

## Interim Report on Change of Branch Rules at IIT Bombay

### 1. Background

The change of branch rules (COBR) in the IIT system serve two different purpose, a) seats that remain vacant in an IIT are allocated to candidates of the same batch after a certain duration, and b) students who show outstanding performance in the institute are given an opportunity to move into branches of their choice. COBR of an IIT is an important part of the common public interface that is notified to all JEE qualified candidates in the form of a section in the counselling brochure. A comparative study of the COBR of several IITs is given in Table 1. The important components of COBR are i) the time it is applied, ii) students who are permitted to participate, iii) eligibility criteria and rules for unconstrained change of branch, and iv) eligibility criteria and rules for change of branch under certain specified constraints. The following parameters are commonly used to specify COBR and are applicable to all categories.

- $S_i$  : Sanctioned intake for branch  $i$
- $R_i$  : On roll strength for branch  $i$  ( usually  $R_i \leq S_i$ , except for tie breaks or supernumary cases)
- $R$  : On roll strength of an institute,  $R = \sum_i R_i$
- $V_i$  : Seats vacant in branch  $i = \max(0, S_i - R_i)$
- $L_i$  : Number of students who are permitted to leave or move out of branch  $i$
- $J_i$  : Number of students who are permitted to join or move into branch  $i$

**COBR operate meaningfully only when there are vacant seats in a branch.** If there are no vacant seats for a certain batch, change of branch (COB) is out of reach for all students of that batch in the institute. Vacant seat is created in one of two possible ways.

A) A seat is vacant at the time of use of COBR, because a) it is not oped by anyone at the time of counselling, b) the candidate allotted the seat does not join or c) the candidate allotted the seat leaves before the application of COBR.

B) Student with outstanding performance in a batch is permitted to move to a branch of her choice without any (or few) restrictions. Such a movement from branch  $j$  to branch  $k$  may be permitted even if  $V_k = 0$ ,  $R_k$  exceeds  $S_k$ , and constraints on  $L_j$  and  $J_k$  are violated.

The vacant seats arising out of (A) and (B) are accumulated and made available to other students interested in a change of branch under constrained COBR wherein the constraints are specified using the parameters mentioned above.

### 2. New global changes in JEE operations and its impact on COBR at IITB

Two changes in JEE operations in the recent times have impacted the basis of COBR. The first is the introduction of a **second round of counselling**, which attempts to reduce the number of seats that are left unfilled. The other one is the expansion of categories to five, namely {GE, OBC, SC, ST, PD}, alongwith the rules and restrictions for movement of seats between these categories.

The impact of these two changes on the COBR of IITB is significant.

- The second round of counselling has made a significant difference to the number of vacant seats in IITB. For instance, despite the large intake of 880 for the 2010 JEE batch, the number of vacancies after the second round is 14 and 10 students have joined the preparatory course at IITB against these 14 seats. The number of vacant seats at IITD, IITM, IITK, IITKGP and IIT Roorkee for the same year is 18, 18, 31, 36 and 56 respectively.
- This institute is the preferred destination of JEE rankers for all the branches of the institute consistently for the past few years. This is corroborated by the data presented in Table 3, which shows that our institute is attracting top JEE rankers and almost every branch opens and closes earlier than the other IITs.
- The aggregate marks scored by qualified candidates in JEE 2009 and 2010 are given in Table 2. Combining the data of IITB given in Tables 2 and 3 indicate that there is marginal difference in the absolute marks of students admitted to several branches. Given the distribution of marks and AIR of students admitted to IITB, it not unfair to infer a branch allotted to a student is more a matter of chance than academic ability.
- The performance of students at IITB after the first year for 2007 to 2009 entrants and after semester 1 for 2010 batch is presented in Table4. Though the data of 2009 batch is incomplete, some performance

patterns are revealing. Two clusters are formed, one comprising CSE and EE and the remaining branches are grouped in the Other. A significant presence of other students in the high CPI groups show that students with comparatively lower JEE ranks are performing at par with the best.

### 3. Proposal for New COBR at IITB

Sustained high academic performance in IITB is a better indicator of an individual's academic capabilities as compared to the JEE rank is the guiding philosophy of the proposed COBR outlined in this section.

#### 3.1 COBR for GE and OBC

Components	Parameters	Existing COBR for GE	Proposed COBR for GE and OBC
After semester		2	2
COB is prohibited from		Nil	Nil
Unconstrained COB : From branch x to y	Eligibility criteria	Top 1% of R	CPI >= 9.0
	Condition	Nil	Can exceed $S_y$ by upto 10%
Constrained COB : From branch x to y	Eligibility criteria	CPI >= 6.5 PC	CPI >= 8.0 or GE & OBC PC
On Roll strength of x (minimum)	Leaving constraint	Can not fall below 85% of $R_x$	Can not fall below 85% of $S_x$
On Roll strength of y (maximum)	Joining constraint	Can not exceed $S_y$	Can exceed $S_y$ by upto 10%
Fairness criteria	Blocking constraint	YES	YES
Additional rule COB : From branch x to branch y	Opening and closing ranks of branch y	Nil	Candidate could have got branch y at JEE allocation time; eligibility criteria same as for constrained COB

**PC : completion of prescribed credits (ensures no backlogs or outstanding courses from the prescribed courses in the curriculum)**

#### 3.2 COBR for SC, ST and PD

Components	Parameters	Existing COBR for SC & ST	Proposed COBR for SC, ST and PD
After semester		2	2
COB is prohibited from		Nil	Nil
Unconstrained COB : From branch x to y		Nil	Same as for GE and OBC
Constrained COB : From branch x to y	Eligibility criteria	CPI >= 6.0 PC	CPI >= 7.0 PC
On Roll strength of x (minimum)	Leaving constraint	Nil	Can not fall below 85% of $S_x$
On Roll strength of y (maximum)	Joining constraint	Can exceed Sanctioned strength of a department (all branches included) by upto 2 seats	Can exceed $S_y$ by upto 10%
Fairness criteria	Blocking constraint	NO	YES
Additional rule COB : From branch x to branch y	Opening and closing ranks of branch y	Nil	Candidate could have got branch y at JEE allocation time; eligibility criteria same as for constrained COB

#### **4. Process for application of COBR**

It is proposed that the allocation of change of branch be carried out in an open manner in the presence of the applicants for COB. The committee recommends that the allocation process be conducted in two sessions. In the first session the allocation of unconstrained COBR and the additional rule for COBR be carried out, using an iterative process, if so required. The vacant seats after session 1 are announced, based on which the allocation for constrained COBR is undertaken. Transparency in the entire process would send a clear message about the institute's intent to strongly encourage academics and urge the students to put their best efforts right from the first semester.

#### **Committee Members**

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**TABLE 1: Change of Branch (COB) rules in IITs (cf. JEE Counselling brochure)**

		Bombay	Delhi	Madras	Roorkee	Guwahati	Kharagpur	Kanpur
After semester		2	2	1	2	2	2	2, 3, 4
COB is prohibited from		Nil	Nil	DD to B Tech	Nil	Nil	Any to B Arch; B Arch to any	Nil
Unconstrained COB : From branch x to y	Eligibility criteria	Top 1% of R	CPI $\geq$ 9.0	Min 1 from each branch	Top 1% of R	Nil	Top 1% of R	Nil
	Condition	Nil	Not to exceed 5% of $S_y$	Nil	Nil	Nil	Nil	Nil
Constrained COB : From branch x to y	Eligibility criteria	CPI $\geq$ 6.5 PC	CPI $\geq$ 7.5 PC	PC	CPI $\geq$ 7.5 PC	CPI $\geq$ 8.0 PC	CPI PC FT	Not in slow pace PC
On Roll strength of x (minimum)	Leaving constraint	Can not fall below 85% of $R_x$	Can not fall below 90% of $R_x$	Can not fall below 90% of $R_x$	Can not fall below 90% of $R_x$	Can not fall below 90% of $R_x$	Can not fall below 90% of $R_x$	Can not fall below 60% of $R_x$
On Roll strength of y (maximum)	Joining constraint	Can not exceed $S_y$	Can not exceed $S_y$	Can exceed $S_y$ by 10%	Can exceed $S_y$ by 5%	Can exceed $S_y$ by 10%	Can exceed $S_y$ by 10%	Maximum ( $R_y, S_y$ )
Fairness criteria	Blocking constraint	YES	YES	YES	YES	YES	YES	YES
Additional rules	COB : From branch x to branch y	Nil	Candidate could have got y at JEE allocation time	Nil	Nil	Nil	Nil	Nil
COBR of the new IITs		Indore, Gandhinagar #	Punjab	Hyderabad	Mandi	Patna	Bhubaneswar	Rajasthan

**Any** : All the branches available through JEE in the institute.

**# IIT Gandhinagar** has adopted COBR of IITB, except for unconstrained COB, where the criteria used is CPI  $\geq$  9.5

**PC** : completion of prescribed credits (ensures no backlogs or outstanding courses from the prescribed curriculum)

**FT** : All courses must be passed at the first attempt

**Blocking Constraint** : If a student S1 is not permitted to change from branch x to branch y, due to the violation of the Leaving constraint, then any other student S2, with CPI less than that of S1, will also not be permitted to change to y. The student S is said to block branch y from allocation, even though it may have vacant seats.

**Observations :**

1. The COBR rules are similar in spirit but differ considerably in the numbers that control its application.
2. For unconstrained COBR, the two criteria are commonly used. The first is the “**top 1 % criteria**” which states that top 1% of on-roll strength are eligible for unconstrained COBR (without any restriction on CPI). The other one is a hard-coded CPI criteria. The former is more restrictive because high rankers of JEE are often within the top 1% and are usually not interested in a COB. The latter criteria is more flexible, is available to students of any branch but demands consistent high academic performance in IIT.
3. More the number of seat allocations under unconstrained COBR, more are the vacancies created in the various branches (even if there were no vacant seats to start with), which in turn results in larger students availing a branch change under constrained COBR.

**TABLE 2 : Aggregate Total of Different Categories (500th for GE and OBC and 100th for SC/ST/PD) (cf. JEE homepage)**

**2 (a). Common Merit List (CML)**

AIR	1	501	1001	1501	2001	2501	3001	3501	4001	4501	5001	5501
2010	418	304	283	269	259	250	243	236	231	225	220	216
2009	424	302	278	262	249	239	230	223	216	211	205	200

AIR	6001	6501	7001	7501	8001	8501	9001	9501	Last Rank (marks)
2010	212	208	205	201	198	195	193	190	9509 (190)
2009	196	191	187	184	180	-	-	-	8295 (178)

**2 (b). OBC Merit List**

AIR	1	501	1001	1501	2001	2501	3001	3501	Last Rank (marks)
2010	380	233	207	190	178	-	-	-	2357 (171)
2009	413	223	194	174	-	-	-	-	1930 (161)

**2 (c). SC Merit List**

AIR	1	101	201	301	401	501	601	701	801	901	1001	1101
2010	366	195	171	154	144	137	130	126	121	117	113	110
2009	326	170	146	132	121	112	105	99	95	91	-	-

AIR	1201	1301	1401	1501	1601	1701	1801	1901	Last Rank (marks)
2010	107	105	102	100	98	96	-	-	1774 (95)
2009	-	-	-	-	-	-	-	-	967 (89)

**2 (d). ST Merit List**

AIR	1	101	201	301	401	501	601	701	Last Rank (marks)
2010	303	139	119	109	101	96	-	-	516 (95)
2009	319	114	91	-	-	-	-	-	208 (89)

**2 (e). PD Merit List**

AIR	1	101	201	301	401	501	601	701	Last Rank (marks)
2010	256	113	-	-	-	-	-	-	174 (95)
2009	289	108	-	-	-	-	-	-	138 (89)

**Observations :** 1. The aggregate marks drops significantly for AIR 1 vs AIR 500 for Common and OBC Merit lists, the difference exceeds 100 for the former and 150 for the latter. Beyond AIR 1500 for CML and 1000 for OBC, the difference in the aggregate marks is marginal.

2. The trend observed in the performance of GE and OBC is also seen for the other categories, however the rank difference here is 100.

**TABLE 3 : Opening and Closing Ranks in IITB, IITD, IITK, IITKGP and IITM**

**3(a). General Category**

	2010					2009					2008				
B Tech	B	D	K	KGP	M	B	D	K	KGP	M	B	D	K	KGP	M
Aero	415, 1480	-	1253, 2000	1687, 2276	1265, 1985	296, 1256	-	891, 1613	1660, 2102	847, 1833	606, 1117	-	569, 1760	1533, 2084	103, 1499
Ch E	512, 872	736, 1038	851, 1372	1413, 1949	561, 1797	244, 928	708, 1100	631, 1481	1391, 1935	960, 1819	496, 908	764, 1006	916, 1454	1398, 1944	984, 1853
Civil	887, 1474	717, 1553	1010, 1910	1842, 2317	1325, 2120	665, 1413	740, 1678	1095, 1984	1601, 2360	1068, 2084	529-1622	1090, 1851	1657, 2170	2053, 2464	1168, 2169
CSE	2, 116	3, 124	39, 231	268, 644	7, 232	3, 86	1, 154	2, 181	276, 527	5, 215	2, 76	3, 112	1, 148	115, 377	7, 156
EE	1, 98	76, 252	148, 467	783, 991	109, 338	8, 109	108, 241	39, 416	596, 920	32, 310	36, 165	122, 245	43, 444	180, 562	12, 286
EP	48, 1002	1050, 1908	-	-	494, 1678	303, 1171	1238, 1929	-	-	832, 1640	322, 1032	1110, 1861	-	-	846, 1725
ME	56, 471	249, 603	531, 772	787, 1156	310, 777	72, 494	237, 634	497, 806	830, 1191	275, 820	171, 494	360, 709	457, 840	820, 1214	260, 877
MEMS	1494, 1961	-	1134, 2923	2356, 3023	2186, 2934	1179, 2056	-	1774, 2794	2344, 2968	2134, 2733	1156, 2111	-	1587, 2895	2255, 3011	1916, 2949
Integrated M. Sc.															
Chem	2474, 4728	-	1995, 5233	5194, 6346	-	2717, 3884	-	1586, 4684	3335, 5287	-	2898, 4321	-	3353, 4630	-	-
Dual Degree programmes															
Aero	-	-	1618, 2048	2197, 2562	1828, 2396	1277, 1756	-	1766, 2009	2155, 2286	1357, 2066	1113, 1715	-	1065, 1887	2043, 2201	1484, 1962
Ch E	892, 1322	1109, 1561	1456, 1615	2023, 2407	1769, 2006	943, 1308	1167, 1652	1641, 1712	1687, 2158	1878, 2037	922, 1304	1170, 1639	1492, 1794	2040, 2452	1822, 2395
C E	-	-	1802, 2115	1805, 2580	2272, 2500	1368, 1662	-	1846, 2175	2099, 2537	2123, 2335	1635, 1952	-	1442, 2536	2584, 2820	2229, 2617
EE Comm	144, 366	284, 419	510, 643	535, 1138	489, 876	266, 379	284, 369	423, 608	482, 1091	458, 764	220, 386	263, 441	473, 590	381, 976	534, 830
EE Micro	101, 242	-	510, 643	535, 1138	486, 810	117, 245	-	423, 608	482, 1091	339, 716	168, 278	-	473, 590	381, 976	327, 707
Energy	414, 1003	-	-	-	901, 1292	294, 1258	-	-	-	1082, 1353	758, 1317	-	-	-	1244, 1425
EP	1022, 1368	-	-	-	-	607, 1266	-	-	-	-	1135, 1364	-	-	-	-
ME CADA	474, 566	-	759, 908	1159, 1552	878, 1304	419, 637	-	808, 992	1292, 1544	890, 1181	520, 647	-	860, 1139	1285, 1762	902, 1356
ME CIM	532, 641	-	759, 908	1159, 1552	708, 1266	556, 757	-	808, 992	1292, 1544	661, 1176	648, 801	-	860, 1139	1285, 1762	1018, 1307
MEMS C & C	1371, 2288	-	-	3030, 3234	2966, 3095	2065, 2285	-	-	2990, 3212	2790, 3032	2130, 2374	-	-	2569, 3272	3014, 3122
MEMS P E	2264, 2453	-	-	3030, 3234	2966, 3095	2200, 2480	-	-	2990, 3212	2790, 3032	2190, 2486	-	-	2569, 3272	3014, 3122

**TABLE 4: Distribution of Two clusters of students in CPI Groups****4.1 JEE 2010 Batch after semester 1**

<b>CPI Group</b>	<b>CS + EE</b>	<b>Others</b>	<b>Total</b>	<b>GE</b>	<b>OBC</b>	<b>SC</b>	<b>ST</b>	<b>PD</b>
>= 9.6	13	12	25	23	2	0	0	0
>= 9.5	20	15	35	32	3	0	0	0
>= 9.4	26	22	48	44	4	0	0	0
>= 9.3	37	25	62	54	7	1	0	0
>= 9.2	44	32	76	68	7	1	0	0
>= 9.1	45	40	85	76	8	1	0	0
>= 9.0	<b>51</b>	<b>47</b>	<b>98</b>	<b>84</b>	<b>11</b>	<b>2</b>	<b>1</b>	<b>0</b>
>= 8.5	82	98	180	147	27	2	4	0
>= 8.0	101	177	278	226	43	4	4	1
>= 7.5	128	274	402	311	69	17	4	1
>= 7.0	159	358	517	352	125	31	8	1
>= 6.5	176	424	600	384	157	45	13	1
>= 6.0	187	481	668	400	183	64	20	1
>= 5.5	192	509	701	411	198	70	21	1
>= 5.0	192	528	720	414	208	73	24	1
>= 4.5	192	531	723	414	210	74	24	1

**4.2 JEE 2009 Batch after semester 2 (Incomplete data)**

<b>CPI Group</b>	<b>CS + EE</b>	<b>Others</b>	<b>Total</b>	<b>GE</b>	<b>OBC</b>	<b>SC</b>	<b>ST</b>	<b>PD</b>
>= 9.6	13	2	15	13	2	0	0	0
>= 9.5	14	4	18	16	2	0	0	0
>= 9.4	22	9	31	28	3	0	0	0
>= 9.3	25	13	38	34	4	0	0	0
>= 9.2	26	17	43	39	4	0	0	0
>= 9.1	30	18	48	44	4	0	0	0
>= 9.0	36	21	57	51	6	0	0	0
>= 8.5	57	46	103	89	13	1	0	0
>= 8.0	74	88	162	134	22	2	4	0
>= 7.5	87	131	218	176	34	3	5	0
>= 7.0	99	179	278	210	49	13	6	0
>= 6.5	103	210	313	221	62	22	8	0
>= 6.0	104	215	319	224	62	25	9	0
>= 5.5	104	216	320	224	63	25	8	0
>= 5.0								
>= 4.5								

#### 4.3 JEE 2008 Batch after semester 2

CPI Group	CS + EE	Others	Total	GE	OBC	SC	ST	PD
>= 9.6	9	2	11	11	0	0	0	0
>= 9.5	14	4	18	18	0	0	0	0
>= 9.4	16	5	21	21	0	0	0	0
>= 9.3	17	6	23	23	0	0	0	0
>= 9.2	20	11	31	30	1	0	0	0
>= 9.1	29	15	44	43	1	0	0	0
>= 9.0	<b>33</b>	<b>21</b>	<b>54</b>	<b>51</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>
>= 8.5	68	61	129	120	7	1	1	0
>= 8.0	88	102	190	175	12	1	2	0
>= 7.5	103	154	257	231	22	2	2	0
>= 7.0	119	225	344	292	35	12	5	0
>= 6.5	128	274	402	324	46	20	12	0
>= 6.0	132	302	434	339	51	31	13	0
>= 5.5	132	309	441	341	51	35	14	0
>= 5.0	132	312	444	342	52	35	15	0

#### 4.4 JEE 2007 Batch after semester 2

CPI Group	CS + EE	Others	Total	GE	OBC	SC	ST	PD
>= 9.6	9	3	12	12	0	0	0	0
>= 9.5	11	5	16	16	0	0	0	0
>= 9.4	19	9	28	27	0	1	0	0
>= 9.3	25	10	35	34	0	1	0	0
>= 9.2	25	16	41	40	0	1	0	0
>= 9.1	26	21	47	46	0	1	0	0
>= 9.0	<b>29</b>	<b>27</b>	<b>56</b>	<b>55</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>
>= 8.5	54	69	123	120	0	3	0	0
>= 8.0	66	119	185	182	0	3	0	0
>= 7.5	81	178	259	254	0	5	0	0
>= 7.0	89	239	328	315	0	12	1	0
>= 6.5	98	272	370	349	0	18	3	0
>= 6.0	101	297	398	367	0	25	6	0
>= 5.5	103	310	413	375	0	30	8	0
>= 5.0	103	316	419	379	0	32	8	0