COURSE STRUCTURE, SYLLABUS AND REGULATIONS

2017

CSR/04/17 dated 8.2.2017

(1st and 2nd semester is common for all departments under the Faculty of Engineering & Technology, University of Calcutta)

(10+2+4) B. TECH PROGRAMME IN CHEMICAL ENGINEERING

DEPARTMENT OF CHEMICAL ENGINEERING

UNIVERSITY OF CALCUTTA

UNIVERSITY OF CALCUTTA

Faculty of Engineering and Technology

4 year B.Tech. Course

Course Structure for 1st SEMESTER

Serial No.	Name	Code	Credit	Weekly Load			Total Load
				L	T	P	
1	Communicative English	HU101	03	2	1	0	03
2	Physics-I	PH102	03	2	1	0	03
3	Chemistry-I	CH103	03	2	1	0	03
4	Engineering Mathematics-I	MA104	03	2	1	0	03
5	Electrical Technology	EE105	03	2	1	0	03
6	Computer Programming and Data Structure	CS106	03	2	1	0	03
7	Language Lab	HU107	02	0	0	3	03
8	Physics-I Lab	PH108	02	0	0	3	03
9	Chemistry-I Lab	CH109	02	0	0	3	03
10	Electrical Technology Lab	EE110	02	0	0	3	03
11	Computer Lab	CS111	02	0	0	3	03
	TOTAL		28	12	6	15	33

Course Structure for 2nd SEMESTER

Serial No.	Name	Code	Credit	Weekly Load			Total Load
				L	T	P	
1	Sociology	HU201	03	2	1	0	03
2	Physics-II	PH202	03	2	1	0	03
3	Chemistry-II	CH203	03	2	1	0	03
4	Engineering Mathematics-II	MA204	03	2	1	0	03
5	Basic Electronics	ET205	03	2	1	0	03
6	Engineering Mechanics	ME206	03	2	1	0	03
7	Physics-II Lab	PH207	02	0	1	3	03
8	Chemistry-II Lab	CH208	02	0	0	3	03
9	Electronics Lab	ET209	02	0	0	3	03
10	Workshop Practice	ME210	02	0	0	3	03
11	Engineering Drawing	ME211	02	0	0	3	03
	TOTAL		28	14	4	15	33

Curriculum of 4 year B. Tech. programme in Chemical Engineering – Departmental papers

3rd Semester:

A. THEORY						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
1.	Fluid Mechanics (ChE-301)	2	1	0	3	3
2.	Process Heat Transfer-I (ChE-302)	2	1	0	3	3
3.	Introduction to Chemical Engineering (ChE-303)	2	1	0	3	3
4.	Energy Resources and Utilization (ChE-304)	2	1	0	3	3
5.	Chemical Engineering Mathematics-I (ChE-305)	2	1	0	3	2
6.	Strength of Material (ChE-306)	2	1	0	3	2
Total of Theory					**18**	**16**

B. PRACTICAL						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
7.	Computer Programming-I (FORTRAN) (ChE-307)	0	0	3	3	2
8.	Instrumental Method of Analysis (ChE-308)	0	0	3	3	2
9.	Fuel Technology laboratory (ChE-309)	0	0	3	3	2
10.	Workshop Practice-II (ChE-310)	0	0	3	3	0 (A)
11.	Engineering Drawing (ChE-311)	0	0	3	3	0 (A)
Total of Practical					**15/9**	**6**
Total of Semester					**33/27**	**22**

4th Semester:

A. THEORY						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
1.	Transport Phenomena-I (ChE-401)	2	1	0	3	3
2.	Process Heat Transfer-II (ChE-402)	2	1	0	3	3
3.	Mechanical Operations (ChE-403)	2	1	0	3	3
4.	Chemical Technology (ChE-404)	2	1	0	3	3
5.	Chemical Engineering Mathematics-II (ChE-405)	2	1	0	3	3
6.	Process Calculation (ChE-406)	2	1	0	3	3
Total of Theory					**18**	**18**

B. PRACTICAL						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
7.	Fluid Mechanics laboratory (ChE-407)	0	0	3	3	2
8.	Heat Transfer laboratory (ChE-408)	0	0	3	3	2
9.	AUTOCAD drawing (ChE-409)	0	0	3	3	2
10.	Seminar-I (ChE-410)	0	0	3	3	2
Total of Practical					**12**	**8**
Total of Semester					**30**	**26**

5th Semester:

A. THEORY						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
1.	Numerical Methods in Chemical Engineering (ChE-501)	2	1	0	3	2
2.	Material Science (ChE-502)	2	1	0	3	2
3.	Separation Process-I (ChE-503)	2	1	0	3	3
4.	Machine Design (ChE-504)	2	1	0	3	3
5.	Reaction Engineering-I (ChE-505)	2	1	0	3	3
6.	Engineering Thermodynamics (ChE-506)	2	1	0	3	3
Total of Theory					**18**	**16**

B. PRACTICAL						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
7.	Mechanical Operations laboratory (ChE-507)	0	0	3	3	2
8.	Machine Drawing (ChE-508)	0	0	3	3	2
Total of Practical					**6**	**4**
Total of Semester					**24**	**20**

6th Semester:

A. THEORY						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
1.	Separation Process-II (ChE-601)	2	1	0	3	3
2.	Process Control (ChE-602)	2	1	0	3	3
3.	Process Instrumentation (ChE-603)	2	1	0	3	3
4.	Chemical Engineering Thermodynamics (ChE-604)	2	1	0	3	3
5.	Reaction Engineering-II (ChE-605)	2	1	0	3	3
Total of Theory					**15**	**15**

B. PRACTICAL						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
6.	Mass Transfer laboratory (ChE-606)	0	0	3	3	2
7.	Thermodynamics and Reaction Engineering laboratory (ChE-607)	0	0	3	3	2
8.	Process Control and Instrumentation laboratory (ChE-608)	0	0	3	3	2
9.	Process Equipment Design and Drawing-I (ChE-609)	0	0	3	3	2
Total of Practical					**12**	**8**
Total of Semester					**27**	**23**

7th Semester:

A. THEORY						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
1.	Modern Separation Techniques (ChE-701)	2	1	0	3	3
2.	Industrial Economics & Management (ChE-702)	2	1	0	3	3
3.	Environmental Engineering and Process Plant Safety (ChE-703)	2	1	0	3	3
4.	Project Engineering (ChE-704)	2	1	0	3	3
5.	Transport Phenomena-II (ChE-705)	2	1	0	3	3
6.	Modeling Simulation and Optimization (ChE-706)	2	1	0	3	3
Total of Theory					**18**	**18**

B. PRACTICAL						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
7.	Project Work (ChE-707)	0	0	3	3	3
8.	In-Plant training (ChE-708)	0	0	3	3	2
9.	Process Equipment Design and Drawing-II (ChE-709)	0	0	3	3	2
Total of Practical					**9**	**7**
Total of Semester					**27**	**25**

8th Semester:

A. THEORY						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
1.	Polymer Engineering (ChE-801)	2	1	0	3	3
2.	Process Plant Simulation (ChE-802)	2	1	0	3	3
3.	Biotechnology (ChE-803)	2	1	0	3	3
4.	Nanotechnology (ChE-804)	2	1	0	3	2
Total of Theory					**12**	**11**

B. PRACTICAL						
Serial Number	**Subject**	**Contact Hours/Week**				**Credit Points**
		L	**T**	**P**	**Total**	
5.	Process Plant Simulation (ChE-805)	0	0	3	3	2
6.	Project Work (ChE-806)	0	0	3	3	3
7.	General Viva Voce (ChE-807)	0	0	3	3	2
Total of Practical					**9**	**7**
Total of Semester					**21**	**18**

UNIVERSITY OF CALCUTTA
Faculty of Engineering & Technology

A. Regulation for 4-year 8-semester B. Tech. course
(with effect from the academic year 2015 – 2016)

<table>
<tr><td>01</td><td colspan="2">The Faculty of Engineering and Technology, University of Calcutta shall provide instructions leading towards the 4-year, 8-semester B. Tech. degree in different Engineering/ Technology courses as mentioned below:

1. Chemical Engineering
2. Chemical Technology
3. Computer Science and Engineering
4. Electrical Engineering
5. Electronics and Communication Engineering
6. Information Technology
7. Instrumentation Engineering
8. Jute and Fibre Technology
9. Optics and Optoelectronics Engineering
10. Polymer Science and Technology
Each of the courses is of four (4) years duration comprised of eight (8) Semesters, each Semester being of six (6) months' duration.</td></tr>
<tr><td>02</td><td colspan="2">Eligibility for Admission</td></tr>
<tr><td></td><td>(a)</td><td>Category-1: For admission into the FIRST YEAR of 4-Year B.Tech. course in any stream, the candidates must have passed Class XII Examinations in the system of 10+2 under West Bengal Council of Higher Secondary Education or equivalent with Physics, Chemistry, Mathematics securing an average of at least 60% marks (or equivalent grade) in these subjects and cleared West Bengal JEE. The minimum requirement of marks will however not be applicable for admission to Jute and Fibre Technology.</td></tr>
</table>

	(b)	Category-2: For admission of the B.Sc. (Hons.) qualified students into the SECOND YEAR of all B.Tech. courses **except the Jute and Fibre Technology course**, the candidates must have passed B.Sc. Honours with the subjects specified for different courses as given below. The selection will be strictly based on merit as adopted and invoked time to time by University of Calcutta. **Chemical Engineering**: BSc Honours in Chemistry **Chemical Technology**: BSc Honours in Chemistry **Computer Science and Engineering**: BSc Honours in Physics/ Computer Science/Mathematics/ Statistics **Electrical Engineering**: BSc Honours in Physics **Electronics and Communication Engineering:** BSc Honours in Physics/Electronics **Information Technology:** BSc Honours in Computer Science/Physics/Electronics **Instrumentation Engineering**: BSc Honours in Physics **Optics & Optoelectronics Engineering**: B.Sc. Honours in Physics/Electronics **Polymer Science and Technology**: BSc Honours in Chemistry The 'Category-2' students (except Jute & Fiber Tech. course)' must have to attend and pass 'Workshop' and 'Engineering Drawing' subjects additionally arranged in the THIRD/FOURTH Semester curriculum. However, no credit points will be awarded and will not be included for SGPA calculation. In the main mark sheet, mention will be made (at the bottom) that he/she has qualified 'Workshop/Drawing' with grade ----. The course of study for students admitted in the 2nd year will be of 6 Semesters (starting from third Semester) in three academic years. **Special Note: A certain percentage of seats in 4-year B.Tech. course will be set aside for entry of B.Sc. (Hons) qualified students in the second year. This percentage is 50% for the academic year 2015-16, and will be reduced in successive years as may be decided from time to time, but will never be below 20%. This provision, however, will not be applicable for admission to Jute and Fibre Technology.**
	(c)	Category-3: **Jute and Fibre Technology:** For admission into the SECOND YEAR of B.Tech. course in Jute and Fibre Technology, the candidates should qualify JELET for lateral entry, and should have any one of the following degrees: BSc with Physics/Chemistry/Mathematics, BSc in Textile and Clothing/ B.FAD OR Diploma in Mechanical Engineering/ Electrical Engineering/ Chemical Engineering/ Computer Engineering/Ceramic Engineering / Electronics/ Textile Technology/ Handloom Technology/ Apparel and Fashion Technology; Post BSc 2-year PG Diploma in Jute Technology and Management. The course of study for students admitted in the 2nd year will be of 6 Semesters (starting from third Semester) in three academic years.
	(d)	Any seat(s) remaining vacant at the end of Second Semester will be filled up by Category-2 candidates except for Jute and Fibre Technology (who might consider JELET qualified candidates).
03	The award of the said B. Tech. Degrees will be conferred to students who are successful in all of the eight	

(8) / six (6) Semester examinations.

04 **Attendance:** A student must attend 75% of the theoretical and laboratory/ practical classes separately in order to appear at Semester examinations.

05 **Credit based Evaluation**

(a) The credit based examination system will be followed for all Semester examinations. Each course shall have a certain number of credits assigned to it depending upon the academic load of the course assessed on the basis of *weekly contact hours* of lecture, tutorial and laboratory classes, assignments or field study and/or self study.

Generally, each course shall have an integer number of credits reflecting its weight. The number of credits of a course in a semester shall ordinarily be calculated as under:

(i) Lecture (L)/Tutorial (T): One lecture hour per week shall normally be assigned one credit. One hour of tutorial per week shall be assigned one credit. For determining the credits of a theory course, lectures and tutorials shall be added.

(ii) Practical (P): Three laboratory hours per week shall be assigned two (2) credits. Courses other than Lectures/Tutorials shall be treated as practical courses.

The course credits for each course shall be given as L-T-P. For example, 3-1-0 will mean that it is a lecture based course and has 3 lectures, 1 tutorial, and no practical assigned to it. Similarly, a course with 0-0-3 means that it is a practical course with 3 hours of practical work. Credits will be assigned to seminar, dissertation, project etc. under the practical component.

The 4-year course in any field of study will have subjects covering a total of 190 credits. The Semester wise credit points in various Departments may vary except the first two Semesters which are common to all disciplines (each Semester having a total of 28 credit points).

All examinations on theoretical papers will be on 100 marks while the laboratory/practical papers will carry 50 marks. Credit points of theoretical and practical papers including project work, design, General Viva Voce, plant training, seminar presentation etc. offered by various Departments will be given in Course Structures separately. There will be two components of examinations of theoretical papers: i) Sessional assessment 30% i.e. 30 marks ii) End Semester examination 70% i.e. 70 marks.

(b) **The Sessional assessment components of theory papers are:**

Serial No	Type of evaluation	Marks
01	Sessional Assessments through Class Test/ Assignments	20
02	Active participation in routine classes	05
03	Overall conduct, attendance, manners, skills etc.	05

(c) **Evaluation in Laboratory/ practical papers:**

Serial No	Type of evaluation	Marks
01	Report and results	20
02	Viva	20
03	Overall conduct, attendance, discipline, manners, skills etc.	10

	(e)	**Eligibility of success/failure in a Semester Examination:** (i) A student has to secure at least 50% marks i.e. Grade-D in all subjects individually in order to ***pass the examination.*** (ii) If a student fails in some subjects having total credits more than 8, he/she will have to repeat the whole Semester and will not be allowed to continue his studies to the next Semester classes. The student will eventually face a year loss. (iii) If a student fails in some subjects amounting 8 credits or less in a Semester but earns rest of the credits, he/she will be allowed to continue to the next Semester, ***provided that total of such backlog credits within the entire course period of eight semesters is 24 or less***. [Example: In the *first and second* Semesters, one has to earn at least 28 - 8= 20 credits; this may vary in other Semesters] (iv) Supplementary examinations of all papers of present Semester will be arranged soon after the publication of results of regular examinations of the present Semester. If the candidate fails to clear the supplementary paper(s), he / she will get another chance to clear the same in the corresponding semester in the next academic session. (v) **Special supplementary examinations** will be arranged only for *Semester 8* just after the declaration of results of 8^{th} *Semester.* (vi) **Additional Semester Examination:** A student who does not appear in some or all the examinations in a Semester on medical grounds or for representing the University in sports, cultural activities, NSS or any other reason considered valid under exceptional circumstances may apply for supplementary examinations to the Vice Chancellor through Head of the Department. These cases will be considered by the university authority and decision will be taken by the Syndicate. (vii) 'Category 1' students will have to utilize all the allowed chances (to pass back papers) **within six years** (i.e. 12 consecutive Semesters) to acquire 190 credits in 8 Semesters. Similarly, 'Category 2' students including lateral entry students of Jute and Fibre Technology will have to utilize all the allowed chances (to pass back papers) within **five years** (i.e. 10 consecutive Semesters) to acquire 134 credits in 6 Semesters. (viii) Eligibility for a Degree: The total credits for all the engineering courses are 190 for a 4-year course. Thus, a student ('Category 1') who could earn 190 credits in 8-Semester course would be eligible for a B.Tech. degree in above mentioned courses. 'Category 2' candidates, however will have to earn a total of 134 credits for the same B.Tech. Degree in 6 (six) Semesters starting from THIRD Semester. (ix) A student failing in any subject should apply to the Secretary, UCSTA through respective Head of the Department for appearing at the supplementary examinations within 07 days of the publication of results.

06 (a) On the basis of total marks (TA+CT+ESE) secured in each paper, **Grade (G)** and **Grade Point (GP)** shall be awarded to a student.

The equivalence between grades, grade points and the percentage marks is given by:

Percentage (%) of marks	Grade (G)	Grade Point (GP)
≥ 90	Ex	10
89 – 80	A	9
79 - 70	B	8
69 - 60	C	7
59 - 50	D	6
< 50	F	0

(b) Each paper shall carry **Credit (C)** according to the number of hours allotted per week and as indicated in the following table:

Paper/subject	No. of hours/week	Credit (C) assigned
Theoretical	1	1
Tutorial	1	1*
Practical	1	(2/3)*

*: For fractional credit, calculation is to be made by rounding off.

(c) The course structure and the credits assigned to each semester of each course are provided by individual Departments.

(d) The performance of a candidate in n^{th} Semester examination, who earns all the credits of that semester, will be assessed by the '**Semester Grade Point Average' (SGPA), 'S_n'** to be computed as:

$$SGPA\ [S_n\ ] = \frac{\sum_k [C_k\ GP_k\ ]}{\sum_k C_k}$$

where 'k' denotes the number of papers in a particular semester

and $\sum_k C_k$ denotes the total credits of a particular semester and GP_k is the grade point of k^{th} paper.

(e) On completion of the B.Tech. course, the overall performance of a candidate will be assessed by the '**Cumulative Grade Point Average' (CGPA)** to be computed as:

$$CGPA = \frac{\sum_n [C_n\ S_n]}{\sum_n C_n}$$

where, $C_n = \sum_k C_k$ and $\sum_n C_n$ denotes total credits of all the semesters i.e. 190 credits for category-1 and 134 credits for category-2 and 3.

(f) Each theory and each practical paper will be assessed by internal examiner(s). Design, Project, seminar and General Viva Voce examinations will be assessed by a board consisting of at least two (2) internal examiners and at least one (1) external examiner.

07 Candidates appearing in a semester examination shall join classes in the next semester immediately, wherever applicable, after completion of the examination.

08 If a candidate is unable to appear at any of the theory or practical examination(s), he/she will earn zero (0) credit in that paper(s).

09 The CU syndicate shall publish a list of successful candidates of the B. Tech. examination for each of the Semester examinations.

10 At the end of each Semester examination, a Grade-Sheet showing the Semester performance (Semester Grade Sheet) indicated by **SGPA** will be issued to the students. However, SGPA will not be calculated for those candidates who fail to earn all the credits in that Semester.
The Semester Grade Sheet should have the following basic information: The merit list will be prepared on the basis of the total marks obtained.

11 (a) A consolidated Grade-Sheet, showing the overall performance in the B. Tech course indicated by **CGPA**, will be issued only to those successful students who have earned 190 credits for Category-1 and 134 credits for category-2 and 3 in the B. Tech. courses.
The consolidated grade sheet shall consist of two components. The first component will have the information of the final Semester as follows:

Paper	Details of courses	Full Marks	Marks obtained	Credit obtained	Grade	Grade Point	SGPA	Remarks

The second component will have a **summary** of all the semesters having the following basic information:

Semester	Total credit	Credit obtained	SGPA	Full marks	Marks obtained	Cumulative statement	
						Total credit	
						CGPA	
						Full marks (Total)	
						Marks obtained	
						Result	#

The hash (#) in the last row of last column will contain the information regarding the final achievement of the candidate in all the examinations. This box will contain only one (1) of the following three (3) information: '1st Class' / '2nd Class' / 'Failed'.

(b) Candidates securing CGPA at least 7.5 in B. Tech. Examination shall be placed in the First Class and those securing 6.0 or more but less than 7.5 shall be placed in the 'Second Class'. Candidates securing CGPA less than 6.0 shall be declared 'Failed'.

12 The Degree of **"Bachelor of Engineering/Technology"** under the seal of the University shall be awarded to a successful candidate mentioning the grade and class he/she has obtained. The format will be as follows:

UNIVERSITY OF CALCUTTA
LOGO

It is hereby certified that after satisfying all the conditions prescribed by the University

***----------(Name)* Was on the ---th day of ----(month), -----(year)**
Duly admitted to the Degree of
Bachelor of ---------- Engineering/Technology
In the ---- Class

Vice Chancellor
Senate House

Additional Regulations of 4 year B. Tech. programme in Chemical Engineering for Departmental papers

Each theoretical paper is of one hundred (100) marks – 70 marks for end-semester examination (of 3 hour duration) and 30 marks for continuous sessional evaluation.

There will be at least two (2) paper-setters (internal) for each theoretical paper for end semester examination and the answer scripts will be examined by at least two examiners (internal). Each paper shall consist of 4 compulsory sections, each dedicated to individual module of respective syllabus. There will be no external paper setter or external examiner for theoretical papers. Theoretical papers will be moderated by a board of moderators consisting of at least 4 departmental faculty members including HOD as the chairman of the Board of moderators.

Examination of Practical Papers (excluding Audit Courses, Seminar, Project Work, In-Plant Training, General Viva-Voce) will be conducted jointly by at least two (2) internal examiners and one (1) external examiner. Examination of Audit Courses (ChE-310 and ChE-311) will be conducted by at least Three (3) internal examiners including HOD (Chairman of the Board).

Seminar (ChE-410)- A candidate shall deliver lecture in an open seminar on a pre-assigned topic during the semester and submit a term-paper (3 copies) which will be assessed by a board consisting of at least 3 internal examiners including the teachers(s) in–charge and HOD (Chairman of the Board). Assessment of the candidates shall be on the basis of the term-paper submitted and performance at the seminar.

Project Work (Thesis-I) (ChE-707) and Thesis-II (ChE-806)- A research problem shall be assigned to a candidate during semester VI. He/She shall work on the assigned problem under the supervision of a teacher in the department in semester VII and semester VIII.

For (ChE-707), two type-written and bound copies of an interim progress on the research problem shall be submitted by the candidate at least 15 days before the commencement of B. Tech. seventh semester examination. Examination of Project Work (Thesis-I) shall be conducted by a number of panels of examiners (internal), duly constituted by the departmental committee. The interim project evaluation is to be done by the supervisor (50%) and the panel excluding the supervisor (50%).

For (ChE-806), two type-written and bound copies of final report on the research problem shall be submitted by the candidate at least 15 days before the commencement of B. Tech. eighth semester examination. Examination of Project Work (Thesis-II) shall be conducted by a number of panels of examiners (internal and external), duly constituted by the departmental committee. The final project evaluation is to be done by the supervisor (50%) and the panel excluding the supervisor (50%).

For In-Plant Training (ChE-708), the candidates shall submit two type-written and bound copies of report with certificate from respective training providers on his/her four to six week In-Plant Training, within one month from date of return from training. Each candidate has to deliver an open presentation based on their training within 15 days from the date of submission of report. A Board consisting of examiners, including teacher(s) in–charge of plant training, one external examiner and HOD as the Chairman of the Board, will jointly conduct the viva-voce examination. The evaluation will be based on report, presentation and viva-voce.

For General viva-voce (ChE-807): Examination shall be conducted by two panels, each consisting of at least one external examiner and three internal examiners.