
Economics	152	44	-	-	-	-	-	-	196
Design (M.Des.)	-	-	-	-	46	-	20	-	66
EE	535	36	-	-	208	15	182	-	976
HSS	-	-	-	-	-	-	64	-	64
Math & Sc. Comp	208	44	-	-	-	-	-	-	252
Math	-	-	78	-	-	-	61	-	139
Stat	-	-	78	-	-	-	-	-	78
ME	388	70	-	-	94	14	152	-	718
MSE	332	30	-	-	33	-	82	-	477
ESM	1	-	-	-	-	-	-	-	1
Physics	100	12	60	19	-	-	81	49	321
IME	-	2	-	-	45	-	37	-	84
PSE	-	-	-	-	17	02	07	-	26
MSP	-	-	-	-	47	-	36	-	83
NET	-	-	-	-	11	-	20	-	31
EEM	-	-	-	-	33	01	-	-	34
DIIT(EE)	-	-	-	-	-	-	-	-	00
MBA (IME)	-	-	-	-	64	-	-	-	64
VLFM(IME)	-	-	-	-	39	-	-	-	39
ES	-	-	-	-	19	-	19	-	19
<b>Total</b>	<b>3261</b>	<b>425</b>	<b>296</b>	<b>19</b>	<b>988</b>	<b>38</b>	<b>1358</b>	<b>49</b>	<b>6434</b>

## COURSES OFFERED

The following table gives the number of courses offered during 2015-2016 at the undergraduate as well as postgraduate level:

### UNDERGRADUATE LEVEL

Core Curriculum / Department Courses	First Sem.	Second Sem.	Summer	Total
Core Courses run by various departments				
Aerospace Engineering	19	24	2	45
B. S. B. E.	14	14	1	29
Chemical Engineering	21	16	2	39
Civil Engineering	27	31	4	62
Computer Science & Engineering	20	28	3	51
Design	-	05	-	5
Electrical Engineering	32	36	5	73
Mechanical Engineering	29	35	8	72
Materials Science and Engineering	21	22	-	43
Chemistry	28	27	1	56
Mathematics	37	34	6	77
Physics	34	32	2	68
Humanities & Social Sciences	41	51	12	104
Industrial & Management Engineering	20	17	3	40
Nuclear Engineering & Technology	1	05	-	6
Materials Science Program	-	-	-	-
Laser Technology Program	2	-	-	2
ES	-	03	-	3
CPA	02	02	02	06

### POST GRADUATE LEVEL

Core Curriculum / Department Courses	First Sem.	Second Sem.	Total
Aerospace Engineering	19	16	35
Chemical Engineering	11	11	22
Civil Engineering	16	21	37
Computer Science & Engineering	13	19	32
Design (M.Des.)	4	7	11
Electrical Engineering	30	32	62
Environmental Engg. & Management	3	9	12
Mechanical Engineering	22	30	52
Materials Science & Engineering	13	12	25
Chemistry	17	12	29
Mathematics / Statistics	16	21	37
Physics	15	16	31
Humanities & Social Sciences	20	34	54
Industrial & Management Engineering	18	12	30
Materials Science Program	3	3	6
Nuclear Engineering & Technology	3	5	8
Photonics Science & Engineering	3	2	5
Biological Science & Bio Engg.	8	9	17
MBA (IME)	13	13	26
VLFM (IME)	6	-	6
Earth Sciences	4	6	10

## PROMOTION AND DETENTION OF STUDENTS

*B. Tech., BS, M.Sc.(Integrated) and Dual Degree students (up to July 2016)*

Sl. No.	Contents	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year	Total
1	Students strength at the beginning of the session	835	809	791	828	116	3379
2	Students strength at the beginning of the 2 <sup>nd</sup> semester	834	803	784	824	90	3335
3	Students joined in 2 <sup>nd</sup> semester on migration	-	-	-	-	267	267
4	Number of students withdrawn or on leave on medical ground in 1 <sup>st</sup> and 2 <sup>nd</sup> semesters	1	2	3	11	2	19
5	Number of students graduated	-	-	-	426	272	698
6	Number of students dismissed due to poor performance in 1 <sup>st</sup> and 2 <sup>nd</sup> semester	2	6	3	15	3	29

*M.Sc.(2-year) and M.Sc.(Dual Degree) students (up to July, 2016)*

S. No.	Contents	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	Total
1	Students strength at the beginning of the session	155	149	304
2	Students strength at the beginning of the 2 <sup>nd</sup> Sem.	150	147	297
3	Number of students dismissed in 1 <sup>st</sup> semester	01	04	05
	Number of students dismissed in 2 <sup>nd</sup> semester	06	04	10
4	Number of students graduated in 1 <sup>st</sup> semester	-	-	-
	Number of students graduated in 2 <sup>nd</sup> semester	-	115	115

## GRADUATION

During the year 2015-2016, 1807 students were awarded the degree of B.Tech., BS, M.Sc.-2 Yr, M.Sc.-5 Yr, Dual Degree, MBA, VLFM, M.Tech., M.Des and Ph.D. in the 49<sup>th</sup> Convocation held on 27<sup>th</sup> & 28<sup>th</sup> June, 2016 as shown in the table below:

GRADUATION DATA - 49<sup>th</sup> CONVOCACTION - 2016

Department	Under-Graduate Programmes											Post Graduate						
	B.Tech.	BS	Double Major	BT-MT (Dual Degree)	BS-MS (Dual Degree)	BS-MT (Dual Degree)	BT-MS (Dual Degree)	BT-MBA (Dual Degree)	M.Sc. (5YR)	M.Sc. (2YR)	MS-Ph.D #	TOTAL	VJEM	MBA	M.Des	M.Tech	Ph.D.	TOTAL
Aero engg.	21	-	-	32	-	-	-	-	-	-	-	53	-	-	64	7	71	124
BSBE	27	-	1	3	-	-	1	-	-	-	-	32	-	-	12	14	26	58
Chem. Engg.	80	-	3	28	-	-	-	-	-	-	-	80	-	-	19	10	99	189
Chemistry	35	-	-	-	8	-	3	1	5	47	-	63	-	-	-	24	74	84
Civil Engg.	80	-	2	45	-	-	-	-	-	-	131	-	-	-	53	8	61	192
Comp. Sc.& Engg.	36	-	1	51	-	-	-	-	-	-	138	-	-	-	66	6	72	210
Design Prog.	-	-	-	-	-	-	-	-	-	-	-	-	-	37	-	-	37	37
Earth Sciences	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
Economics	112	-	3	33	21	-	-	-	7	-	4	148	-	-	131	17	166	316
Elect. Engg.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	21	21
Env. Engg. & Mgmt.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	9	9
Humanities & Social Sciences	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Industrial & Mgmt. Engrg.	-	-	-	-	-	-	-	-	-	-	-	-	36	33	27	2	101	101
Photonics Sc. & Materials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	7	7
Metallurgical	61	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3	5	6
Materials Science	60	-	1	7	-	-	1	-	-	-	69	-	-	-	21	3	24	93
Mathematics	-	23	1	-	28	-	-	-	7	29	29	-	-	-	-	6	6	70
Mechanical	62	-	-	53	-	-	1	-	-	-	115	-	-	-	36	17	53	166
Nuclear Engg. & Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	1	15	15
Physics	-	33	01	-	9	-	-	-	2	23	4	42	-	-	-	20	20	62
Statistics	-	-	-	-	-	-	-	-	-	3.	3.	-	-	-	-	-	-	31
<b>TOTAL</b>	<b>499</b>	<b>49</b>	<b>12</b>	<b>251</b>	<b>66</b>	<b>-</b>	<b>6</b>	<b>1</b>	<b>21</b>	<b>125</b>	<b>4</b>	<b>4034</b>	<b>39</b>	<b>33</b>	<b>37</b>	<b>151</b>	<b>773</b>	<b>1807</b>

# M.Sc. 2 Year degree awarded under MS-Ph.D (Dual Degree) Program