Indian Institute of Technology

Kanpur- 208016

REPORT OF DUAL MAJOR COMMITTEE

The dual major committee was formed by the Chairman Senate, vide letter no. DIR/IITK/2011/00-80.

The committee has the following members:

(1) Prof. CS Upadhyay
(2) Prof. K. Srihari
(3) Prof. RK Ghosh
(4) Prof. Balaji Prakash
(5) Prof. B. Dasgupta
(6) Prof. S. Qureshi

The mandate of the committee was to take into account the decisions of the senate with respect to the ARC report on the Dual Major programme to be started at IIT Kanpur. The committee, as desired, met several times and created a set of guidelines and a template for the departments to fill up. The guidelines and sample template are attached below as ***Appendix I***.

Several requests were sent to all departments to fill up the templates and return them to the committee. The following is the final status:

Department	Status of template submission	Mandatory ESO/SO credits	Mandatory departmental core credits	Maximum intake
Aerospace	Yes	33	101	15
BSBE	Yes	11	About 100	4
Chemical	Yes	About 44	103	8
Chemistry	Yes	Nil	99	10
Civil Engg.	Yes	22	123	20
Computer Sc.	Yes	11	108	10
Elec. & E Engg.	Yes	28	100 + 18(optional)	10
Math. & Stat.	Yes	22	110	5
Mech. Engg.	Yes	30	92	10%
Material Sc.&E	Yes	11	About 94	Not specified
Physics	Yes	11	102	Not specified

The detailed templates are given in ***Appendix II***.

Additional observations and recommendations:

(1) The courses required for the Dual Major should be offered in slots that do not clash with regular slots for these students (creation of buffer slots).
(2) The departmental templates should be reviewed and refined after one or two years.
(3) Additional correspondences (equivalent courses) may be specified by departments later, as the UG and PG curriculum evolves.
(4) The dual major templates and eligibility criterion should be added to the UG manual.

Eligibility for Dual Major:

(1) An interested student with CPI of atleast 8.0 can apply for the Dual Major option, at the end of the fifth semester. No requests should be entertained beyond this period.
(2) Allotments of requests should be based on overall CPI ranking and availability of seats, as is used for the usual branch change.

Program management:

(1) When a student is assigned a Dual major department, the student will migrate to the second department at the end of the eighth semester.
(2) After migration to the second department, the student will be advised by the DUGC convener of the new department on all issues related to registration and program management.
(3) After a student gets the dual major option, he/she may be allowed to take courses required for the dual major in the summer term, if offered. Summer registration will be done in consultation with the DUGC's of both departments. The maximum credit limit will be governed by the extant summer registration rules.
(4) The committee feels strongly that the summer term has to be treated as a regular term, with courses offered at an accelerated pace, but with the same rigor. A functional summer term is imperative for the smooth (and successful) implementation of this option and will reduce the burden of course management in the regular semesters. The faculty should be given incentives to encourage them to offer relevant courses in summer. This could be in the form of reduced/no load in subsequent semesters and monetary incentives. The student should also pay fees in tune with that charged for regular semesters.

(5) Migration to the dual department should be withdrawn if the student accumulates more than 30 credits of backlogs, or the CPI falls below 6.0 at the end of the eighth semester of the academic program of the student.

(6) If the student accumulates more than 25 credits of backlogs in the second department, after migration, his/her dual program should be terminated.

(7) A student may withdraw from the dual major at any time during the course of his/her academic program.

(8) In case of items (5), (6) and (7), the student will graduate with a bachelor's degree in the parent department only. In this case, all courses taken towards the dual major should be treated as OE courses towards the primary degree.

(9) Students pursuing a Dual Major will not be allowed to pursue a minor or dual degree.

(10) The senate should form a "Dual major implementation committee", to interface with the departments, in order to implement the Dual major program. The committee can refine the processes and establish a procedure to be followed in future.

CS Upadhyay K Srihari RK Ghosh B Prakash

B Dasgupta S Qureshi

Appendix I

Preparation of Template for DUAL MAJOR (B.Tech/BS)

Preamble: As per the senate approved ARC document, each department is required to give a template of the credits/courses that will constitute a dual major in the department. This option is for only the very good, interested students (CPI of 8.0). The student will make a request for dual major at the end of 5th semester (section 2.5.4 of ARC report).

Guidelines:

(1) The department should identify about 100 mandatory credits that will suffice for a second major. *This does not mean that the student has to do ALL the compulsory credits of the second department*.

(2) Identify the ESO/SO courses (or equivalent courses) that will be essential prerequisites for your department. Indicate if some/all of these ESO/SO credits can be waived.

(3) The template provided below should be used (a sample is created for guidance).

(4) Please try to indicate equivalent credits (taken elsewhere), which will be counted in lieu of any mandatory departmental credit.

(5) UGP should not be included in the mandatory credits, as per the ARC guidelines.

(6) A student will be allowed to use about 27-36 OE credits, towards credits for the Dual major. Hence, ensure that the remaining credits can be completed in 2 semesters (1 additional year).

(7) A department can allow *atleast* 10% of its sanctioned strength, for dual major students (section 2.5.4 of ARC report). **Please indicate the maximum number of students that can be accommodated in your department.**

(8) For APEC rules see section 2.4 of ARC report.

Sample Double Major Template

Department Name: XXXXX

Total Mandatory credits for second major: (about 100)

Essential core credits (ESO/SO): XXXX

Table 1: Sample template for double major.

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1	ESO212		ME231, CHE???	Equivalent credits
2	ESO204			
3	ESO202			
	Department core requirement			
4	AE231		ME353, CE???	Equivalent credits
5		AE211		
6		AE251		
7	AE311			
8	AE321			
9	AE331			
10		AE341		
11		AE351		
12		AE322		
13	AE441			
14	AE451			
15	AE461			
16		AE462		

Additional Remarks:

(1) Credits obtained in an equivalent course can be used in lieu of AE231.

(2) Maximum number of students that can be accommodated: XXX

Appended below are the dual-major templates given by various departments. A few templates have not been received. The departments that have not submitted the templates are: Physics, Material Science and Engineering, Civil Engineering.

Appendix II

Double Major Template: Department of Aerospace Engineering

Department Name: Aerospace Engineering

Total Mandatory credits for second major: 101

Essential core credits (ESO/SO): 33

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1	ESO212		ME231, CHE211	Equivalent credits
2	ESO204			
3	ESO202		CHE221	Equivalent credits
	Department core requirement			
4	AE231		ME353, CE455	Equivalent credits
5		AE211		
6		AE251		
7	AE311			
8	AE321			
9	AE331			
10		AE341		
11		AE351		
12		AE322		
13	AE441			
14	AE451			
15	AE461			
16		AE462		

Additional Remarks:

(3) Credits obtained in an equivalent course can be used in lieu of AE231.

(4) Maximum number of students that can be accommodated: 15

Double Major Template: Department of Biological Sciences and Bioengineering

Department Name: Biological Sciences & Bioengineering

Total Mandatory credits for second major: (about 100)

Essential core credits (ESO/SO): 11

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1	ESOXXX			Course Title: Principles of Biotechnology (New course)
	Department core requirement			
2		BSE221		
3		BSE222		
4	BSE211			
5	BSE311			
6	BSE312			
7		BSE321		
8		BSE322		
9		BSE323		
10	BSE411			
11	BSE412			

The ESO/SO courses (or equivalent courses) that will be essential prerequisites for the BSBE Department: ESOXXX: Principles of Biotechnology (This is a new course BSBE is planning to offer as part of the new UG Curriculum)

Maximum number of students that can be accommodated in BSBE: 4 (Four only).

<u>BSBE Department Core Courses</u>

BSE211: Cell Biology, Physiology & Anatomy
BSE221: Biochemistry
BSE222: Biochemistry Lab
BSE301: Technical Communications
BSE311: Basic Molecular Biology
BSE312: Molecular Biology Lab
BSE321: Structural Biology
BSE322: Bioinformatics & Computational Biology
BSE323: Biochemical Engineering
BSE411: Biomaterials
BSE412: Biomaterials Lab

Double Major Template: Department of Chemical Engineering

Department Name: Chemical Engineering

Total Mandatory credits for second major: 103 (Does not include ESO/SO)

Essential core credits (ESO/SO): ESO202, ESO214, ESO218, SO (CHM205/SE333)

Maximum number of students that can be accommodated: eight

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1	ESO202			See remarks below.
2	ESO214			
3	ESO218			
4	SO (Indus org. chem.)			
	Department core requirement			
4	D1 (Intro + Process Calc)			See remarks below
5		D2 (ChE Fluids)		
6		D3 (ChE Thermo)		
7		D4 (CPI)		
8	D5 (Heat Transfer)			
9	D6 (Mass Transfer)			
10	D7 (Process Sim. Lab)			
11		D8 (Rxn Engg)		
12		D9 (Process Control)		
13		D10 (UO Lab I)		
14	D11 (Process Design)			
15	D12 (UO Lab II)			

Remarks:

It was decided in the faculty meeting that “equivalent” ESO, SO and Department compulsory courses can only be decided based on the parent department of the student. Thus, a student applying from the CHM department **may** get a waiver for the SO course, a student from the MSE department **may** get a waiver for ESO214 (if it is not compulsory for the MSE department) and a student from the ME department **may** substitute D5 (heat transfer) by ME341 (heat and mass transfer). There are several other situations that may arise for finding the substitute/equivalent/waiver of the ESO, SO and Department compulsory courses and has to be handled on a case to case basis, which can be done at the DUGC level of the second-major department.

Double Major Template: Department of Chemistry

Department Name: CHEMISTRY

Total Mandatory credits for second major: 99

Essential core credits (ESO/SO): NONE

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1-4	ESO-1,2/SO-1,2 + ESO-3	SO-3	-	-
	Department core requirement			
5	CHM 203			
6		CHM222		
7		CHM242		
8		CHM202		
9	CHM303			
10	CHM321			
11	CHM345			
12	CHM305			
13		CHM322		
14		CHM342		
15		CHM344		
16	CHM423			

Additional Remarks:

Maximum number of students that can be accommodated: **10**

DUAL MAJOR (B.Tech/BS) for CE

Preamble: As per the senate approved ARC document, each department is required to give a template of the credits/courses that will constitute a dual major in the department. This option is for only the very good, interested students (CPI of 8.0). The student will make a request for dual major at the end of 5th semester (section 2.5.4 of ARC report).

The dual major in the department of Civil Engineering is open to any undergraduate student in the institute who has completed ESO 204 (Mechanics of Solids) and ESO 212 or ME 231 (Fluid Mechanics), on or before the 6th Semester.

Department Name: CE

Total Mandatory credits for second major: 123

Essential core credits (ESO/SO): 22 (ESO 204 and ESO 212/ME 231)

No.	Odd Semester	Even Semester	Correspondence	Remarks
	ESO/SO			
1	ESO212		ME231*	Must complete prior to enrolment
2	ESO204		-NA-	Must complete prior to enrolment
3	ESO218		Any 3rd ESO	Waived in favour of any 3rd ESO taken as part of the parent UG curriculum
4		ESO209	Any SO	Waived in favour of any SO taken as part of the parent UG curriculum
	Department core requirement			**Credits**
4	CE 211		None	12
5		CE 242	None	11
6		CE 262	None	8
7		CE 272	None	9
8	CE 321		None	8
9	CE 331		None	11
10	CE 351		None	8
11	CE 361		None	6
12	CE 371		None	6
13		CE 352	None	7
14		CE 372	None	6
15		CE 382	None	9
16	DE(A)		None	11
17		DE(A)	None	11

***It is possible that the Fluid Mechanics course of CHE will also be an alternative. But at the time of writing this report, detailed information was not available for that course. The CHE departmental template on ARC website simply mentions "D2 Fluids (9 credits)". This may be added as a possible alternative at a later date.**

Additional Remarks:

- Odd semester credits = 62 (marked in red), Even semester credits = 61.
- Maximum number of students that can be accommodated = 20
- Civil engineering total curriculum consist of 101 credits of compulsory courses and at least 22 credits from the elective *Basket A* denoted as DE(A).
- Compulsory Courses:

L-T-P-A	Credits	Title	Number	Pre-req
3-0-3-0	12	Environmental Quality and Pollution	CE211	pass grades (A-D) in CHM 101 and MTH 101, at least exposure grade (E) in CHM 102 and LIF 101
3-0-2-0	11	Civil Engineering Materials	CE242	None
2-0-2-0	08	Engineering Hydraulics	CE262	at least exposure grade (E) in ESO 212/ME 231 (Fluid Mechanics)
3-0-0-0	09	Structural Analysis	CE272	pass grades (A-D) in ESO 204 (Mechanics of Solids)
2-0-2-0	08	Engineering Geosciences	CE321	None
3-0-2-0	11	Geoinformatics	CE331	None
2-0-2-0	08	Soil Mechanics	CE351	at least exposure grade(E) in CE 242 and ESO 204 (Mechanics of Solids)
2-0-1-0	07	Foundation Design	CE352	CE 351
2-0-0-0	06	Engineering Hydrology	CE361	None
2-0-0-0	06	Design of Steel Structures	CE371	pass grades (A-D) in ESO 204 (Mechanics of Solids)
2-0-0-0	06	Design of Reinforced Concrete Structures	CE372	pass grades (A-D) in ESO 204 (Mechanics of Solids) and at least exposure grade(E) in CE 242
3-0-0-0	09	Introduction to Transportation Engineering	CE382	pass grades (A-D) in CE 242, at least an exposure grade(E) in CE 351

- The composition of the *Basket A* for DE(A). In the even semesters, CE 412 and CE 462 will be offered. In the odd semesters, CE 451, CE 471 and CE 481 will be offered.

L-T-P-A	Credits	Title	Number	Pre-req
3-0-2-0	11	Water Supply and Wastewater Disposal System	CE 412	pass grades (A-D) in CE 211
3-0-0-2	11	Application of Geotechnical Engineering	CE 451	pass grades (A-D) in CE 351, CE 352
3-1-0-0	11	Hydraulic and Hydrologic Design	CE 462	pass grades (A-D) in CE 262, CE 361
3-0-0-2	11	Special Topics in Structural Design	CE 471	pass grades (A-D) in CE 272, CE 371, CE 372
3-0-0-2	11	Transportation Facilities Design	CE 481	pass grades (A-D) in CE 382

- Possible Implementation Logic: Two extra semesters in the dual major program can accommodate a maximum of ~110 credits. Maximum of about 35 credits (three courses)

may have to be incorporated through OEs in the parent UG program. Conversion of 2 OEs from the parent UG program to DE(A) should suffice if at least one of the compulsory ESO courses is already part of the core curriculum of the parent UG program (e.g., for AE and ME, both the compulsory ESOs are satisfied). This will have implications in the routine making because a common and exclusive DE-OE slot will have to be created and the DE(A)'s need to be scheduled in that slot. For the parent UG program where none of the compulsory ESOs are contained in the core curriculum, one more OE slot may be used for the ESO.

Double Major in Department of Computer Science and Engineering

Department Name: Computer Science and Engineering

Total Mandatory credits for second major: 108

Essential core credits (ESO/SO): ESO 209 (Probability and Statistics) – this is strongly recommended.

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			(Units)
1	ESO209		Strongly recommended.	11
	Department core requirement			
4	CS210(3)	CS201 (4)		12+9
5	CS351(3)(lab)	CS202(4),CS203(4) modular		3+9
6	CS330(5)	CS220(4)		12+12
7	CS340(5)	CS352(4)(lab)		9+3
8	DE1(5)	CS335(6)		9+12
9		CS345(6)		9
10		DE2(6)		9

Additional Remarks:

(1) DE1, DE2 are to be taken from the basket {CS315, CS350, CS365, CS422, CS425, CS433, CS455}.

(2) It is strongly recommended that a student do ESO209 Probability and Statistics.

(3) Maximum number of students that can be accommodated: 10

Double Major Template: Department of Electrical and Electronics Engineering

<table>
<tr><th>Sem</th><th>Course</th><th></th><th>Credits</th></tr>
<tr><td>Sem VI</td><td>(See note below)</td><td rowspan="3">WHILE IN PARENT DEPARTMENT</td><td rowspan="3">21 Credit from OE in Parent Department</td></tr>
<tr><td>Sem VII</td><td>EE 200 (See note below)</td></tr>
<tr><td>Sem VIII</td><td>EE210
Or EE250
(Parent Dept.)</td></tr>
<tr><td>Sem IX</td><td>EE 320 (11)
EE 330 (11)
EE 370 (11)
EE 380/EE480 (10)
May do one extra PG course (min 9)
Or Project (Optional)</td><td rowspan="3">WHILE IN EE DEPARTMENT</td><td>43 + 9 (Extra Credit)</td></tr>
<tr><td>Sem X</td><td>S = { EE321 (9),EE301 (9), EE340 (11), EE311(9), EE360 (9), EE381/EE481 (6)}

Following options are recommended

1. 1 out of S + 3 PG Courses
2. 2 out of S + 2 PG Courses
3. 3 out of S + 1 PG Course
4. 1 out of S + 2 PG Courses + UGP 3 (Project)
5. 2 out of S + 1 PG Course +UGP 3 (Project)
May do one extra PG course (min 9) (Optional)</td><td>36 + 9 (Extra Credit)</td></tr>
<tr><td>Total Credits</td><td></td><td>100 + 18 (Extra Credit)</td></tr>
</table>

Note: The candidate is required to do ES0 209, ESO 210 and Math Module (PDE and Complex variables) in his core program

Double Major Template (BTech/BS)

Department Name: Mathematics and Statistics

Total Mandatory credits for second major: 110 [10 Dept. Core courses]

Essential core credits (ESO/SO): 22 (ESO209,ESO211)

Maximum number of students that can be accommodated: 5

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1	ESO211	ESO209	NA	
2				
3				
	Department core requirement			4 department core courses can be taken as OE during the BTech study and the rest 6 can be taken in the fifth year.
4	MTH204			
5	MTH301	MTH302		
6		MTH421		
7				
8				
9	MTHxxx*			
10	MTH403			
11		MTH424		
12		MTH308		
13	MTH401			
14	MTH423			
15				
16				

*Course number to be assigned

Remark: Need the full list of approved courses from other departments to decide on the mandatory department core course(s) than can be waived

Double Major Template

Department Name: Mechanical Engineering

Total Mandatory Credits for Second Major: 122
(Out of 122, 30 Credits are for the essential ESO/SO Courses)
(27 -36 Credits can be taken in OE slots of Parent Department)

Essential Core credits (ESO/SO): 30

No.	Odd Semester	Even Semester	Correspondence	Remarks
	ESO/SO			
1	ESO202 (11)			
2	ESO204 (11)			
3	ESO206 (8)		AE231	
	Department Core Requirement			
4		ME231 (10)	AE211+AE311	
5	ME251 (5)			
6		ME301 (10)		
7	ME321 (7)			
8		ME351 (8)		
9	ME352 (7)			
10		ME354 (10)		
11	ME341 (10)		ChE 312	
12	ME361 (10)			
13	ME401 (6)			
14		ME461 (9)		

Additional Remarks:

(1) Maximum number of students that can be accommodated: 10%

MSE Double Major Template

Department Name: Materials Science and Engineering

Total Mandatory credits for second major: about 94

Essential core credits (ESO/SO): 14

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1	ESO202 (11): "Mechanics of Solids"			preferred (not mandatory)
2	ESO205 (14): "Nature and Properties of Materials"			
3		PSO201 (8): "Quantum Physics"		Preferred (not mandatory)
	Department core requirement			
4	MSE201 (11)			
5		MSE202 (11)		
6		MSE203 (9)		
7		MSE204 (6)		
8	MSE301 (6)			
9	MSE302 (9)			

10	MSE303 (9)			
11		MSE304 (6)		
12		MSE305 (6)		
13	MSE311 or MSE313 (3)			
14	Department Elective (about 9)			
15		Department Elective (about 9)		

Additional Remarks: NONE

Double Major Template: Department of Physics

Department Name: Physics

Total Mandatory credits for second major: 102

Essential core credits (ESO/SO): 11

No.	Odd Semester	Even Semester	Correspondence	**Remarks**
	ESO/SO			
1		Quantum Phy		
	Department core requirement			
2	Optics			
3		Thermal Phy.	ESO202	Equivalent credits

4		Relativity		
5	Phy401			
6	Phy421		MTH203	Equivalent credits
7	Phy431			
8	Phy315			
9		Phy412		
10		Phy552		
11		Phy473	Any comput. course	Equivalent credits
12	Phy461			

Additional Remarks:

(1) There are no department elective or project courses, in the departmental core programme. This compactness should make the double major in Physics an attractive proposition for the interested students.

(2) Maximum number of students that can be accommodated: flexible