CRITERION 2	Program Curriculum and Teaching-Learning Processes	100
	Marks Claimed	95

2.1. Program Curriculum (30) Claimed 30

2.1.1. State the process for designing the program curriculum (10) Claimed 10

The program curriculum for Chemical Engineering is designed based on the broad guidelines of the Institute keeping in view the curriculums developed in other National Institutes of Technology (NIT), Ministry of Human Resources and Development (MHRD) directives and program specific criteria to meet the requirements of Program Outcomes (POs) and Program Educational Objectives (PEOs) of the Department. Industry persons, alumni and students are consulted at the time of designing the curriculum to update and rectify any gaps in the curriculum structure. To strengthen the teaching and learning process, curriculum is modified for every three years by introducing contemporary emerging areas of chemical engineering. Department Undergraduate Committee (DUGC) is formulated once in every three years with the Head of the Department (HOD) as the Chairman and a faculty from the department will be nominated by the HOD as Convener. All faculty members, one senior faculty member from the sister department, two working alumni and class representatives of all semesters are members of DUGC. The committee collects feedback, suggestions, and modifications, if any, from stakeholders and submits the same to the course instructor to prepare curriculum. The course contents of individual courses are discussed specifically for their outcomes in Department Undergraduate Committee (DUGC) meetings. The course instructors prepare and submit a tentative draft after thorough study of the report given by DUGC. The committee analyses and evaluates all the issues mentioned in the draft related to feedback and direct the instructor to draft a curriculum aligned with PEOs, POs and PSOs. The next step involves sending the DUGC approved draft by the chairman to the Program Assessment Committee (PAC) for their comments. The PAC is chaired by the HOD and senior faculties of the department are members. The curriculum is subjected to evaluation in the PAC so that the contents fulfill all the statutory requirements, else it is again returned for review. Redrafting the curriculum is made on the basis of valuable comments into consideration; the final draft is ready for the Senate Undergraduate Committee's (SUGC) approval. Considering all the comments and after a final review, the

modified syllabus is put forward by the SUGC for the Senate approval which is the highest academic body of the institute. The senate of NIT Srinagar is chaired by the Director and comprises of members drawn from various departments of the institute as well as from outside the institute. At least one member is an alumni and others are from other institutes of repute. The presence of outsiders and alumni ensure that the curriculum is designed keeping in view the inputs of alumni and faculty from other institutes. The process for designing the program curriculum is illustrated in Figure B.2.1a.

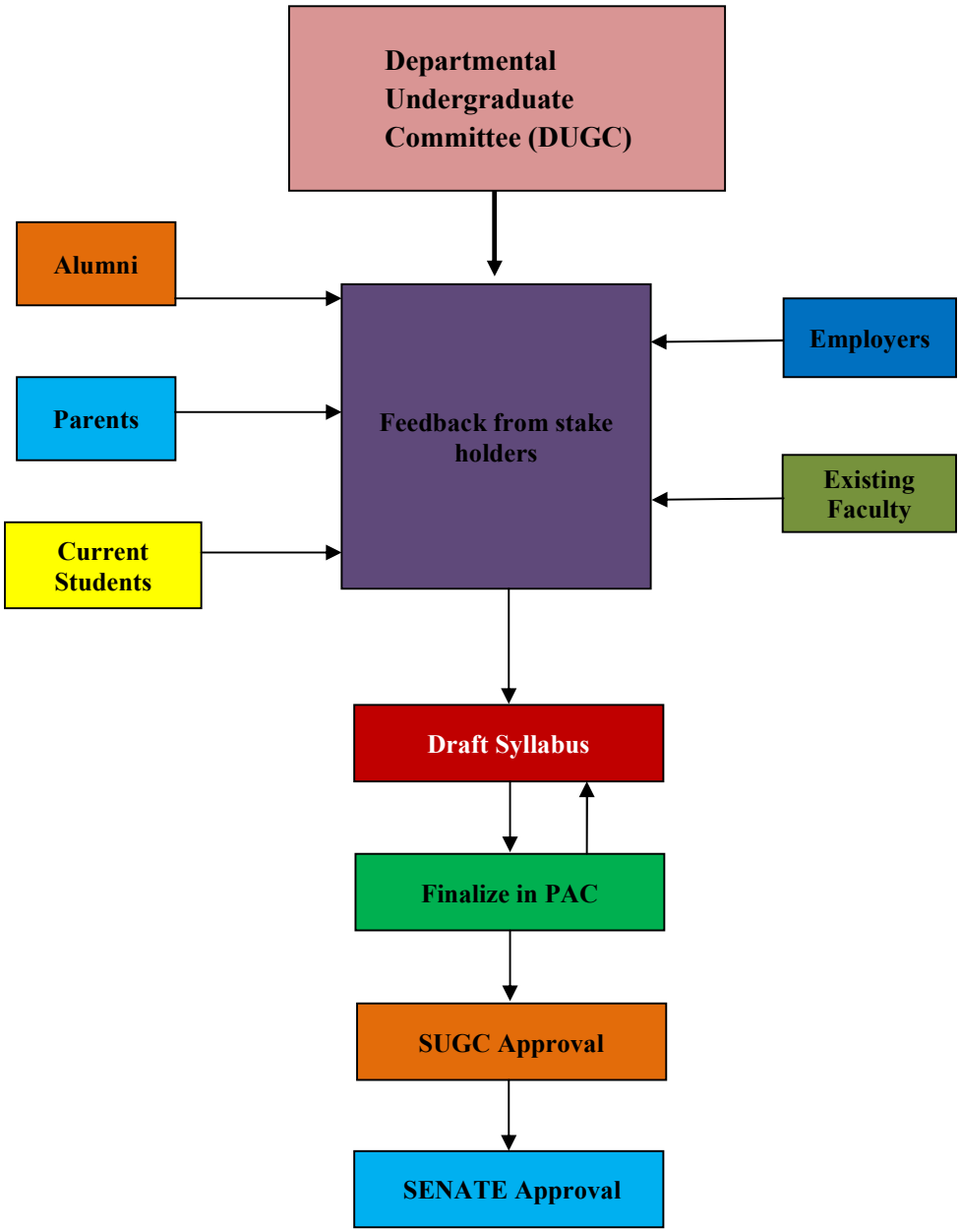

Figure B.2.1a: Process of designing the program curriculum

Process to Identify Gaps in the Curriculum

1. **Alumni Survey**

- Measures the degree to which past students believes they achieved program level learning outcomes.
- Overall satisfaction with the program.
- Overall satisfaction with the program delivery.
- Information on current professional or academic status. Typically collected every three-four years

2. **Industry/Employers Survey**

- Provides general information on current industry trends.
- Desirable graduate attributes.
- Overall perceptions of program quality. Strengths and expectations of graduates.

3. **In Program Students Survey**

- Measures the degree to which current students believe they are achieving Program-level learning outcomes.
- Overall satisfaction with the program.

4. Existing Students Survey

- Measures quality of the program and satisfaction with curriculum.
- An overall program delivery.

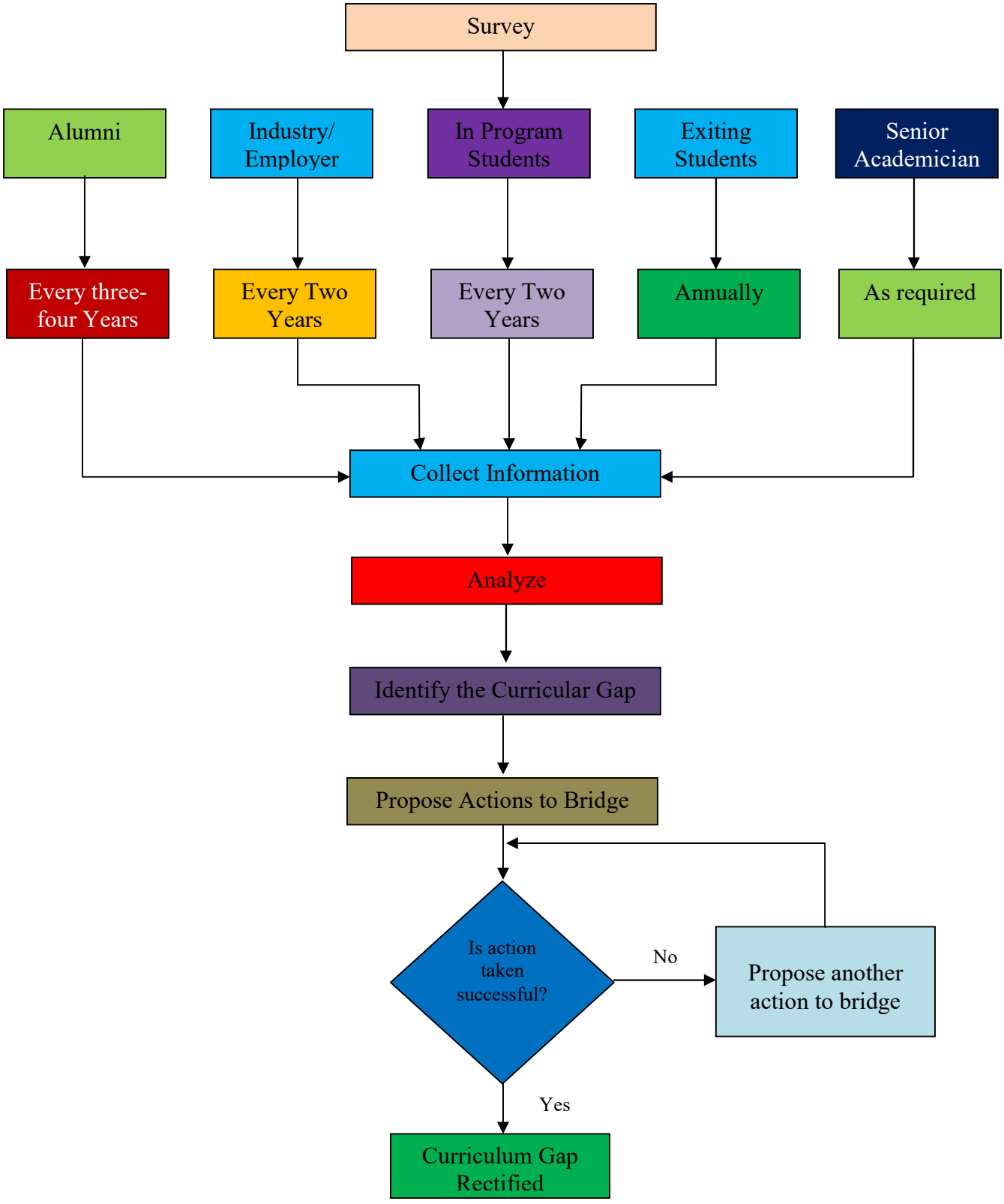

Figure B.2.1b: Process to identify the Curricular Gaps through Survey

ALUMNI SURVEY

Chemical Engineering Department
National Institute of Technology Srinagar
Alumni Survey Form

Thank you for taking the time to fill out this questionnaire. All the information will be kept confidential and will be used only for statistical purposes.

Alumni name		
Year of Graduation		
Mailing address		
Placement	**Before/after graduation**	**Core/Software**
Name of the Company		

Please rate each of the following skills, abilities or attributes in terms of their importance to state how well your education at **Chemical Engineering Department, National Institute of Technology, Srinagar** prepare you for these.

Skills, Abilities and Attributes	**Scale (1 to 5) Excellent to poor**
Apply Knowledge of mathematics, Basic sciences and Engineering	
Problem Identification and Analysis	
Design a system and develop solution to the problem	
Investigate and handle complex problems	
Ability to use techniques and tools in engineering practice	
Understand and appreciate the impact of engineering in the societal and global contexts	
Awareness of existing issues (e.g. Economics of engineering, Environmental issues)	
Understand professional and ethical responsibilities as an engineer (e.g., safety, professional ethics, code of conduct)	
Function effectively in teams	
Proficient in English language in both communicative and technical forms	
Awareness of the need for life-long learning (Seeking further education, self-learning, Membership in professional societies)	
Project Management and Finance	
Ability to apply the principles and practices of Chemical Engineering discipline along with the basic sciences and humanities to solve the complex engineering problems concerning the issues of environment, safety, economics, culture and society etc	
Apply the new knowledge with professional responsibility and ethics towards the advancement of academic and research pursuits in chemical and allied disciplines in the societal contexts	
Design, develop and modify the chemical processes and to analyze these by applying the physicochemical and biological techniques	

Signature	**Suggestion if any:**

EMPLOYER SURVEY

Chemical Engineering Department
National Institute of Technology, Srinagar
Employer Survey Form

The purpose of this survey is to obtain Employer's input on the quality of education of undergraduate programs in NIT, Srinagar. Your sincere cooperation would enable us to improve the quality of our graduates as per your requirements

Name of Company/ Organization			
Mailing address			
Sector Private/Public/Academia			
What are the pertinent employability skills to stay updated in current industry trends and thereby improve the quality of the undergraduate program?	Logical Thinking	Good Aptitude	Excellent Communication

Rate NIT Srinagar Graduates working in your organization using the following criterion.
Put tick mark Knowledge, Skills, Abilities, Attitude and other Attributes expected out of NIT Srinagar graduates.

Sl. No.	**Overall, are you satisfied with**	**Excellent (3)**	**Good (2)**	**Satisfied(1)**
i.	Capacity for development and analysis of engineering problems and formulation of appropriate solutions, retaining professional and ethical responsibilities.			
ii.	Aptitude for self-education, ability to learn new skills and a clear appreciation for the value of life-long learning to update professional knowledge.			
iii.	Understanding professional engineering solutions for sustainable development and their application in global, national and societal contexts.			
iv.	Competence for acquiring new skills and applying them in research and development.			
v.	Fundamental knowledge in mathematics and science and professional fluency in English both communicative and technical forms.			
vi.	Dexterity in differentiation of management techniques and possession of leadership skills that enable successful function of multi-disciplinary teams.			
Name and Designation:		**Signature:**		

IN PROGRAM STUDENTS SURVEY

National Institute of Technology, Srinagar **Chemical Engineering Department** **In-Program Student Survey Form**			
Name:		**Year Passed out:**	
Email:		**Phone**	
Assessment of Knowledge, Skills, Abilities and Attributes presently acquired at NIT Srinagar			
Please rate each of the following Knowledge, Skills, Abilities, Attitudes or attribute in terms how well NIT Srinagar inculcated them in your education so far. (tick mark the your choice)			
i.	Ability to acquire and apply knowledge of basic mathematics, science and engineering fundamentals. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
ii.	Ability to apply analytical skills to engineering problems. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
iii.	Ability to conduct experiments, analyze data, and present results. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
iv.	Ability to conduct independent research for information required in engineering problem Solving. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
v.	Ability to use modern technologies and tools necessary for practice. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
vi.	Ability to understand global issues related to engineering. If not satisfied give your suggestions to improve.		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
vii.	Understand the importance of ethical and professional responsibility. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
viii.	An ability to function on multi-disciplinary teams. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
ix.	An ability to communicate effectively. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
x.	A recognition of the need for, and an ability to engage in life-long learning. If not satisfied give your suggestions to improve		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**

EXITING STUDENTS SURVEY

Chemical Engineering Department
National Institute of Technology, Srinagar

Exiting Students Survey Form

Name:	Enrollment. No:
Phone No.	Email:

Assessment of Abilities, Skills and Attributes acquired at NIT Srinagar.
Please rate each of the following items in terms how well your education at NIT Srinagar prepared you for them.

1.	Basic knowledge in mathematics, science, engineering and humanities.		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
2.	Ability to identify, analyse and solve chemical engineering problems		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
3.	Ability to design and develop solutions for chemical engineering problems		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
4.	Ability to investigate the complex chemical engineering problems and their solutions		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
5.	Use of research-based knowledge and research methods		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
6	Demonstrate the ability to apply advanced technologies to solve contemporary and new problems		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
7.	Understanding professional engineering solutions in societal and environmental contexts		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
8.	Understanding of professional and ethical responsibility		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
9.	Ability to function as an effective member in multi-disciplinary teams		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
10.	Proficient in English language in both communicative and technical forms		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
11.	Demonstrate the ability to choose and apply appropriate resource management techniques		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
12.	Capable of self-education and clearly understand the value of updating their		

	professional knowledge to engage in life-long learning		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
13.	Ability to apply the principles and practices of Chemical Engineering discipline along with the basic sciences and humanities to solve the complex engineering problems concerning the issues of environment, safety, economics, culture and society etc.		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
14.	Ability to acquire and apply the new knowledge with professional responsibility and ethics towards the advancement of academic and research pursuits in chemical and allied disciplines in the societal contexts.		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**
15.	Design, develop and modify the chemical processes and to analyze these by applying the physicochemical and biological techniques.		
	Extremely Satisfied	**Satisfied**	**Not Satisfied**

1. Please list some very important skills that you think you had learned in the engineering program.

2. Please write down any comments or suggestions that you think will improve the engineering programs at NIT Srinagar.

3. Please comment about the department Vision and Mission:

2.1.2. Describe the structure of the curriculum (5)

Claimed 5

The syllabi format includes:

- Department, course code, and title of course.
- Designation as a required or elective course.
- Contact hours and type of course (lecture, tutorial, seminar, project etc.).
- Text books, and/or reference material.

The syllabus finalized by the Chemical Engineering Department during the years 2014 onwards.

1st Semester						
Course Code	**Course Title**	**(L)**	**(T)**	**(P)**	**Total Hours**	**Credits**
CHM-101	Chemistry-I	4	0	0	4	4
PHY-101	Physics-I	3	0	0	3	3
MTH-101	Mathematics-I	3	1	0	4	4
HSS-101	Communication Skills & Oral Presentation	3	1	0	4	4
IT-101	Computer Fundamentals And Problem Solving Techniques	3	0	0	3	3
CIV-102	Engineering Drawing	1	0	3	4	4
CHM-101 P	Chemistry-I Lab	0	0	2	2	1
PHY-102 P	Physics-I Lab	0	0	2	2	1
IT-102P	Computer Fundamentals And Problem Solving Techniques Lab	0	0	2	2	1
WSP-I	Workshop Practices- I	1	0	3	4	2
	Total	18	2	12	32	27
2nd Semester						
CHM-201	Chemistry-II	3	1	0	4	4
PHY-201	Physics- II	3	0	0	3	3
MTH-201	Mathematics-II	3	1	0	4	4
HSS-201	Introduction To Social Sciences	3	1	0	4	4
CSE-201	C Programming	3	0	0	3	3
CIV-201	Strength of Materials	3	1	0	4	4
MED-201	Machine Drawing	1	0	2	3	3
CHM-201 P	Chemistry-II Lab	0	0	2	2	1
PHY-201 P	Physics-II Lab	0	0	2	2	1
CSE-202 P	Computer Programming Lab	0	0	2	2	1
WSP-II	Workshop Practices-II	1	0	3	4	2
	Total	20	4	11	35	30

3rd Semester						
ChBC-31	Introduction to Chemical Eng.	3	1	0	4	4
ChBC-32	Material and Energy Balance	3	2	0	5	5
ChBC-33	Process Fluid Mechanics	3	1	0	4	4
ChBC-34	Thermodynamics and Chemical Kinetics	3	1	0	4	4
EEBC-31	Basic Electrical Eng.	2	1	0	3	3
EEBC-32P	Basic Electrical Eng. Lab	0	0	2	2	1
MTBC-31	Chemical Eng. Mathematics-I	3	1	0	4	4
	Total= 17+7+2=26	17	7	2	26	25
4th Semester						
ChBC-41	Chemical Eng. Thermodynamics	3	1	0	4	4
ChBC-42	Heat Transfer	3	1	0	4	4
ECEBC-41	Basic Electronics Eng.	2	1	0	3	3
ECEBC-42P	Basic Electronics Eng. Lab.	0	0	2	2	1
ChBC-43	Mechanical Operations	3	1	0	4	4
ChBC-44P	Fluid Mechanics & Mechanical Operations Lab	0	0	4	4	2
ChBS-41	Seminar	0	0	4	4	2
HSBC-41	Ethics and Self Awareness	2	0	0	2	2
MTBC-41	Chemical Eng. Mathematics –II	3	0	0	3	3
	Total=16+4+10=30	16	4	10	30	25
5th Semester						
ChBC-51	Process Equipment Design –I (Mechanical Aspects)	3	0	2	5	4
ChBC-52	Chemical Reaction Engineering	3	2	0	5	5
ChBC-53	Material Science & Technology	3	1	0	4	4
ChBC-54	Chemical Technology-I	3	0	0	3	3
ChBC-55	Mass Transfer-I	3	1	0	4	4
ChBC-56P	Heat Transfer Lab.	0	0	4	4	2
HSBC-51	Basic Management Principles	3	0	0	3	3
	Total=18+4+6=28	18	4	6	28	25
6th Semester						
ChBC-61	Process Equipment Design-II (Process Aspect)	3	0	2	5	4
ChBC-62	Mass Transfer-II	3	1	0	4	4
ChBC-63	Chemical Technology-II	3	0	0	3	3
ChBC-64	Energy Eng.	3	0	0	3	3
ChBC-65P	Energy Eng. Lab.	0	0	2	2	1
ChBC-66	Process Instrumentation	3	0	0	3	3

ChBC-67	Transport Phenomenon	3	1	0	4	4
ChBC-68P	Thermodynamics & Reaction Engineering Lab.	0	0	2	2	1
ChBC-69	Industrial Training & Presentation	0	0	4	4	2
	Total=18+2+10=30	18	2	10	30	25
7th Semester						
ChBP-71	Pre-project Work	0	0	4	4	2
ChBC-72	Chemical Process Safety	3	0	0	3	3
ChBC-73	Process Dynamics & Control	3	1	0	4	4
ChBC-74P	Process Dynamics & Control Lab.	0	0	2	2	1
ChBC-75	Process Economics & Plant Design	3	1	0	4	4
ChBC-76	Biochemical Eng.	3	1	0	4	4
ChBC-77P	Mass Transfer Lab.	0	0	2	2	1
E-I	Elective-I	3	0	0	3	3
E-II	Elective-II	3	0	0	3	3
	Total=18+3+8=29	18	3	8	29	25
8th Semester						
ChBP-81	Project	0	0	16	16	8
ChBC-82	Bioresource Technology	3	0	0	3	3
ChBC-83P	Biochemical Engineering Lab.	0	0	2	4	2
ChBC-84	Modeling & Simulation in Chemical Eng.	3	0	0	3	3
ChBC-85	Industrial Pollution Abatement	3	0	0	3	3
E-III	Elective-III	3	0	0	3	3
E-IV	Elective-IV	3	0	0	3	3
	Total=15+0+20=35	15	0	20	35	25

Table B.2.1.2a: Course Structure for B.Tech Chemical Engineering-2014 Batch onwards

L: Lecture, P: Practical, T: Tutorial

7th Semester (E-I)		
S.No.	Elective	Code
1.	Polymer Sciences and Engineering	ChBE-71
2.	Petrochemical Technology	ChBE-72
3.	Advanced Separation Processes	ChBE-73
4.	Operation Research	MTBE-71
5.	Human Resource Development	HSBE-71
7th Semester (E-II)		
1.	Computational Fluid Dynamics	ChBE-74

2.	Multi Component Distillation	ChBE-75
3.	Optimization Techniques in Chemical Eng.	ChBE-76
4.	Managerial Economics for Engineers	HSBE-72
	8th Semester (E-III)	
1.	Instrumental Methods of Analysis	ChBE-81
2.	Petroleum Refining	ChBE-82
3.	Food Technology	ChBE-83
4.	Nano-Science and Technology	ChBE-84
	8th Semester (E-IV)	
1.	Process Heat Integration	ChBE-85
2.	Fuel Cell Technology	ChBE-86
3.	Clean Technology in Process Industries	ChBE-87
4.	Entrepreneurship Development	HSBE-81

Table B.2.1.2b: Electives 2014 Batch onwards

The syllabus finalized by the Chemical Engineering Department during the years 2017 onwards.

1st Semester						
Course Code	**Course Title**	**(L)**	**(T)**	**(P)**	**Total Hours**	**Credits**
CHM-101	Chemistry-I	4	0	0	4	4
PHY-101	Physics-I	3	0	0	3	3
MTH-101	Mathematics-I	3	1	0	4	4
HSS-101	Communication Skills & Oral Presentation	3	1	0	4	4
IT-101	Computer Fundamentals And Problem Solving Techniques	3	0	0	3	3
CIV-102	Engineering Drawing	1	0	3	4	4
CHM-101 P	Chemistry-I Lab	0	0	2	2	1
PHY-102 P	Physics-I Lab	0	0	2	2	1
IT-102P	Computer Fundamentals And Problem Solving Techniques Lab	0	0	2	2	1
WSP-I	Workshop Practices- I	1	0	3	4	2
	Total	18	2	12	32	27
2nd Semester						
CHM-201	Chemistry-II	3	1	0	4	4
PHY-201	Physics- II	3	0	0	3	3
MTH-201	Mathematics-II	3	1	0	4	4
HSS-201	Introduction To Social Sciences	3	1	0	4	4
CSE-201	C Programming	3	0	0	3	3
CIV-201	Strength of Materials	3	1	0	4	4
MED-201	Machine Drawing	1	0	2	3	3

CHM-201 P	Chemistry-II Lab	0	0	2	2	1
PHY-201 P	Physics-II Lab	0	0	2	2	1
CSE-202 P	Computer Programming Lab	0	0	2	2	1
WSP-II	Workshop Practices-II	1	0	3	4	2
	Total	20	4	11	35	30
3rd Semester						
ChBC-31	Introduction to Chemical Eng.	3	1	0	4	4
ChBC-32	Material and Energy Balance	3	1	0	4	5
ChBC-33	Process Fluid Mechanics	3	1	0	4	4
ChBC-34	Thermodynamics and Chemical Kinetics	3	1	0	4	4
EEBC-31	Basic Electrical & Electronics Eng.	3	1	0	4	4
HSBC-31	Ethics and Self Awareness	2	0	0	2	2
MTBC-31	Chemical Eng. Mathematics-I	2	1	0	3	3
	Total= 19+6=25	19	6	0	25	25
4th Semester						
ChBC-41	Chemical Eng. Thermodynamics	3	1	0	4	4
ChBC-42	Heat Transfer	3	1	0	4	4
ChBC-43	Mechanical Operations	3	1	0	4	4
ChBC-44P	Fluid Mechanics & Mechanical Operations Lab	0	0	4	3	2
ChBC-45	Mass Transfer-I	3	1	0	4	4
ChBS-41	Seminar	0	0	4	4	2
EEBC-41P	Basic Electrical & Electronics Eng. Lab	0	0	4	4	2
MTBC-41	Chemical Eng. Mathematics –II	2	1	0	3	3
	Total=14+5+12=29	14	5	12	30	25
5th Semester						
ChBC-51	Process Equipment Design –I (Mechanical Aspects)	3	0	2	5	4
ChBC-52	Chemical Reaction Engineering	3	2	0	5	5
ChBC-53	Material Science & Technology	3	1	0	4	4
ChBC-54	Chemical Technology-I	3	0	0	3	3
ChBC-55P	Heat Transfer Lab.	0	0	4	4	2
HSBC-51	Basic Management Principles	3	0	0	3	3
MTBC-51	Numerical Methods	3	1	0	4	4
	Total=18+4+6=28	18	4	6	28	25
6th Semester						
ChBC-61	Process Equipment Design-II (Process Aspect)	3	0	2	5	4

ChBC-62	Mass Transfer-II	3	1	0	4	4
ChBC-63	Chemical Technology-II	3	0	0	3	3
ChBC-64	Energy Eng.	3	0	0	3	3
ChBC-65P	Energy Eng. Lab.	0	0	2	2	1
ChBC-66	Process Instrumentation	3	0	0	3	3
ChBC-67	Transport Phenomenon	3	1	0	4	4
ChBC-68P	Thermodynamics & Reaction Engineering Lab.	0	0	2	2	1
ChBC-69	Industrial Training &Presentations	0	0	4	4	2
	Total=18+2+10=30	18	2	10	30	25
7th Semester						
ChBP-71	Pre-project Work	0	0	4	4	2
ChBC-72	Chemical Process Safety	3	0	0	3	3
ChBC-73	Process Dynamics & Control	3	1	0	4	4
ChBC-74P	Process Dynamics & Control Lab.	0	0	2	2	1
ChBC-75	Process Economics & Plant Design	3	1	0	4	4
ChBC-76	Biochemical Eng.	3	1	0	4	4
ChBC-77P	Mass Transfer Lab.	0	0	2	2	1
E-I	Elective-I	3	0	0	3	3
E-II	Elective-II	3	0	0	3	3
	Total=18+3+8=29	18	3	8	29	25
8th Semester						
ChBP-81	Project	0	0	16	16	8
ChBC-82	Bioresource Technology	2	1	0	3	3
ChBC-83P	Biochemical Engineering Lab.	0	0	4	4	2
ChBC-84	Modeling & Simulation in Chemical Eng.	2	1	0	3	3
ChBC-85	Industrial Pollution Abatement	2	1	0	3	3
E-III	Elective-III	3	0	0	3	3
E-IV	Elective-IV	3	0	0	3	3
	Total=12+3+20=35	12	3	20	35	25

Table B.2.1.2c: Course Structure for B.Tech Chemical Engineering-2017 Batch onwards

L: Lecture, P: Practical, T: Tutorial

7th Semester (E-I)		
S.No.	Elective	Code
1.	Polymer Sciences and Engineering	ChBE-71
2.	Petrochemical Technology	ChBE-72
3.	Advanced Separation Processes	ChBE-73

4.	Operation Research	MTBE-71
5.	Human Resource Development	HSBE-71
	7th Semester (E-II)	
1.	Computational Fluid Dynamics	ChBE-74
2.	Multi Component Distillation	ChBE-75
3.	Optimization Techniques in Chemical Eng.	ChBE-76
4.	Managerial Economics for Engineers	HSBE-72
	8th Semester (E-III)	
1.	Instrumental Methods of Analysis	ChBE-81
2.	Petroleum Refining	ChBE-82
3.	Food Technology	ChBE-83
4.	Nano-Science and Technology	ChBE-84
	8th Semester (E-IV)	
1.	Process Heat Integration	ChBE-85
2.	Fuel Cell Technology	ChBE-86
3.	Clean Technology in Process Industries	ChBE-87
4.	Entrepreneurship Development	HSBE-81

Table B.2.1.2d: Electives 2017 Batch onwards

The syllabus finalized by the Chemical Engineering Department during the years 2019 onwards.

1st Semester						
Course Code	**Course Title**	**(L)**	**(T)**	**(P)**	**Total Hours**	**Credits**
MEL100	Elements of Mechanical Engg.	2	1	0	3	3
PHL100	Engineering Physics	3	1	0	4	4
CIL100	Engineering Mechanics	3	1	0	4	4
HUL100	Basic English and Communication Skills	2	1	0	3	3
CYL101	Environmental Studies	2	1	0	3	3
MAL100	Mathematics I	3	1	0	4	4
HUP100	Language Laboratory	0	0	2	2	1
PHP100	Physics Laboratory	0	0	2	2	1
WSP100	Work shop Practice	0	0	5	5	2
	Total= 15+6+9=30	15	6	9	30	25
2nd Semester						
HUL101	Advanced English Comm. Skills & Organizational Behavior	2	1	0	3	3
EEL100	Basic Electrical Engineering	3	1	0	4	4
ITL100	Computer Programming	2	1	0	3	3

CYL100	Engineering Chemistry	3	1	0	4	4
CIP100	Engineering Drawing	1	0	6	7	4
MAL101	Mathematics II	3	1	0	4	4
ELP100	Basic Electrical Engineering Laboratory	0	0	2	2	1
CYP100	Chemistry Laboratory	0	0	2	2	1
ITP100	Computer Programming Laboratory	0	0	2	2	1
	Total=14+5+12=31	14	5	12	31	25
3rd Semester						
CET-211	Introduction to Chemical Engineering	3	1	0	4	4
CET-212	Material and Energy Balance	3	1	0	4	4
CET-213	Process Fluid Mechanics	3	1	0	4	4
CET-214	Thermodynamics and Chemical Kinetics	3	1	0	4	4
ECT-215	Basic Electronics Engineering	2	1	0	3	3
HST-216	Ethics & Self Awareness	2	0	0	2	2
MTT-217	Chemical Engineering Mathematics-I	3	1	0	4	4
	Total= 19+6=25	19	6	0	25	25
4th Semester						
CET-257	Chemical Engineering Thermodynamics	2	1	0	3	3
CET-258	Heat Transfer	3	1	0	4	4
CET-259	Mechanical Operations	3	1	0	4	4
CEL-260	Fluid Mechanics & Mechanical Operations Lab.	0	0	4	4	2
CET-261	Material Science & Technology	3	1	0	4	4
CET-262	Process Instrumentation	3	0	0	3	3
ECL-263	Basic Electronics Engineering Lab.	0	0	2	2	1
MTT-264	Chemical Engineering Mathematics – II	3	1	0	4	4
	Total=17+5+6=28	17	5	6	28	25
5th Semester						
CET-305	Process Equipment Design– I	3	1	0	4	4
CET-306	Chemical Reaction Engineering	3	2	0	5	5
CET-307	Mass Transfer-I	3	1	0	4	4
CET-308	Chemical Technology – I	3	0	0	3	3
HST-309	Basic Management Principles	3	0	0	3	3
MAT-310	Numerical Methods	3	1	0	4	4
CEL-311	Heat Transfer Lab	0	0	2	2	1

CEL-312	Computer Simulation Lab	0	0	2	2	1
	Total=18+5+4=27	18	5	4	27	25
6th Semester						
CET-355	Process Equipment Design -II	3	1	0	4	4
CET-356	Mass Transfer – II	3	1	0	4	4
CET-357	Chemical Technology – II	3	0	0	3	3
CET-358	Energy Technology	3	0	0	3	3
CET-359	Chemical Process Safety	3	0	0	3	3
CET-360	Transport Phenomena	3	1	0	4	4
CEL-361	Energy Technology Lab	0	0	2	2	1
CEL-362	Thermodynamics & Reaction Engineering Lab	0	0	2	2	1
CEI-363	Industrial Training & Presentation	0	0	4	4	2
	Total=18+3+8=29	18	3	8	29	25
7th Semester						
CEP-413	Pre-project work	0	0	4	4	2
CES-414	Seminar	0	0	4	4	2
CET-415	Process Dynamics & Control	3	1	0	4	4
CET-416	Process Economics & Plant Design	3	1	0	4	4
CET-417	Biochemical Engineering	3	1	0	4	4
CEL-418	Process Dynamics & Control Lab	0	0	2	2	1
CEL-419	Mass Transfer Lab	0	0	4	4	2
CET-020-24	Elective – I	3	0	0	3	3
CET-025-29	Elective – II	3	0	0	3	3
	Total=15+3+14=32	15	3	14	32	25
8th Semester						
CEP-464	Project Work	0	0	16	16	8
CET-465	Bioresource Technology	3	0	0	3	3
CEL-466	Biochemical Engineering Lab	0	0	4	4	2
CET-467	Modeling & Simulation of Chemical Process Systems	3	0	0	3	3
CET-468	Industrial Pollution Abatement	3	0	0	3	3
CET-069-72	Elective – III	3	0	0	3	3
CET-073-76	Elective – IV	3	0	0	3	3
	Total=12+3+20=35	15	0	20	35	25

Table B.2.1.2e: Course Structure for B.Tech Chemical Engineering-2019 Batch onwards

L: Lecture, P: Practical, T: Tutorial

SNo.	Elective	Code
	7th Semester (E-I)	
1.	Polymer Science and Engineering	CET-020
2.	Managerial Economics for Engineers	HST-021
3.	Advanced Separation Processes	CET-022
4.	Operations Research	MAT-023
5.	Process Heat Integration	CET-024
	7th Semester (E-II)	
1.	Cement Technology	CET-025
2.	Computational Fluid Dynamics	CET-026
3.	Multi-component Distillation	CET-027
4.	Optimization Techniques in Chemical Engineering	CET-028
5.	Heterogeneous Catalysis & Catalytic Processes	CET-029
	8th Semester (E-III)	
1.	SWAYAM Online course	CET-069
2.	SWAYAM Online course	CET-070
3.	SWAYAM Online course	CET-071
	8th Semester (E-IV)	
4.	SWAYAM Online course	CET-072
1.	SWAYAM Online course	CET-073
2.	SWAYAM Online course	CET-074
3.	SWAYAM Online course	CET-075
4.	SWAYAM Online course	CET-076

Table B.2.1.2f: Electives 2019 Batch onwards (Proposed)

Improved Curriculum

In view of the gaps identified following changes were made to the course curriculum:

i. "Basic Electrical Engineering" taught in 3rd semester with LTP and credits as 2:1:0:3 for the 2014 curriculum has been renamed as "Basic Electrical & Electronics Engineering" with LTP and credits as 3:1:0:4 for the 2017 curriculum.

ii. "Basic Electrical Engineering Lab" taught in 3rd semester with LTP and credits as 0:0:2:1 for the 2014 curriculum has been shifted to 4th semester with LTP and credits as 0:0:4:2 for the 2017 curriculum.

iii. "Basic Electronics Engineering" taught in 4th semester with LTP and credits as 2:1:0:3 for the 2014 curriculum has been shifted to 3rd semester as "Basic Electrical & Electronics Engineering" with LTP and credits as 3:1:0:4 for the 2017 curriculum.

iv. "Ethics and Self Awareness" taught in 4th semester with LTP and credits as 2:0:0:2 for the 2014 curriculum has been shifted to 3rd semester for the 2017 curriculum with same LTP and credits in order to inculcate an ethical culture amongst students from an early stage in their program.

v. "Mass Transfer-I" taught in 5th semester as core course for the 2014 curriculum has been shifted to 4th semester level with same LTP so as to get core knowledge from the very beginning of the Chemical Engineering course.
vi. For 2017 batch onwards, "Numerical Analysis" taught as an elective has been shifted as a core course under the name "Numerical Methods" taught in the 5th semester. Techniques involved in latest analysis.

From the Academic Year 2019-2020 based on the gaps identified, the following changes were made to the 2019 onwards course curriculum:

i. The LTP and credits of "Chemical Engineering Thermodynamics" taught in 4thsemester with LTP and credits as 3:1:0:4 for the 2017 curriculum have been changed in 2019 curriculum. In new scheme, the LTP and credits are 2:1:0:3.
ii. "Process Instrumentation" taught in 6th semester as core course for the 2017 curriculum has been shifted to 4th semester level with same LTP and credits so as to get core knowledge from the very beginning of the Chemical Engineering course.
iii. "Material Science &Technology" taught in 5thsemester as core course for the 2017 curriculum has been shifted to 4th semester level with same LTP and credits so as to get core knowledge from the very beginning of the Chemical Engineering course.
iv. "Mass Transfer-I" taught in 4th semester with LTP and credits as 3:1:0:4 for the 2017 curriculum has been shifted to 5thsemester with same LTP and credits as 3:1:0:4 for the 2019 curriculum.
v. "Computer Simulation Lab" has been introduced as a new lab in 5thsemester with LTP and credits as 0:0:2:1 for the 2019 curriculum in order to inculcate software knowledge amongst students from an early stage in their program.
vi. "Chemical Process Safety" taught in 7thsemester as core course for the 2017 curriculum with LTP and credits as 3:0:0:3 has been shifted to 6th semester level with same LTP and credits in 2019 curriculum.
vii. "Seminar" which was kept in 4th semester with LTP and credits as 0:0:4:2 for the 2017 curriculum has been shifted to 7th semester level with same LTP and credits in 2019 curriculum.
viii. The LTP and credits of "Bioresource Technology" taught in 8th semester with LTP and credits as 2:1:0:3 for the 2017 curriculum has been changed in 2019 curriculum. In new scheme, the LTP and credits are 3:0:0:3.
ix. "Modeling and Simulation in Chemical Eng." taught in 8thsemester with LTP and credits as 2:1:0:3 for the 2017 curriculum has been renamed as "Modeling & Simulation of Chemical Process Systems"in 2019 curriculum. In new scheme, the LTP and credits are 3:0:0:3.
x. The LTP and credits of "Industrial Pollution Abatement" taught in 8thsemester with LTP and credits as 2:1:0:3 for the 2017 curriculum has been changed in 2019 curriculum. In new scheme, the LTP and credits are 3:0:0:3.

2.1.3. State the components of the curriculum (5)

Claimed 5

Programme curriculum grouping based on different components:

Course Component		Curriculum Content (% of total number of credits of the programme)	Total number of contact hours	Total Number of credits
1	**Mathematics**	7.25	15	15
2	**Basic Science**	8.7	18	18
3	**Basic Eng. Course**	11.11	34	23
4	**Computing**	3.8	8	8
5	**Humanities and Social Science**	6.28	13	13
6	**Professional Core**	50.24	117	104
7	**Electives (Department and open)**	5.8	12	12
8	**Projects/Training/Seminar**	6.76	28	14
	Total	100	245	207

Table B.2.1.3 a: Percentage of Credits Allotted for various Courses for 2014 scheme

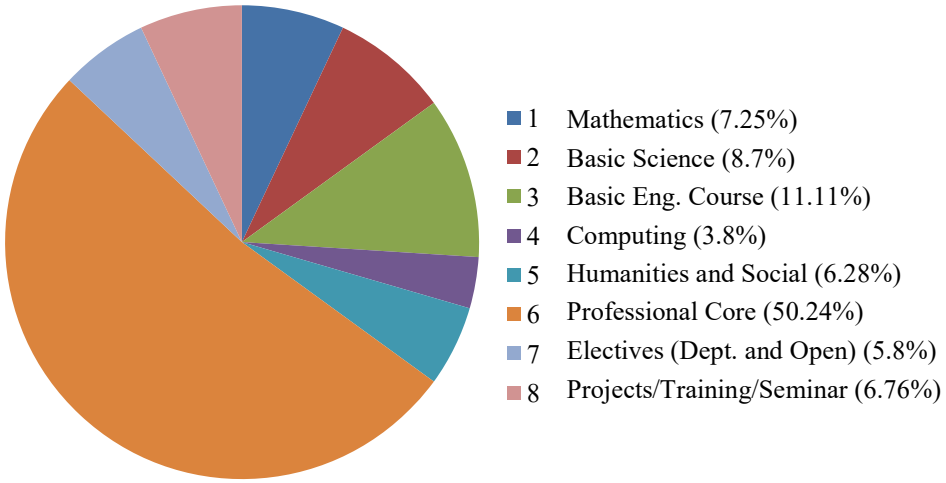

Figure B.2.1.3a: Graphical Representation of percentage of Credits Allotted for Various Courses

Course Component		Curriculum Content (% of total number of credits of the programme)	Total number of contact hours	Total Number of credits
1	**Mathematics**	8.7	18	18
2	**Basic Science**	8.7	18	18
3	**Basic Eng. Course**	11.11	34	23
4	**Computing**	3.8	8	8
5	**Humanities and Social Science**	6.2	13	13
6	**Professional Core**	49.75	116	103
7	**Electives (Department and open)**	5.8	12	12
8	**Projects/Training/Seminar**	6.76	28	14
	Total	100	245	207

Table B.2.1.3b: Percentage of Credits Allotted for various Courses for 2017 scheme

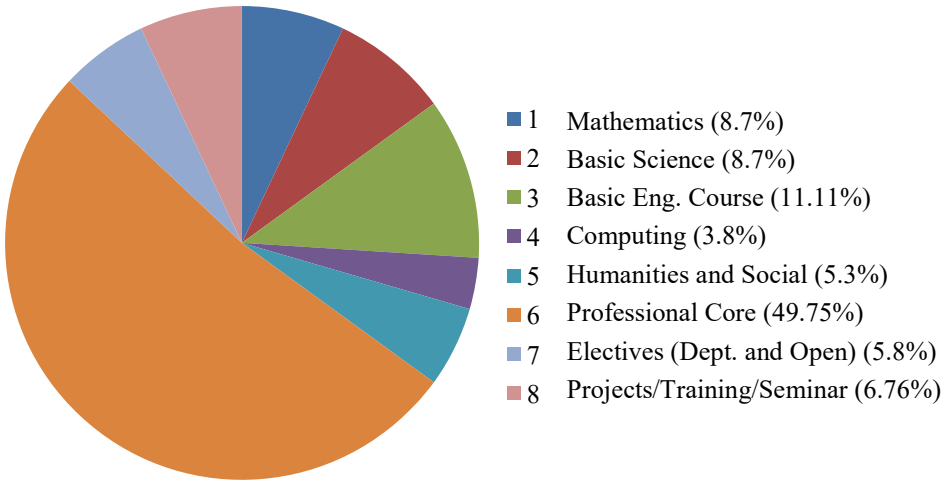

Figure B.2.1.3b: Graphical Representation of Percentage of Credits Allotted for Various Courses

Course Component		Curriculum Content (% of total number of credits of the programme)	Total number of contact hours	Total Number of credits
1	**Mathematics**	10	20	20
2	**Basic Science**	6.5	15	13
3	**Basic Eng. Course**	11	26	22
4	**Computing**	2.5	7	5
5	**Humanities and Social Science**	6	13	12
6	**Professional Core**	51	111	102
7	**Electives (Department and open)**	6	12	12
8	**Projects/Training/Seminar**	7	28	14
	Total	100	232	200

Table B.2.1.3 c: Percentage of Credits Allotted for various Courses for 2019 scheme

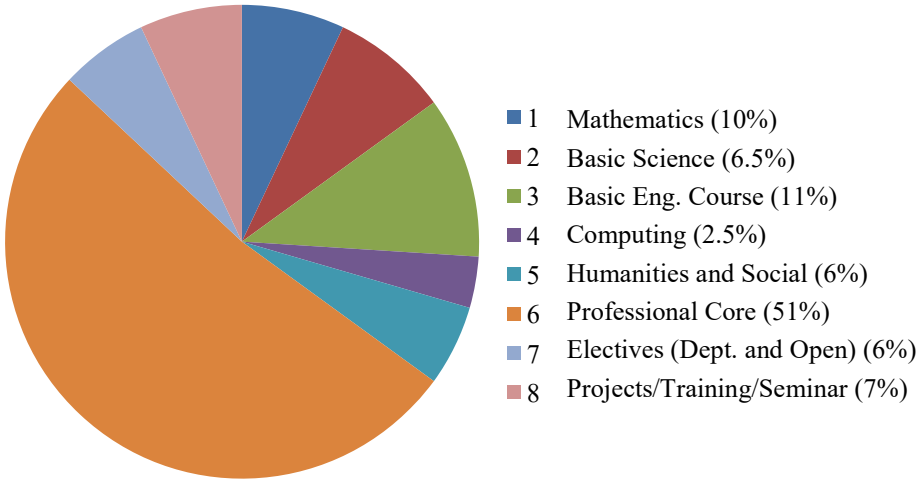

Figure B.2.1.3c: Graphical Representation Percentage of Credits Allotted for Various Courses

2.1.4 State the process used to identify extent of compliance of the curriculum for attaining the program outcomes (POs) and program specific outcomes (PSOs) (10) **Claimed 10**

The Department of Chemical Engineering has formed the Departmental Undergraduate Committee for guiding academic activities. The committee lead by Head of the Department (HOD) consists of all faculty members, representatives from the industry, alumni and the current academic session students. Broad curriculum, concept of outcome based education, programme outcomes (POs), Program Specific Outcomes (PSOs), course delivery, evaluation process, mapping etc. is discussed at par to improve as well as assess the viability of the curriculum such as to achieve excellence in teaching/learning process. This process has helped us to comply with the broad curriculum for attaining the programme outcomes. Accordingly feedback, views, expectations are collected from various stakeholders. The process of establishing POs and PSOs involve a brain storming session firstly in the departmental meetings of the faculty based on feedbacks sought from the various stake holders' thorough interactions/questionnaires/interviews/meetings. The department arrives at specific conclusions after a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis based on these interactions and considerations of requirements for developing an ideal student. The program outcomes and PSOs thus evolved, are put forth in the departmental meeting which reviews the POs and PSOs.

A. Process to identify the extent of compliance of curriculum for attainment of POs & PSOs

- POs & PSOs stated clearly.
- Department curriculum is stated subject wise and the percentage of total credits for each subject is evaluated.
- The total number of contact hours for each subject in a semester is calculated.
- Course allocation to the faculty takes place two months prior to the commencement of classes as per the faculty preference such as to prepare their pedagogical approach for the subject.
- Faculty incharge of the course prepares detailed lecture plans according to the academic calendar of the Institution, and maintains a course file comprising of all the lesson plans. The lecture plans incorporate the details of the topics to be covered in each lecture, syllabus to be covered before internal exams, number of tutorials to be conducted and, total number of lecture hours necessary for completion of the course.
- The Program Assessment Committee considers the defined mandatory graduate attributes (GAs) from the NBA guidelines, Program Educational Objectives, Vision and Mission statements of the Department and views from the stakeholders. The committee develops POs & PSOs and discusses with the senior faculty members of the Department. The developed POs & PSOs are put up in DUGC (earlier Board of Studies) meeting for review and approval. Process of defining POs and PSOs is depicted in the flowchart as shown in Figure B.2.1.4a.

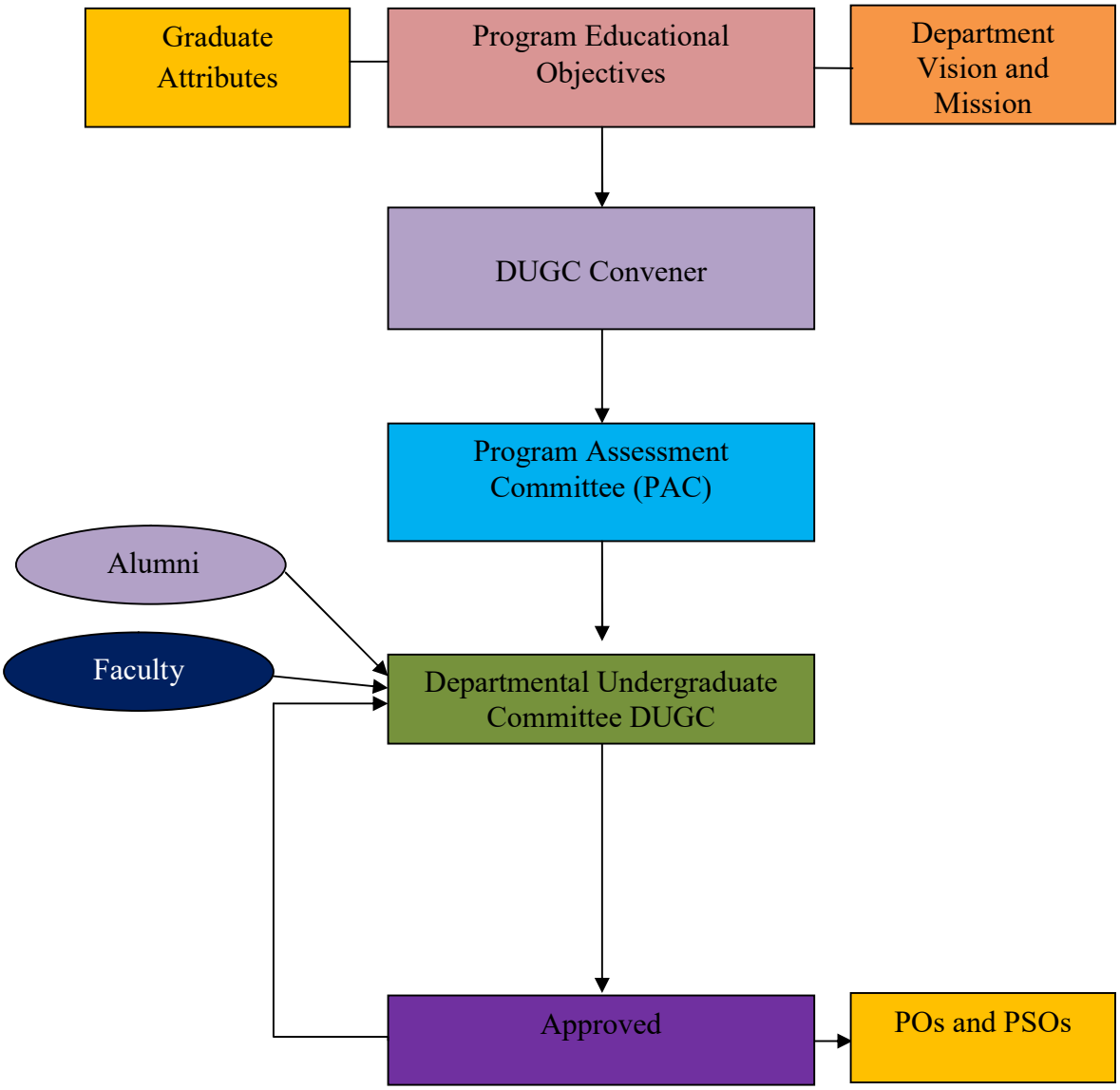

Figure B.2.1.4a: Procedure for Defining Program Outcomes and Program Specific Outcomes

B. Program Outcomes (POs)

PO 1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO 3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs

with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

PO 5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

C. Program Specific Outcomes (PSOs)

The Chemical Engineering graduates will be able to:

PSO 1. Apply the principles and practices of Chemical Engineering discipline along with the basic sciences and humanities to solve the complex engineering problems concerning the issues of environment, safety, economics, culture and society etc.

PSO 2. Acquire and apply the new knowledge with professional responsibility and ethics towards the advancement of academic and research pursuits in Chemical and Allied disciplines in the societal contexts.

PSO 3. Design, develop and modify the Chemical Processes and to analyze these by applying the physicochemical and biological techniques.

D. Course Outcomes (COs)

Course Outcomes are statements of what a student should be able to demonstrate upon the completion of a course. They are assessable and measurable knowledge, skill, abilities or attitude that students should attain by the end of the course.

- Course outcomes for each subject are identified.
- The POs and PSOs are mapped with each course outcome and are shown Criterion 3.
- The compliance is found out by checking whether each domain maps with the relevant PO and PSO.

Course Code and Course Name	Course Outcomes
Introduction to Chemical Eng. ChBC-31	CO1: Introduction to Chemical Engineering: Origin, Growth, Relation to other sciences. CO2: Knowledge of Unit Operations and Unit Processes and its application to Chemical Process Industries. CO3: Concerns of Chemical Engineering in areas of Energy, Environment, new materials, health, bioengineering and safety. CO4: Implementation of Chemical Engineering Basics to simple systems. CO5: Role of modelling and simulation in chemical engineering.
Material and Energy Balance ChBC-32	CO1: To understand the fundamentals and basic principles of mass transfer in various unit operations and their applications in both chemical and non chemical systems. CO2: Identify and understand the principles of energy transfer for chemical systems. CO3: To design, analyze, formulate processes where both mass and energy balance is taking place for various engineering systems CO4: Application of Mass and energy balance for non conventional engineering systems.
Process Fluid Mechanics ChBC-33	CO1: Able to understand the fundamentals and basic principles of process fluid mechanics. CO2: Able to formulate and solve the fluid flow problems with the application of conservation laws. CO3: Able to examine energy losses and evaluate pressure drop in pipes. CO4: Able to understand and analyze the functions and performances of various equipments and flow measuring devices.
Thermodynamics and Chemical Kinetics ChBC-34	CO1: Understanding and application of laws of thermodynamics CO2: Ability of application of thermodynamics to phase equilibrium and reaction equilibrium. CO3: Basic Idea of Reactors CO4: Basic insight into the interpretation of kinetic data and reactor design.

Basic Electrical Eng. EEBC-31/EEBC-31	CO1: To analyze and evaluate the electrical circuits, apply basic laws in circuit theory and to determine electric circuit parameters. CO2: To study and analyses of AC and DC series-parallel circuit, various network theorems, and basics of phasor and power of electrical circuit. CO3: To analyses the characteristics of 3 phase systems, current and voltage relations in star/delta configuration's, Balanced/unbalanced systems. CO4: To study and analyze of fundamental/basic operation, construction and working DC machines. CO5: To study and analyze of fundamental/basic operation, construction and working AC machines.
Chemical Eng. Mathematics-I MTBC-31	CO1: Understand the concept of complex differentiation and analyticity of complex valued functions. CO2: Understand the concept of complex integration and its properties. CO3: Expand a complex valued function about a point using Taylor and Laurent's theorem. CO4: Understand the concept of Special functions like Legendre and Bessel functions and their properties.
Chemical Engineering Thermodynamics ChBC-41	CO1: Basic understanding of the thermodynamic properties of fluid, mixture and solutions. CO2: Apply thermodynamic principles to understand fugacity, partial molar properties, chemical potential, and activity coefficients for non-ideal fluid systems. CO3: Investigate binary phase equilibria; perform vapour-liquid equilibrium (VLE) calculations. CO4: Apply thermodynamic principles to reaction equilibrium between phases and reactions.
Heat Transfer ChBC-42	CO1: Able to understand the fundamentals and basic principles of conduction and convection heat transfer mechanisms and their applications in various heat transfer equipments in process industries. CO2: Able to formulate, analyze, design and solve the problems related to heat transfer. CO3: Able to perform the thermal analysis and sizing of heat transfer equipments. CO4: Able to understand radiation heat transfer.
Mechanical Operations ChBC-43	CO1: Understand the characterization, classification, conveying and storage of solids. CO2: Calculate the power requirements and crushing efficiencies of size reduction equipment using laws of communition and understand the working of different size reduction equipment. CO3: Analyze the screening results to estimate the screen effectiveness and acquire knowledge of screening mechanism and separation of solids from solids and gases. CO4: Apply the knowledge of filtration theory to estimate the filtration

	time, specific cake and medium resistance of filtration processes and understand the settling characteristics. CO5: Acquire the knowledge of agitation and different types of agitated vessels.
Fluid Mechanics and Mechanical Operations Lab. ChBC-44P	CO1: Make velocity measurements using flow meters and viscosity measurements by Stoke's Apparatus. CO2: Understand the laminar and turbulent flow behaviour, verify Bernoulli's principle and pipe fittings. CO3: Understand the classification, conveying and communication of solids. CO4: Understand the theories of sedimentation and to study the settling characteristics of batch settling.
Mass Transfer-I ChBC-45/ChBC-55	CO1: Fundamental understanding of mass transfer operation. CO2: Understanding of inter phase mass transfer and coefficients of mass transfer operation. CO3: Analyze gas absorption and tower characteristics. CO4: Understanding of absorption, humidification, drying and crystallization operation.
Seminar ChBS-41	CO1: To study research papers for understanding of new fields of interest, and to summarize and review. CO2: Imparting skills for effective report writing describing the project and the results. CO3: Identifying novel areas of research and latest trends in technologies. CO4: Development of Comprehensive communication skills.
Basic Electrical Engineering Lab EEBC-41P	CO1: Connection of Ammeters, Voltmeters, Wattmeter's and multi-meters in DC and AC circuits and selection of their ranges, Use of LCRQ meter. CO2: To verify the KVL, KCL, star/delta transformation, superposition and maximum power transfer theorem on DC circuits CO3: To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load. CO4: To measure the power and power factor in three phase AC circuits.
Ethics and Self Awareness HSBC-41/HSBC-31	CO1: Study human experience and behavior situation in social and cultural context. CO2: Promote the appreciation of students' own culture, ethics and values as well as the culture, ethics and values of others. CO3: Empower students to think critically and evaluate theories, concepts and perspectives related to psychology, human mind and human behavior as well as current societal advances related to career. CO4: Develop an understanding of the importance of self-awareness, self-reflection and self-regulation as well as gain practical knowledge and experience.
Chemical Eng. Mathematics –II MTBC-41	CO1: To examine the use of probability theory in decision making. CO2: To develop rules for calculating different kinds of probabilities. CO3: To use different probability distributions and how to find their

	values. CO4: To learn how correlation analysis describes the degree to which two variables arelinearly related to each other.
Process Equipment Design- I ChBC-51	CO1: To apply the basic principles of fluid mechanics, heat transfer, mass transfer and mechanical operation in the design of chemical process equipment CO2: Design the appropriate process equipment for the required unit or process operation CO3: Selection of equipments for various applications CO4: Optimize the process condition CO5: To analyze and evaluate the performance of existing equipments.
Chemical Reaction Engineering ChBC-52	CO1: Understand the different types of reactions, their kinetics and their influence on chemical equilibrium. CO2: Design of single, isothermal plug-flow, CSTR, and batch reactors for a single homogeneous reaction. CO3: Analyze and size reactors while accounting for non-isothermal conditions and non-ideal flow patterns. CO4: Design reactors for the homogenous and heterogeneous, and understand their effect on performance equations for reactors
Material Science and Technology ChBC-53	CO1: Analyze the micro structure of crystalline materials like lattice systems, unit cells and theoretical density. CO2: Clear the concept of mechanical behaviour of materials through calculations and appropriate equations along with their failure mechanics including corrosion. CO3: Understand the concept of phase diagrams and their construction, usage and applications. CO4: Understand and analyze the heat treatment processes and their types involving solid state diffusion processes.
Chemical Technology-I ChBC-54	CO1: Understanding manufacturing technologies of organic and inorganic chemicals. CO2: Draw the process flow diagrams to represent the process and look for the solution of challenges faced by the process industry at large. CO3: Analyze the effect of chemical technology on safety and environment, through chemical reactions and mechanism involved. CO4: Understand Engineering problems related with a particular process industry and suggest solutions thereof.
Heat Transfer Lab. ChBC-56P/ChBC-55P	CO1: Estimate the thermal conductivity of a composite slab and verify the Fourier's law of heat conduction. CO2: Measure the Heat transfer coefficient for Forced convection. CO3: Understand and demonstrate the heat transfer in Shell and Tube Heat Exchanger. CO4: Measure the emissivity of gray body and verify Stefan Boltzmann's Law. CO5: Evaluate heat transfer in Drop and Film wise condensation.

Basic Management Principles HSBC-51	CO1: Relate, discuss, understand, and present management principles, processes and procedures in consideration of their effort on individual actions. CO2: Have developed a working knowledge of fundamental terminology and frameworks in the four functions of management: Planning, Organizing, Leading and Controlling. CO3: Be able to identify and apply appropriate management techniques for managing contemporary organizations. CO4: Participate, summarize and lead class discussions, case problems and situations from both the text and student experience that relate to the text material.
Numerical Methods MTBC-51	CO1: Study Errors in Numerical Methods and Solution of Algebraic and Transcendental equations. CO2: Study Solution of Simultaneous Algebraic equations, finite differences and interpolation. CO3: Evaluate Differentials and integrals by numerical methods CO4: Find solution of Differential equation by Numerical Methods.
Process Equipment Design- II ChBC-61	CO1: Basic understanding about the process equipments based on heat and mass transfer. CO2: Design of heat and mass transfer systems. CO3: Selection of equipments for various applications. CO4: Optimize the process conditions. CO5: To analyze and evaluate the performance of existing equipments.
Mass transfer-II ChBC-62	CO1: Understand the concept of distillation and determine the number of stages in distillation column. CO2: Select solvent for extraction operations and determine the number of stages in extraction operations CO3: Understand the concept of adsorption and determine the number of stages in adsorption operations. CO4: Select solvent for leaching operations and determine the number of stages in leaching operations.
Chemical Technology-II ChBC-63	CO1: Understanding manufacturing technologies of organic and inorganic chemicals. CO2: Draw the process flow diagrams to represent the process and look for the solution of challenges faced by the process industry at large. CO3: Analyze the effect of chemical technology on safety and environment, through chemical reactions and mechanism involved. CO4: Understand Engineering problems related with a particular process industry and suggest solutions thereof.
Energy Eng. ChBC-64	CO1: Basic understanding about various energy sources and their significance with respect to energy and environmental sustainability. CO2: Knowledge about the processing/generation of fuels and their significant characteristics for various applications. CO3: Design of the systems for efficient fuel utilization and maximum recovery of heat. CO4: Understanding energy audits and management of the non

	conventional energy utilizing systems.
Energy Eng. Lab ChBC-65P	CO1: Basic understanding about the Proximate Analysis of fuels and its significance with respect to energy. CO2: Demonstrate and understand the working principle, construction and operation of combustion equipment. CO3: Estimate the calorific value of solid fuels like coal to ascertain their suitability in a combustion equipment. CO4: Predict various fuel property parameters like flash point, fire point etc.
Process Instrumentation ChBC-66	CO1: Understand basic concept of instrumentation, principles and applications. CO2: Understand the measurement techniques for Temperature. CO3: Understand the measurement techniques for Pressure. CO4: Understand the measurement techniques for Flow and Level.
Transport Phenomenon ChBC-67	CO1: To Identify transport properties and analyze the mechanism of momentum, energy and mass transport. CO2: To Apply conservation laws to formulate differential form of equations of change for mass, momentum and heat transfer problems. CO3: To solve linear partial differential equations along with appropriate boundary conditions to get the velocity, temperature and concentration profiles of different engineering problems. CO4: Recognize non Newtonian fluids and apply appropriate models to solve them
Thermodynamics and Reaction Eng. Lab ChBC-68P	CO1:Standardization of chemical solution. CO2: Estimation of reaction rate constant of continuous and batch reactors. CO3: Determination of dispersion number of CSTR and packed reactors. CO4: To plot the RTD curve for CSTR and Packed bed reactor using a pulse and a step input.
Industrial Training and Presentation ChBC-69	CO1:Correlate class mode learning to real industrial applications CO2: Development of written and oral communication skills. CO3: Ability to be a multi-skilled engineer with good technical knowledge. CO4: Development of management, leadership and entrepreneurship skill.
Pre-Project work ChBP-71	CO1: Able to collect the information from literature reviews CO2: Classify a chemical engineering research problems CO3: Ability to analyze energy and environmental problem. CO4: Able to find objectives of research problems
Chemical Process Safety ChBC-72	CO1: Anticipate, recognize, investigate and evaluate hazardous conditions and practices affecting people, property and the environment. CO2: Develop and evaluate appropriate strategies designed to mitigate risk by understanding the importance of plant safety and safety regulations, different types of plant hazards and their measurement, control, principles and procedures of safety audit.

	CO3: Appreciate the importance of physical, chemical and physico-chemical transformations of the material in process industries with respect to safety. CO4: Analyze the hazards and assess the risk and Recognize that the practice of safety requires ongoing learning, and undertake appropriate preventive activities to address the need of safety.
Process Dynamics and Control ChBC-73	CO1: To understand and model the dynamic behavior of chemical processes based on their time domain, Laplace domain. CO2: Analyze the properties e.g. speed of response, frequency response of first order and second order systems. CO3: Analyze the different components of a control loop. CO4: Understand the operation of P, I, D and PID controllers and to tune them.
Process Dynamics and Control Lab ChBC-74P	CO1: Calculate the response of first order systems to step input CO2: Analyze dynamic behavior of liquid level as a first order system for different inputs. CO3: Find dynamic behavior of multi capacity systems. CO4: Analyze the behavior of 2^{nd} order systems to step input.
Process Economics and Plant Design ChBC-75	CO1: Understanding the role of economics in process plant design. CO2: Design optimization and profitability analysis. CO3: Application of various project management techniques. CO4: Understands the replacement and maintenance analysis.
Biochemical Eng. ChBC-76	CO1: Fundamental understanding of the subject based on various conversion routes. CO2: Acquire basic knowledge of microbiology, biochemistry and genetics. CO3: Exhibit knowledge for analysis of the bioprocess and the unit operations used. CO4: Able to analyze the data and its application in bioprocess development.
Mass Transfer Lab. ChBC-77P	CO1: Determination of gas and liquid diffusivity. CO2: Experimental determination of heat and mass transfer characteristics using wetted wall column and cooling tower. CO3: Plotting drying rate curve using wet solid. CO4: Determine Gas absorption characteristics using packed tower.
Operation Research MTBE-71	CO1: Able to formulating the real-world problem into the form of mathematical equations. CO2: Able to maximize or to minimize some numerical value. CO3: Able to determine the schedule for transporting goods from source to destination in a way that minimizes the shipping cost. CO4: Able to formulate the alternative strategy to compete with one another.
Human Resource Development HSBE-71	CO1:Identify each of the major HRM functions and processes of strategic HRM planning, job analysis and design, recruitment, selection, training and development, compensation and benefits, and performance

	appraisal. CO2: Define strategic HR planning and the HRM process to the organization's strategic management and decision making process. CO3: Recall the wide range of sources for attracting and recruiting talent and appropriate practices for job Placement. CO4: Recognize emerging trends, opportunities and challenges in performance appraisal and list training and development processes as well as future trends for HRM globalization.
Numerical Analysis MTBE-72	CO1: Study Interpolation and Integration by Numerical techniques. CO2: Study advanced methods in the Numerical solutions of algebraic and transcendental equations. CO3: Study advanced methods in Numerical solutions of ordinary differential equations. CO4: Numerical solution of Partial differential equations.
Computational Fluid Dynamics (E2) ChBE-74	CO1:Fundamental understanding and interpretation of governing equations involved in heat and fluid flow problems. CO2: Understanding of basic numerical techniques involved. CO3: Understanding of Grid formation. CO4: Understanding discretization technique's using FDM FVM.
Managerial Economics for Engineers HSBE-72	CO1: Understand the roles of managers in firms and understand the internal and external decisions to be made by managers. CO2: Analyze the demand and supply and elasticity conditions and assess the position of a company. CO3: Analyze the production function in one as well as in two variables and explain the relevance of economies of scale in production. CO4: Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
Project ChBP-81	CO1: Apply the knowledge of chemical engineering to design or fabricate a system. CO2: Identify chemical engineering research problems. CO3: Apply knowledge of chemical engineering to solve energy and environmental problem. CO4: Ability to write a research proposal.
Bioresoursce Technology ChBC-82	CO1: Fundamental understanding of the bioresourcesand its applications for attainment of social objectives (energy, environment, product, sustainability). CO2: Acquire knowledge with respect to the properties of the bioresources and the conversion technologies. CO3: Exhibiting knowledge of the systems used for bioresource technology. CO4: Understanding about analysis of data and their applications in design of the systems and development of the bioprocess.
Biochemical Eng. Lab ChBC-83P	CO1: Acquire basic knowledge of various equipments used in biochemical engineering lab. CO2: Fundamental understanding of techniques with respect to

	sterilization, preparation of solid and liquid media, culture growth and preservation. CO3: Basic understanding of estimation techniques for biomass, substrate and product. CO4: Generation and analysis of data for design and development of bioprocess.
Modelling and Simulation in Chemical Engineering ChBC-84	CO1: Identify the terms involved in inventory rate equation of mass, energy and momentum. CO2: Recall the basic concepts involved in modelling and simulation. CO3: Apply conservation of mass, momentum and energy equations to engineering problems. CO4: Develop model equations for chemical engineering systems. CO5: Solve the model equations and chemical engineering problems using numerical techniques.
Industrial Pollution Abatement ChBC-85	CO1: Understand the sources, effects and prevention of pollution and recycling of water and waste. CO2: Illustrate the methods to measure the industrial pollution. CO3: Understand the principles of industrial pollution control and design air pollution control systems. CO4: Apply the basic chemical engineering concepts in design of industrial wastewater treatment systems.
Petroleum Refinery (E3) ChBE-82	CO1: Knowledge about production of crude oil, along with its properties and characterization methods. CO2: Understand the process of fractionation and identify the specifications for good quality petroleum. CO3: Identify different products obtained from refining process and their best utilization. CO4: Integrate and evaluate problems pertaining to crude oil refinery engineering.
Nano-Science and Technology ChBE-84	CO1: Understand the properties of nanomaterials and their applications. CO2: Apply chemical engineering principles to nanoparticles production and scale-up. CO3: Solve the quantum confinement equations and analyze the nanomaterials characterization. CO4: State the applications of nanotechnology in electronics and chemical industries.
Process Heat Integration (E4) ChBE-85	CO1: Ability to understand the fundamentals of process integration. CO2: Ability to determine the minimum heating and cooling requirements. CO3: Ability to design minimum energy heat exchanger networks. CO4: Ability to understand the composite and grand composite curves.
Fuel Cell Technology ChBE-82	CO1: Understanding the basics of fuel cell technology in modern energy applications CO2: Analyzing the working and applications of various fuel cells. CO3: Understanding of the thermodynamic and kinetic aspects of fuel cell systems

	CO4: Assessment of various fuel cells by several characterization techniques.
Entrepreneurship Development HSBE-81	CO1: Define basic terms and analyse the business environment in order to identify business opportunities. CO2: Identify the elements of success of entrepreneurial ventures and the legal and financial conditions for starting a business venture. CO3: Evaluate the effectiveness of different entrepreneurial strategies and specify the basic performance indicators of entrepreneurial activity. CO4: Explain the importance of marketing and management in small businesses venture and interpret their own business plan.

Table B.2.1.4a: Course Outcomes of various courses for the Department of Chemical Engineering

Different methods/processes are used to identify the extent of compliance of the curriculum for attaining the Program Outcomes and Program Specific Outcomes based on the POs mentioned in SAR of NBA, subjects are segregated and mapped with POs and PSOs. Each Course has well defined course outcomes and they correlate to POs and PSOs leading to eventual attainment, as explained in detail in Criterion 3. This strong correlation among the COs and POs-PSOs, develops the necessary skills in students, and transforms them as proficient engineers. The chemical engineering department has set the attainment levels of POs and PSOs at 65%, 65% and 70% of average CO-PO & CO-PSO mapping values as target levels for the Academic Years 2017-2018, 2018-2019 and 2019-2020 respectively.

Course Component		**Curriculum Content (% of total**	**Total number of contact hours**	**Total Number of credits**	**Program Outcomes (POs)**	**Program Specific Outcomes (PSOs)**	**Program Educational Objectives (PEOs)**
1	**Mathematics**	7.25	15	15	PO1,PO2,PO3, PO4, PO5, PO6	PSO1,PSO3	PEO1, PEO 2, PEO 3, PEO4
2	**Basic Science**	8.7	18	18	PO1,PO2,PO3,PO4,PO6, PO7, PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
3	**Basic Eng. Course**	11.11	34	23	PO1,PO2,PO3,PO4.PO5,PO6, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
4	**Computing**	3.8	8	8	PO1,PO2, PO3, PO5	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
5	**Humanities and Social Science**	6.28	13	13	PO6,PO8,PO9,PO10,PO11,PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
6	**Professional Core**	50.24	117	104	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8, PO9, PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4

7	**Electives (Department and open)**	5.8	12	12	PO1,PO2,PO3,PO4,PO5, PO6,PO7, PO8, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
8	**Projects/Training/ Seminar**	6.76	28	14	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO9,PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
	Total	100	245	207			

Table B.2.1.4b: Mapping of course components to POs and PSOs for 2014 Scheme

Course Component		**Curriculum Content (% of total**	**Total number of contact hours**	**Total Number of credits**	**Program Outcomes (POs)**	**Program Specific Outcomes (PSOs)**	**Program Educational Objectives (PEOs)**
1	**Mathematics**	8.7	18	18	PO1,PO2,PO3, PO4, PO5, PO6	PSO1,PSO3	PEO1, PEO 2, PEO 3, PEO4
2	**Basic Science**	8.7	18	18	PO1,PO2,PO3,PO4,PO6, PO7, PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
3	**Basic Eng. Course**	11.11	34	23	PO1,PO2,PO3,PO4.PO5,PO6, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
4	**Computing**	3.8	8	8	PO1,PO2, PO3, PO5	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
5	**Humanities and Social Science**	5.3	11	11	PO6,PO8,PO9,PO10,PO11,PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
6	**Professional Core**	49.75	116	103	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8, PO9, PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
7	**Electives (Department and open)**	5.8	12	12	PO1,PO2,PO3,PO4,PO5, PO6,PO7, PO8, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
8	**Projects/Training/ Seminar**	6.76	28	14	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO9,PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
	Total	100	245	207			

Table B.2.1.4c: Mapping of course components to POs and PSOs for 2017 scheme

Course Component		Curriculum Content (% of total	Total number of contact hours	Total Number of credits	Program Outcomes (POs)	Program Specific Outcomes (PSOs)	Program Educational Objectives (PEOs)
1	**Mathematics**	10	20	20	PO1,PO2,PO3, PO4, PO5, PO6	PSO1,PSO3	PEO1, PEO 2, PEO 3, PEO4
2	**Basic Science**	6.5	15	13	PO1,PO2,PO3,PO4,PO6, PO7, PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
3	**Basic Eng. Course**	11	26	22	PO1,PO2,PO3,PO4.PO5, PO6, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
4	**Computing**	2.5	7	5	PO1,PO2, PO3, PO5	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
5	**Humanities and Social Science**	6	13	12	PO6,PO8,PO9,PO10, PO11,PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
6	**Professional Core**	51	111	102	PO1,PO2,PO3,PO4,PO5, PO6, PO7,PO8, PO9, PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
7	**Electives (Department and open)**	6	12	12	PO1,PO2,PO3,PO4, PO5,, PO6,PO7, PO8, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
8	**Projects/Training / Seminar**	7	28	14	PO1,PO2,PO3,PO4,PO5, PO6, PO7,PO9,PO10, PO11, PO12	PSO1,PSO2,PSO3	PEO1, PEO 2, PEO 3, PEO4
	Total	100	232	200			

Table B.2.1.4d: Mapping of course components to POs and PSOs for 2019 scheme

2.2 Teaching-Learning Processes (70)

Claimed 65

2.2.1 Describe the process followed to improve quality of Teaching-Learning (15)

Claimed 15

Our concern here is specifically with teaching, as opposed to research program structure and administration. Prime focus is given as to how an instructor can improve the quality of instruction in an individual course, and then the more difficult question of how an academic organization (which in our case is our academic Department) can improve the quality of its instructional program.

A. Adherence to Academic Calendar

The course delivery and the conduct of activities are planned in accordance with the academic calendar. All the academic and extracurricular activities of the department are conducted with strict adherence to the academic calendar. The academic calendar serves as an information source and planning document for students, faculty and staff of the Department. The academic calendar is prepared at the beginning of a calendar year with a clear plan of conducting examinations, co-curricular and extracurricular activities of the Institute. Subject allotment is done well in advance for the staff to prepare lesson plans, course plan, soft and hard copies of the lecture notes. Adherence of academic activities with the academic calendars for the calendar years 2020, 2019 and 2018 are detailed in the tables given below:

Adherence Report Academic Calendar for the year- 2020

SPRING-2020					
S. No.	**Activity**	**Date**		**Adherence**	**Remark**
		From	**To**		
1.	Registration for U.G. 2nd Semester	09-03-2020	11-03-2020	Yes	Executed on Date
	Commencement of classes of U.G. 2nd Semester	12-03-2020		Yes	Executed on Date
	Registration for U.G. 4th Semester	12-03-2020	13-03-2020	Yes	Executed on Date
	Commencement of classes of U.G. 4th Semester	16-03-2020		Yes	Executed on Date
	Registration for U.G. 6th Semester	16-03-2020	17-03-2020	Yes	Executed on Date
	Commencement of classes of U.G. 6th Semester	18-03-2020		Yes	Executed on Date
	Registration for U.G. 8th Semester	09-03-2020	11-03-2020	Yes	Executed on Date
	Commencement of classes of U.G. 8th Semester	12-03-2020		Yes	Executed on Date
	Registration for P.G. & PhD	09-03-2020	11-03-2020	Yes	Executed on Date
	Commencement of classes of P.G. & PhD	12-03-2020		Yes	Executed on Date
2.	Registration with late fee @ Rs.400/=per day	Applicable after 5th day of Registration		Yes	Executed on Date
3.	Sports week	11-04-2020	13-04-202	Suspended	Due to spread of COVID-19 Pandemic
4.	Mid-Term examination	04-05-2020		Suspended	Due to spread of COVID-19 Pandemic
5.	Advertisement for admission to: a) M. Tech (sponsored category) b) Ph. D	Last Week of May		Suspended	Due to spread of COVID-19 Pandemic
End-Term Examinations					
6.	B. Tech Project viva-voce Exam	Last week of May,2020		Postponed	Due to spread of COVID-19 Pandemic
	B. Tech 8th Semester	10-06-2020 13-06-2020		Postponed	Due to spread of COVID-19 Pandemic
	Registration for Supplementary Examinations with Regular candidates	03-06-2020to 07-06-2020		Postponed	Due to spread of COVID-19 Pandemic
	B.Tech. 2nd,4th&6th M.Tech/M.Sc. 2nd & 4th semesters and Ph.D.	From 10-06-2020		Postponed	Due to spread of COVID-19 Pandemic
7.	Registration for Supplementary Examinations (Odd Semester)	15-06-2020 to 26 -06-2020		Postponed	Due to spread of COVID-19 Pandemic
8.	Supplementary Examinations for odd Semesters	From 05-07-2020		Postponed	Due to spread of COVID-19 Pandemic
9.	Registration for Special Supplementary Exam for 8th Semester	01-06-2019 to -2019		Postponed	Due to spread of COVID-19 Pandemic
Autumn-2020					
Registration & Commencement of Classes					
1.	RegistrationforU.G.,P.G.&Ph.D.	29-07-2019	01-08-2019	Yes	Executed on Date
	Registration with late fee @ Rs.400/=per day	Upto 05-08-2019		No	Relaxed due to abrogation of Article 370 in J&K
	Commencement of classes	01-08-2019		No	Postponeddue to abrogation of Article 370 in J&K. Classes commenced from 11 Nov, 2019.

2.	Fresher's Orientation day	20-08-2019		Postponed	Held on 15 Nov, 2019
3.	Sports Event	06-09-2019	08-09-2019	Suspended	Due to abrogation of Article 370 in J&K
4.	Midterm Examinations	16-09-2019		Suspended	Due to abrogation of Article 370 in J&K
5.	Convocation	28-09-2019		Deferred	Due to abrogation of Article 370 in J&K
6.	National Entrepreneurship Day	09-11-2019		Deferred	Due to abrogation of Article 370 in J&K
End-Term Examinations					
7.	Practical Examinations	1st week of November		Postponed	3rd week of December
8.	Registration for Supplementary Examinations with Regular candidates	01-11-2019 to 07-11-2019		Yes	
9.	End Semester Examinations	From 11-11-2019		Postponed	25-02-2020
10.	Registration for Supplementary Examinations (Even Semester)	20-11-2019 to 28-11-2019		Yes	
11.	Supplementary Examinations for Even Semesters	From 01-12-2019		Postponed	16-03-2020
12.	Winter Vacations for Students	10-12-2019		Yes	Executed on Date

Table B.2.2.1a: Adherence Report for Academic Calendar for the Calendar Year 2020

Adherence Report Academic Calendar for the year- 2019

SPRING-2019					
S. No.	**Activity**	**Date**		**Adherence**	**Remark**
		From	**To**		
1.	Reopening of Institute for Faculty	18-02-2019		Yes	Executed on Date
	Registration forU.G. , P.G &Ph.D.	18-02-2019	22-02-2019	Yes	Executed on Date
	Registration with late fee @ Rs.400/=per day	25-02-2019	28-02-2019	Yes	Executed on Date
	Commencement of classes	Upto 25-02-2019		Yes	Executed on Date
2.	Mid-Term Examinations	18-04-2018		Yes	Executed on Date
3.	Techvaganza	27-04-2019 & 28-04-2019		Yes	
4.	Advertisement for admission to: c) M. Tech (sponsored category) d) Ph. D	3rd Week of May		Yes	Executed on Date
End-Term Examinations					
5.	B. Tech 8th Semester	From 23-05-2 019		Yes	Executed on Date
	B. Tech Project viva-voce Exam	10-06-2019 13-06-2019		Yes	Executed on Date
	Registration for Supplementary Examinations with Regular candidates	03-06-2019 to 07-06-2019		Yes	Executed on Date
	B.Tech. 2nd,4th&6th M.Tech/M.Sc. 2nd & 4th semesters and Ph.D.	From 10-06-2019		Yes	Executed on Date
6	Registration for Supplementary Examinations (Odd Semester)	24-06-2019 to 02-07-2019		Yes	Executed on Date
7.	Supplementary Examinations for odd Semesters	From 04-07-2019		Yes	Executed on Date
8.	Registration for Special Supplementary Exam for 8th Semester	01-07-2019 to 11-07-2019		Yes	Executed on Date
9.	Special Supplementary Examinations for 8th Semester	From 15-07-2019		Yes	Executed on Date
10.	Summer Break	23-06-2019	28-07-2019	Yes	Executed on Date

Autumn-2019					
Registration & Commencement of Classes					
1.	RegistrationforU.G.,P.G.&Ph.D.	29-07-2019	01-08-2019	Yes	Executed on Date
	Registration with late fee @ Rs.400/=per day	Upto 05-08-2019		No	Relaxed due to abrogation of Article 370 in J&K
	Commencement of classes	01-08-2019		No	Postponed due to abrogation of Article 370 in J&K. Classes commenced from 11 Nov, 2019.
2.	Fresher's Orientation day	20-08-2019		Postponed	Held on 15 Nov, 2019
3.	Sports Event	06-09-2019	08-09-2019	Suspended	Due to abrogation of Article 370 in J&K
4.	Midterm Examinations	16-09-2019		Suspended	Due to abrogation of Article 370 in J&K
5.	Convocation	28-09-2019		Deferred	Due to abrogation of Article 370 in J&K
6.	National Entrepreneurship Day	09-11-2019		Deferred	Due to abrogation of Article 370 in J&K
End-Term Examinations					
7.	Practical Examinations	1st week of November		Postponed	3rd week of December
8.	Registration for Supplementary Examinations with Regular candidates	01-11-2019 to 07-11-2019		Yes	
9.	End Semester Examinations	From 11-11-2019		Postponed	25-02-2020
10.	Registration for Supplementary Examinations (Even Semester)	20-11-2019 to 28-11-2019		Yes	
11.	Supplementary Examinations for Even Semesters	From 01-12-2019		Postponed	16-03-2020
12.	Winter Vacations for Students	10-12-2019		Yes	Executed on Date

Table B.2.2.1b: Adherence Report for Academic Calendar for the Calendar Year 2019

Adherence Report Academic Calendar for the year- 2018

S.No.	Activity	Date		Adherence	Remark
		From	To		
	REGISTRATION	19-02-2018	21-02-2018	Yes	Executed on Date
01.	B.Tech. 8th semester				
02.	Registration with late fee @ Rs. 400/= per day	Up to 26-02-2018		Yes	Executed on Date
03.	B.Tech.. 2nd 4th& 6th semesters and M.Tech./ M.Sc. 2nd& 4th and Ph.D.	26-02-2018 to 28-02-2018		Yes	Executed on Date
04.	Registration with late fee @ Rs. 400/= per day	Up to 05-03-2018		Yes	Implemented
05.	COMMENCEMENT OF CLASSES				
06.	Commencement of Classes for B.Tech.. 8th semester	22-02-2018		Yes	Executed on Date
07.	Commencement of Classes for B.Tech.. 2nd& 4th , 6th semesters and M.Tech./ M.Sc. 2nd& 4th and Ph.D.	01-03-2018		Yes	Executed on Date
08.	Extra-Curricular Activities	28-04-2018 to 30-04-2018		Yes	Executed on Date
09.	Alumni meet-2018	28-04-2018 to 29-04-2018		Yes	Executed on Date
10.	B.Tech.. 8th Semester	16-04-2018 to 21-04-2018		Yes	Executed on Date

11.	B.Tech.. 2nd,4th& 6th; M.Tech./M.Sc. 2nd& 4th semesters and Ph.D..	23-04-2018 to 28-04-2018	Yes	Executed on Date
12.	ANNUAL DAY	01-05-2018	Deferred	Lock down
	PRACTICAL EXAMINATIONS			
13.	B.Tech.. Project viva-voce Exam	11-06-2018 to 12-06-2018	Yes	Executed on Date
14.	M.Tech. Dissertation Viva-voce Exam	1st week of July-2018	Yes	Executed on Date
	END SEMESTER			
15.	B.Tech.. 8th	28-05-2018	Yes	Executed on Date
16.	B.Tech.. 2nd, 4th& 6th; M.Tech. / M.Sc. 2nd& 4th semesters and Ph.D.	19-06-2018	Yes	Executed on Date
17.	Advertisement for Ph.D. admissions	Last week of May-2018	Yes	Executed on Date
18.	Supplementary Examinations for odd semester	From 02-07-2018	Yes	Executed on Date
19.	Summer Break	10-07-2018 22-07-2018	Yes	Executed on Date
20.	Special Supplementary Examinations for 8th semester	16-07-2018	Yes	Executed on Date
21.	Registration for U.G., P.G. & Ph.D.	23-07-2018 to 25-07-2018	Yes	Executed on Date
22.	Registration with late fee @Rs 400/= per day	Up to 30-07-2018	Yes	Executed on Date
23.	Commencement of classes	26-07-2018	Yes	Executed on Date
24.	Extracurricular activity	07-09-2018 to 15-09-2018	No	Deferred due Prevailing condition
25.	Midterm examination	10-09-2018 to 15-09-2018	Postponed one week	17-09-2018 to 22-09-2018
26.	Convocation	22-09-2018	Yes	Executed on Date
27.	Alumni meet Delhi chapter	29-09-2018 to 30-09-2018	Yes	Executed on Date
28.	Practical examination	1st week of November	Yes	Executed on Date
29.	National Entrepreneur day	09-11-2018	Yes	Executed on Date
30.	End semester examination	From 12-11-2018	Yes	Executed on Date
31	Supplementary examinations for even semester	From 26-11-2018	Yes	Executed on Date
32.	Winter vacation for students	10-12-2018	Yes	Executed on Date

Table B.2.2.1c: Adherence Report for Academic Calendar Year 2018

B. Pedagogical Initiatives

We may define good teaching as instruction that leads to effective learning, which in turn means thorough and lasting acquisition of the knowledge, skills, and values the instructor or the institution that has set out to impart. In the sections that follow, we describe several strategies, known to be particularly effective and as implemented in the departmental teaching methodologies.

1. Instructional objectives are met

Instructional objectives are statements of specific observable actions that students should be able to perform if they have mastered the content and skills the instructor has attempted to teach. An instructional objective has one of the following stems:

*At the end of this [course, chapter, week, lecture], the student should be able to ****
*To do well on the next exam, the student should be able to ****
Where *** is a phrase that begins with an action verb (e.g., *list, calculate*, *solve*, *estimate*, *describe*, *explain*, *paraphrase, interpret, predict*, *model*, *design*, *optimize*…). The outcome of the specified action must be directly observable by the instructor: words like "learn," "know," "understand," and "appreciate," while important, do not qualify.

Following are illustrative phrases that are attached to the stem of an instructional objective, grouped in six categories according to the levels of thinking they require.

i. ***Knowledge*** *(repeating verbatim)*
ii. ***Comprehension*** *(demonstrating understanding of terms and concepts)*
iii. ***Application*** *(solving problems)*
iv. ***Analysis*** *(breaking things down into their elements, formulating theoretical explanations or mathematical or logical models for observed phenomena)*
v. ***Synthesis*** *(creating something, combining elements in novel ways)*
vi. ***Evaluation*** *(choosing from among alternatives)*

Well-formulated instructional objectives help the teachers prepare lectures and assignment schedules and facilitate construction of in-class activities, out-of-class assignments, and tests. The greatest benefit comes when the objectives cover all of the content and skills the teacher wishes to teach and they are handed out as study guides prior to examinations. The more explicitly students know what is expected of them, the more likely they are to meet the expectations.

2. Active Learning is promoted in Class

Most students cannot stay focused throughout a lecture. After about 10 minutes their attention begins to drift, first for brief moments and then for longer intervals, and by the end of the lecture they are taking in very little and retaining less. A classroom research study showed that immediately after a lecture, students recalled 70% of the information presented in the first ten minutes and only 20% of that from the last ten minutes.
Therefore, students' attention is maintained throughout a class session by periodically giving them something to do. Many different activities serve this purpose, of which the most common is the quick question exercise.

Active learning exercises address a variety of objectives. Some examples follow:

***i. Recalling Prior Material*:** The students may be given one minute to list as many points as they can recall about the previous lecture or about a specific topic covered in an assigned reading.

***ii. Responding to Questions*:** Any questions a teacher normally asks in class is directed to groups. In most classes—especially large ones—very few students are willing to volunteer answers to questions, even if they know the answers. When the questions are directed to small groups, most students attempt to come up with answers and the teacher thus, gets as many responses as he or she wants.

iii. Problem Solving: A large problem can always be broken into a series of steps, such as paraphrasing the problem statement, sketching a schematic or flow chart, predicting a solution,

writing the relevant equations, solving them or outlining a solution procedure, and checking and/or interpreting the solution. When working through a problem in class, the instructor usually completes some basic pre-requisite steps and then asks the student groups to attempt others. It should be ensured and is generally followed, that the groups should generally be given enough time to think about what they have been asked to do and begin formulating a response but not necessarily enough to reach closure.

iv. Generating Questions and Summarizing: The students are given a minute to come upwith two good questions about the preceding lecture segment or to summarize the major points in the lecture just concluded.

3. Assessment and Evaluation of Teaching Quality

Most institutions use only end-of-course student surveys to evaluate teaching quality. While student opinions are important and should be including in any assessment plan, meaningful evaluation of teaching must rely primarily on assessment of learning outcomes. Current trends in assessment include shifting from standardized tests to performance-based assessments, from teaching-based models to learning-based models of student development, and from assessment as an add-on to more naturalistic approaches embedded in actual instructional delivery. Measures that are used to obtain an accurate picture of students' content knowledge and skills include tests, performance investigations, project reports, and learning logs and journals.

Improving teaching requires identifying problems with existing academic practices and then applying a combination of sound educational and psychological principles to devise a better approach. Such approaches have already been devised.

- Faculty members and administrators define the knowledge, skills, and values that the graduates of the program should have.
- With the assistance of experts in pedagogy and learning assessment, the faculty defines the instructional methods most likely to lead to the acquisition of the desired attributes, selects the methods needed to assess the effectiveness of the instruction, and estimates the resources needed to implement both the instruction and the assessment.
- The administration commits to provide both the necessary resources to initiate and sustain the program and appropriate incentives for faculty members to participate.
- The faculty and administration formulate a detailed implementation plan.
- The faculty implements the plan.
- The faculty and administration assess the results and modify the plan as necessary to move closer to the desired outcomes.

4. Mentoring System to Help at Individual Levels

The functions of the mentors include:

- Monitoring the academic and general progress of the students.
- Advising them on elective course selection.
- Monitoring their attendance.
- Advising them to register for supplementary exams based on their progress and capabilities.
- Counseling the students on general matters, discipline, conduct and ethical values.
- Monitoring their attendance.

- Advising them to register for supplementary exams based on their progress and capabilities.
- Counseling the students on general matters, discipline, conduct and ethical values.

To carry out pedagogical initiatives, the following methodologies are employed:

a) Real time examples

- To demonstrate the complexity and unpredictability of real issues, and to stimulate critical thinking real world examples are discussed.
- Inter- and multi-disciplinary approaches are used for problem solving.
- In order to demonstrate that there is no perfect solution to a particular problem real world problems are invoked.
- Real world examples help students think more analytically about the solutions.

b) **Interactive classrooms:** Classes are made more interactive by encouraging student participation as follows:

- Asking students to elaborate something they have written in a response paper or on the class' discussion board.
- Having students to answer other students' questions.
- Punctuating the lecture with questions.
- Interrupting the lecture with a sample exam question.
- Asking students to interpret a statistic, a graph, a chart, or another visual image.
- Integrating a case study or an inquiry or a problem solving exercise into the class.
- Integrating student presentations into the class.
- Asking questions that involve higher-order thinking skills like diagnostic, challenge, evaluation or prediction questions.
- Asking students to summarize the main points that they learned in class that day and the points they found most confusing.
- Asking the students to explain the relevance, utility, or significance of the information presented in the class.

c) Slide Presentation: Slide presentation is used to benefit the students by engaging in multiple learning styles, increasing visual impact, improving audience focus and providing annotations and highlights.

d) Video Lectures: Video lectures are imparted that are archived and can be accessed anytime anywhere. For certain topics and concepts video can be used by the novice students who have lower knowledge to process the concepts. Almost 50% of the lecture halls are fitted with LCD projectors for facilitate this initiative.

e) Collaborative learning: Theory subjects and Lab

- Groups comprising a maximum of five to six students are formed in each class.
- One from the group is designated as the group leader.
- Each group may be assigned tasks by the faculty and a report on the activity is provided by the respective group leader.
- An assessment on the report is done by the faculty to analyze the expected outcome from the activity is achieved.
- The tasks assigned could be a minimum of three in each semester as decided by the faculty member.

- The focus of the tasks is on learning new technologies, enhance the knowledge on a particular topic, studying new tools to be in pace with the industry, doing some mini projects, etc.
- Additional experiments could be assigned to each group in lab sessions.
- Faculty encourages each group to disseminate the knowledge they have gathered to others.

f) Group Discussion: Group Discussions is an excellent strategy for enhancing student motivation, fostering, intellectual agility and encouraging democratic habits. It create opportunities for students to practice and to sharpen a number of skills including the ability to articulate and defend positions, consider different points of view, and enlist and evaluate evidence. The group discussions are promoted in the theory and lab classes.

g) Assignments: The purpose of the writing assignments is to help each student develop research and communication skills so they obtain the necessary information literacy skills to complete the engineering curriculum.

- Writing assignments is a flexible means of demonstrating learning as well as a method of exploring one's thinking to stimulate learning. The civil engineering department strictly follows this method
- A minimum of two assignments is given for each course in a semester.
- The assignment given could be theoretical or a practical implementation.
- The assignments are designed so that the COs, POs and PSOs are covered in the questions asked in the assignments.

h) Conducting Quiz

- Quizzes are conducted for all courses in all semesters.
- At least one quiz competition is held per course in semester.
- Faculty keeps a document of the quiz questions.
- The mode of conducting quiz is oral the class.
- Quiz Competitions are organized to promote scholastic excellence and to provide a venue for interaction amongst students.

i) Tutorials: Tutorials are generally intended to

- Enables the students to pursue their individual academic interests within the context of the subject.
- Helps the students to gain a deep understanding of the subject matter.
- Develop students' ability to think and act likes a professional in their discipline.
- Develop students' basic academic skills like identification and evaluation of relevant resources, effective communication, effective time-management etc.
- For each subject, at least one hour in every week is allotted for conducting tutorial as shown under the heading "Structure of Curriculum" above.
- A tutorial register is maintained for each subject and regularly maintained by the concerned faculty.

j) Self-Learning Facility: The self- learning facilities provided in the institute are:

- A Common Computing Centre equipped with more than 100 computers is available 12 hours per day with internet facility.
- A computer lab equipped with 30 computers having necessary system and application software is functioning 12 hours per day for students to carry out their work.

- Wi-Fi facility of 10Mbps speed is available which can be accessed anywhere in the campus.
- A Central Library with an excellent collection of Books, Journals, Technical magazines, Newspapers and non-book materials in engineering and technology, science, humanities and management like CD-ROMs are available.
- The digital library provides IP enabled access to a large number of full texts on line journal databases from the various publishers such as Science direct etc.

k) Co-curricular Activities: Guest Lectures/ Workshops

- Every year a number of eminent personalities are invited from a variety of fields, articulating their thoughts and elaborating on their well known works, ranging from current rages to the age old topics.

l) Internal Assessment Tests

- Two internal assessment tests are conducted in every semester.
- The first test is conducted after the completion of the first module of each subject.
- The duration of the each test is one hour.
- The results of each test are analyzed to identify the weak and bright students.
- The bright students are assigned some task by the faculty to encourage their performance.
- Remedial classes and tests are conducted for the weaker students after each test and the remedial test results are analyzed to identify the impact.

m) Industrial Training and Industrial Visits: The objectives of the industrial training are to expose the students to the engineering practice which is specific to their course specialization and to the nature of the industry selected. This exposes the students to the responsibilities of an engineer and the engineering profession such as to develop the students' communication skills. These skills are developed by daily interaction within the working environment and technical writing.

- The students of the chemical engineering department are deputed to very important infrastructure projects for undergoing industrial training of minimum 6 weeks, at 5th and 6th semester levels.
- The same is evaluated at the end of 7^{th} semester.
- In addition, the students visit several industrial sites depending upon their faculty members and the availability of the industries.

n) Exhibitions

- Project exhibitions are encouraged during programs of technical festivals such as TECHVAGANZA etc. organized by NIT Srinagar.
- Students are encouraged to take part in exhibitions conducted by various organizations so that their innovative ideas are made known to the public.

C. Methodologies to support weak students and encourage bright students

Chemical Engineering Department has always strived on the culture of encouraging bright students as well as helping weak students by providing them necessary guidance and moral support. The weaker students are monitored constantly through their class performance, attendance; quiz outcomes and even grades and pointers. They are helped by arranging extra classes and tutorials. Apart from this, critical cases are even addressed by proper counselling and support by the faculty members. Individual attention is also provided to motivate certain weaker student sections.

The students who scored less than 50% marks belong to group of weak student and above 80% belong to the group of bright students.

- A total of three tests will be conducted in each semester to assess the student's performance in subjects.
- Remedial classes will be conducted for the weak students by each faculty.
- The number of hours taken for remedial classes will be decided by the faculty as required.
- A remedial test will be conducted for the weaker students thereafter and the results are analyzed to identify the impact of the remedial classes.
- Additional measures will be taken by the respective faculty in cases where the students fail to achieve the objective of remedial classes.

The department has a well-defined process of monitoring, guiding and assisting slow learners (weak students). Care is taken by the faculties in monitoring the performance of slow learners, the students deviations from studies is observed by the respective section coordinators and corrective measures are suggested.

The observable impact of assisting weak students is reduced number of identifiable weak students and improved results with less number of failures in each subject.

On the other hand, class toppers are felicitated by encouragement. The bright students are identified based on their overall performance and their orientation towards academics. The students who scored above 80% marks belong to the group of bright students. The measures taken to encourage bright students will be decided by the respective faculty.
The measures taken may include the following and additional actions may be according to the requirement:

- Recommend some quality references.
- Provide details of books to be referred.
- Suggest some e-resources and journals.
- Motivate them to support/assist weak students.
- Self-learning facility.

They are even encouraged to attend conferences, workshops and publish papers; encouraged to take up innovative projects. Bright students having high academic track records are encouraged by faculties to achieve university ranks, also encouraged to take up competitive examinations like GATE, GRE etc.

Assisting Weak Students:

- They are supported by the student mentoring and faculty mentoring, extra classes, remedial class and study hours are conducted.
- Behavior problems are corrected through counseling system.
- During the lab, special assistance given by other bright students and also lab technicians.

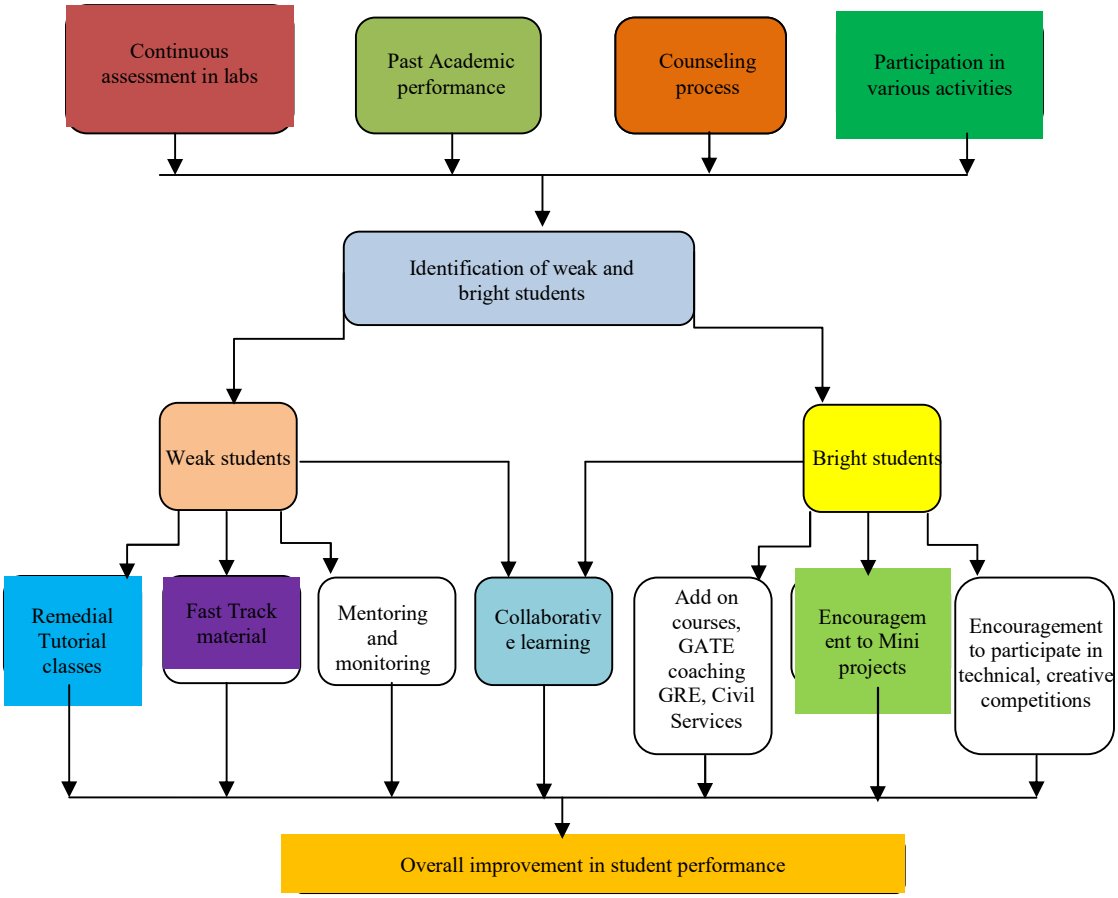

Figure B.2.2a: Process to identify and monitor weak and bright students

The impact of this methodology usually produces very good results in the overall performance of students and exemplary results in their examinations. Improvement in analytical abilities of students thus improve the professional bent of students and serves as a good check on the adherence to all PO's in the departmental ideology.

D. Quality of Classroom Teaching (Observation in a Class)

The faculty of the department adopts various innovative Teaching and Learning methodologies to create the best learning environment for students. These methodologies include traditional white board teaching, presentations, NPTEL/video lecturing. Various collaborative learning methods are used where every concept is correlated with real world illustrations, design and problematic aspects and are conveyed in a precise manner. The faculty are oriented towards Outcome based Education (OBE) and are actively utilizing the OBE to cater to the learning needs of students in an innovative manner. The lecture session duration is 50 minutes or 100 minutes. The Laboratory duration is 2-3 hours. Assignments are given to students for their better performance. Tutorial/Remedial classes are conducted for the slow learners of the class based on their performance in external exams and after the first internals. Motivating and guiding students for higher studies and university ranks is the vision for academic growth. Technical quizzers are also conducted for the students. All the faculties are requested to maintain attendance registers, course files, work dairies. Industrial visits are conducted at least once a year to reduce the gap between industry and institute. Workshops are organized to help the students to understand

concepts beyond curriculum. One-one discussion, interaction between Professors and students has increased confidence levels of the students. To meet the current requirements of the industry, the syllabus is formulated in light of the PO's. Project Work allows them to gain in depth knowledge as they carry out literature survey of the concepts, and hands on experience of the tools and hardware. Through the experiences of independent research, students are better prepared in the areas of critical thinking and learning. This encourages the students to pursue graduate studies and research work.

E. Implementation Details

Modes of delivery of courses:

The following are various content delivery methods used to deliver the courses:

Mth1 – Lectures
Mth2 – Tutorial Sessions
Mth3 – Laboratory Sittings
Mth4 – Quiz/Assignment
Mth5 – Presentations
Mth6 – Research Literature
Mth7 – Guest/Extension Lectures
Mth8 – Workshop Sessions

- **Mth1 – Lectures (Online/Offline)**

Lectures held in classrooms/virtual platforms to help in transmitting the knowledge. Here, the course coordinator disseminates the information to the students. Each lecture is generally delivered according to the Course Plan which is distributed to the students at the beginning of the course during the start of each semester. Students are encouraged to interact during the lectures. Thus, lectures generally help in the attainment of POs.

- **Mth2 – Tutorial Sessions**

Tutorials are generally intended to

i. Enable students to pursue their individual academic interests within the context of the subject.
ii. Help students to gain a deep understanding of the subject matter.
iii. Develop student's ability to think and act like a professional in their discipline.
iv. Develop student's basic academic skills like identification and evaluation of relevant resources, effective communication, effective time-management etc.
v. For each subject, one hour in every week is allotted for conducting tutorial.

The tutorials help motivating the students to closely interact with the course coordinator/teaching assistant and the peer group and help in attainment of PO2, PO3 and PO4.Tutorial are conducted to give exercises to the students and also to closely monitor their learning ability and achievement. Tutorials have improved interaction of the students with faculty members which in turn has improved their learning outcomes. Further, tutorials have provided opportunity to the students to improve their problem analysis and solving skills, team collaboration and communication skills.

- **Mth3 – Laboratory Sittings/ Virtual lab sessions**

Courses having associated laboratory in curriculum help the students in formulating the link between the theory and practice and hence acquire skills. Specific tasks are assigned to the students individually or in groups. These tasks help the student(s) to comprehend the behaviour of processes. The students also acquire the skills to utilize the equipment, software and tools. After solving each task, the students are supposed to interpret the outcome and provide valid conclusions/remarks. Hence, these laboratory sittings help in attainment of PO4, PO5, PO8 and PO9. Due to COVID-19 lockdown, in the session Spring 2020, the lab material, links from other sources were uploaded on department website and the interaction sessions were held online.

- **Mth4 – Quiz/Assignment**

Generally 1-2 surprise quizzes are held during each semester for every course. Such quizzes are based on objective questions viz. multiple choice questions, questions/problems requiring one word answer, recalling the important equations/theorems, etc. Surprise quiz and assignments allocation alerts the students to be prepared for each session. These sessions also help in attainment of the specific POs.

- **Mth5 – Presentations**

Slide presentations can be used in courses more geared toward information exchange than skill development. The benefits of using presentations include: Engaging multiple learning styles

i. Increasing visual impact.
ii. Improving audience focus.
iii. Providing annotations and highlights.

This delivery method helps in attainment of PO1, PO2, PO8, PO10 and PO11.

- **Mth6 – Research Literature**

In addition to the text books/references mentioned for each course, the students are also exposed to the technical research content such as IEEE Xplore subscriptions and basic NPTEL platforms to enhance their knowledge and skills. They encourage the students to develop an attitude to pursue lifelong learning with high ends. This helps in attainment of PO1, PO2 and PO12.

- **Mth7 – Guest/Extension Lectures**

During the semester, experts from various domains of computer science & engineering are invited to deliver guest/extension lectures on the latest trends and developments. These lectures help the students to interact with the industry people and enhance their knowledge in the subject domain. The students are exposed to industry expectations as a professional to serve the societal needs. Hence, it helps in the attainment of PO6, PO7, PO11 and PO12.

- **Mth8 – Workshops**

In addition to the book sphere, the students are also given inputs like Workshops, at least once each semester, so as to keep them accustomed to latest technical spheres of engineering streams. These workshops encompass a wide range of topics and objectives, lending a hand to both, direct as well as secondary teaching aids.

Delivery Methods	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Mth1 – Lectures(Online/Offline)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mth2 – Tutorial Sessions	Y	Y	Y	Y	Y	Y	Y		Y			
Mth3 – Laboratory Sittings/Virtual Lab Sessions	Y	Y	Y	Y	Y		Y					
Mth4 – Quiz/Assignment	Y	Y	Y	Y	Y	Y	Y				Y	
Mth5 – Presentations	Y				Y			Y	Y	Y	Y	Y
Mth6 – Research Literature	Y	Y		Y	Y	Y	Y					Y
Mth7 – Guest/Extension			Y	Y	Y						Y	Y
Mth8 – Workshops	Y	Y	Y						Y		Y	Y

Table-B.2.2.1f: Provides the course and their delivery methods with linkages to POs.

Mathematics and Basic Science	Mathematics I & II	Mth1, Mth2, Mth4	PO1, PO2,PO3, PO11
	Physics I & II	Mth1, Mth2, Mth4	PO1, PO2, PO5, PO6, PO7, PO10, PO12
	Chemistry I & II	Mth1, Mth2, Mth4	PO1, PO2, PO5, PO6, PO7, PO10, PO12
	Chemistry lab I & II	Mth1, Mth3	PO1, PO2, PO5, PO6, PO7, PO10, PO12
	Physics lab I & II	Mth1, Mth3	PO1, PO2, PO5, PO6, PO7, PO10, PO12
Engineering Sciences	Engineering Drawing	Mth1, Mth3	PO1, PO3, PO4, PO8, PO9, PO12
	Machine Drawing	Mth1, Mth3,	PO1, PO3, PO4, PO8, PO9, PO12
	Electronics I & Lab	Mth1, Mth2, Mth3, Mth4	PO1, PO2,PO7
	Basic Electrical	Mth1, Mth2,Mth4	PO1, PO2, PO3, PO4, PO5, PO6, PO11, PO12
	Engineering Mechanics	Mth1, Mth3,	PO1, PO2,PO11
Humanities and Social Sciences	Humanities I & II	Mth1, Mth5,	PO3, PO6, PO12
	Self-awareness and ethics	Mth1, Mth5	PO3, PO6, PO7, PO8, PO9,PO11,PO10,PO12
	Basic management principles	Mth1, Mth5	PO2, PO3, PO8, PO9,PO10, PO12

Professional Core	Introduction to Chemical Eng.	Mth1, Mth2, Mth 4, Mth5	PO1,PO2,PO3,PO5,PO6,PO7,PO8 ,PO11, PO12
	Material and Energy Balance	Mth1, Mth2,Mth4	PO1,PO2,PO3,POP4,PO5,PO6,PO 7,PO8,PO9,PO11,PO12
	Process Fluid Mechanics	Mth1, Mth2, Mth4, Mth5	PO1, PO2 , PO3, PO4, PO5, PO12
	Thermodynamics and Chemical Kinetics	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4,PO12
	Chemical Eng. Thermodynamics	Mth1, Mth2, Mth4	PO1,PO2,PO3,PO4,PO12
	Heat Transfer	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4, PO6, PO7, PO12
	Mechanical Operations	Mth1, Mth2, Mth 4	PO1,PO2,PO3,PO4,PO6,PO7,PO1 2
	Fluid Mechanical and Mechanical Operation Lab.	Mth1, Mth3, Mth4	PO1, PO2 , PO3, PO4
	Process Equipment Design –I	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO11, PO12
	Chemical Reaction Eng.	Mth1, Mth2, Mth4	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11, PO12
	Material Science & Technology	Mth1, Mth2, Mth4	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO12
	Chemical Technology-I	Mth1, Mth5, Mth7	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO12
	Mass Transfer-I	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4, PO5, PO6, PO7, PO11, PO12
	Heat Transfer Lab	Mth1, Mth3,	PO1, PO2 , PO3, PO4, PO6, PO12
	Process Equipment Design-II	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4, PO5, PO6, PO7, PO9, PO11, PO12
	Mass Transfer-II	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4, PO5, PO6, PO7, PO11, PO12
	Chemical Technology-II	Mth1, Mth5, Mth7	PO1, PO3, PO4, PO5, PO6, PO7, PO11, PO12
	Energy Eng. Lab	Mth3, Mth1	PO1,PO2,PO3,PO4,PO5,PO6,PO7 ,PO8,PO9,PO10,PO11,PO12
	Energy Eng.	Mth1, Mth2, Mth5, Mth8	PO1,PO2,PO3,PO4,PO5,PO6,PO7 ,PO8,PO9,PO10,PO11,PO12
	Process Instrumentation	Mth1, Mth2, Mth5	PO1, PO2, PO3, PO4,PO5

	Transport Phenomenon	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4,PO5,PO6, PO7, PO8, PO12
	Thermodynamics & Reaction Eng. Lab	Mth3, Mth1	PO1, PO2 , PO3, PO4, PO6, PO11, PO12
	Industrial Training & Presentation	Mth5, Mth6	PO1. PO2.PO9,PO10,P012
	Chemical Process Safety	Mth1, Mth2, Mth8	PO1,PO2,PO3,PO4,PO5,PO6,PO7 ,PO8,PO9,PO10,PO11,PO12
	Process Dynamics & Control	Mth1, Mth2, Mth4	PO1, PO2 , PO3, PO4, PO5, PO6, PO7, PO8, PO12
	Process Dynamics & Control Lab	Mth3, Mth1	PO1, PO2 , PO3, PO4, PO5, PO6, PO7, PO8, PO12
	Process Economics & Plant Design	Mth1, Mth2, Mth4, Mth5	PO1, PO2 , PO3, PO4, PO12
	Biochemical Eng.	Mth1, Mth2	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, P09, PO10, PO12
	Mass transfer lab	Mth3, Mth1	PO1, PO2 , PO3, PO4, PO5, PO9, PO10, PO11, PO12
	Bio resource Technology	Mth1, Mth2	PO1, PO2, PO3, PO4,PO5, PO6, PO7,PO8,PO9, PO10, PO12
	Biochemical Eng. Lab	Mth3, Mth1	PO1, PO2 , PO3, PO4,PO5, PO9,PO7,PO8,PO11,PO12
	Modeling& Simulation in Chemical Eng.	Mth1, Mth2, Mth3	PO1, PO2 , PO3, PO4,PO5,PO6,PO12
	Industrial Pollution Abatement	Mth1, Mth2, Mth8	PO1, PO2, PO3,PO4, PO5, PO6, PO7
Computing	Computer Science Programming I, II	Mth1, Mth4, Mth8	PO1, PO2, PO3, PO4, PO5, PO12
	Computer Science Programming I, II Lab	Mth1, Mth3	PO1, PO2, PO3, PO4, PO5, PO12
Projects/Training/Seminar	Major Project	Mth1, Mth3 Mth5, Mth6, Mth7, Mth8	PO1, PO2, PO4, PO5, PO6, PO7, PO9, PO10, PO11, PO12
	Pre-Project/Viva	Mth3, Mth4, Mth5, Mth6, Mth8	PO1, PO2,PO3,PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12
	Industrial Training	Mth4, Mth5	PO1, PO2, PO9, PO10, PO12
	Seminar	Mth4, Mth5	PO1,PO3,PO4,PO5,PO6,PO7,PO10,PO11,PO12

Table B.2.2.1g: Course Delivery Methods and Linkage to POs.

Conduct of Experiments (Observations in Lab)

- A lab manual is maintained in each laboratory.
- All the experiments in the prescribed syllabus is followed and completed by the end of the semester.
- The objective and the procedure for all experiments in the prescribed syllabus is available in the lab manual.

Continuous assessment in the laboratory

- Each student should maintain a rough record to record the details of work done in each laboratory session.
- The students are directed to write the step by step procedure to achieve a solution for the given experiment.
- The faculty-in-charge will check the procedure and then students can proceed with doing the experiment.
- Students should record the observations in the rough record while doing the experiment
- Students may also analyze the data to plot graph or other related work.
- The final output will be verified by the faculty-in-charge.
- Students should add the details of the experiments done in the laboratory to the prescribed record book.

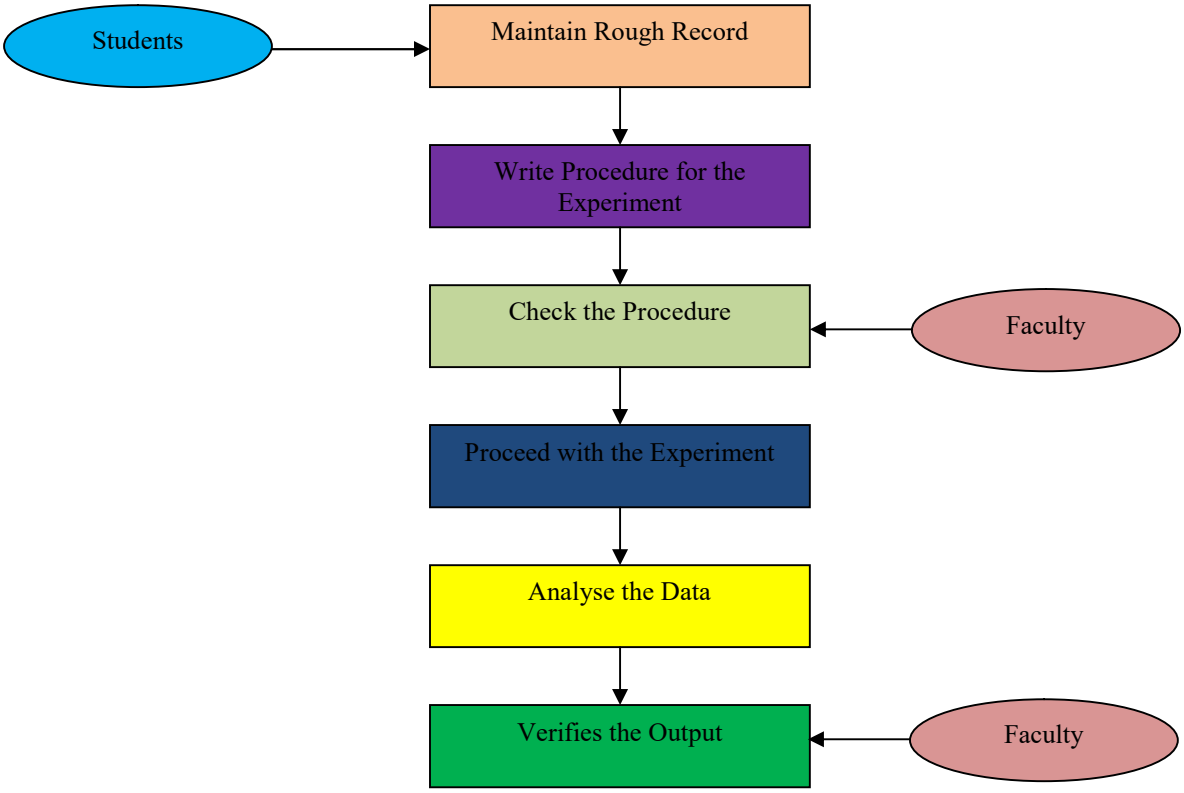

Figure B.2.2b: Process for conduct of experiments, record of observations and analysis of data

- The Laboratories are evaluated by the faculties for 100 marks based on their performance during the semester, internal test and record submission.

- The distribution of marks for laboratory subjects has been reflected in Table 2.2d.

Continuous Assessment	Major Examination	Total	Grade
40	60	100	.....

Table B.2.2.1h: Distribution of Marks for Laboratory Subjects

F. Impact Analysis

Student feedback of teaching-learning process and actions taken

Feedback collected for all courses: Yes

Process:

- At the end of each semester exam, feedback forms/Course Exit Survey forms on each subject are collected.
- Student Feedback is valuable for identifying areas for instructional improvement because simple changes can help motivate students and enhance student learning.
- The questionnaire is prepared covering all areas of faculty's including ability of teaching, quality of learning, class-handling attitude, acceptance authority by students, etc. where students are asked to record their opinion directly.
- If the overall feedback falls below 80 % corrective actions are taken.
- The Head of the Department will provide some suggestions for improvement based on the feedback if required.

Note: Percentage of students participating: 95-100%

COURSE APPRAISAL/FEEDBACK FORM

Course No & Title **Date:**

Instructor's Name **Sem:**

Please Tick In The Appropriate Box

S. No.	**Course Organisation**	Range	5	4	3	2	1	
1	Were the objectives and course plan clearly specified?	Very clearly excellent						Very Poorly
2	Was the course coverage and depth adequate?	Excellent						Very poor
3	Did the topics provide any new knowledge?	Mostly						Hardly
4	Was the prescribed study material readily available?	Very readily						Not available at all
	Presentation and interaction							
5	How were the lectures in terms of clarity and presentation of the fundamental concepts?	Excellent						Poor
6	Rate the audibility and articulation of the instructors or'2al presentation	Excellent						Poor
7	Did the instructor encourage think logically and objectively?	Very much						Never
8	Was the instructor's response to the questions	Very much						Not at all

	asked in the class satisfactory?							
9	Rate the instructor's attitude towards teaching of this course.	Enthusiastic						Indifferent
10	Were the classes held regularly and on time?	Always						Never
11	Rate the overall quality of teaching in this course	Outstanding						Poor
	Evaluation							
12	Did the examinations reflect the courses plan?	Very closely						Poorly
13	Were the examinations of appropriate level and length?	Always						Rarely
14	Were the answer script promptly checked and returned?	Always						Rarely
15	Was the grading fair and transparent?	Mostly						Rarely
16	Did the midterm evaluation and feedback improve the understanding of this course?	Always						Rarely

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR (J&K)
DEPARTMENT OF CHEMICAL ENGINEERING
Course Exit Survey

Name of the Program:
Academic Year
Code and Title of the Course:
Semester:
Name of the Course Teacher:

Note: Please rate the quality of course on course curriculum, course organization, teaching learning process, quality of learning material, assignments, progressive assessments, performance of faculty members and course outcomes. Rate each applicable criteria by putting points as mentioned in legend.

S. No.	**Criteria**	**Rating**		
		Good (3)	**Average (2)**	**Poor (1)**
1	**Course Curriculum**			
	Course Outcome explained			
	Depth and breadth of course content			
	Importance of course explained			
2	**Course Organization**			
	Ease of learning			
	Logically sequenced			
	Linked with previous and subsequent courses			
3	**Teaching Learning Process**			
	Introduction of topic			
	Development of content			
	Opportunity of participation			
	Quality of questions asked by teacher			

	Variety of teaching materials			
	Use of teaching aids			
	Summarization of learning			
4	**Quality of Learning Material**			
	Relevance to course outcomes			
	Coverage			
	Comprehendible			
	Variety in learning material such as handouts, case study, papers, workbook, manual, ppts			
	Reference material			
5	**Assignments**			
	Relevance to course			
	Feedback provided on assignments			
6	**Progressive Assessment**			
	Relevance of progressive test			
	Feedback provided on assignments			
7	**Performance of Faculty members**			
	Effective communication			
	Guidance and feedback			
	Time management			
8	**Course Outcome Assessment**			
	CO1:			
	CO2:			
	CO3:			
	CO4:			
	CO5:			

- The quality of teaching exhibited in terms of attaining POs, PSOs to the extent of 70-80 % in most of the courses.
- When the academic outcome is more than 75%, most students have achieved their course outcomes within the stipulated time of four years.
- Because of the extra support given to the slow learners and the weak students, the pass percentage is continuously increasing and the number of backlogs students is decreasing.

2.2.2 Quality of end semester examination, internal semester Question papers, Assignments and Evaluation (15)

Claimed 15

A. Process to ensure the quality of internal semester question papers:

- All tests are conducted in strict adherence to the academic calendar.
- The question papers for each subject are set in such a way that it maps to the Course Outcomes of the respective subject.
- The question paper will be verified by the Head of the Department and may accept with or without modifications.
- The questions asked in each subject are categorized to knowledge, comprehension, application, analysis, evaluation and synthesis level.
- All course outcomes will be achieved through the tests conducted in each semester.

  - CO Coverage for Midterm Exams
  - CO Coverage for End term Exams
  - CO Attainment Calculation.

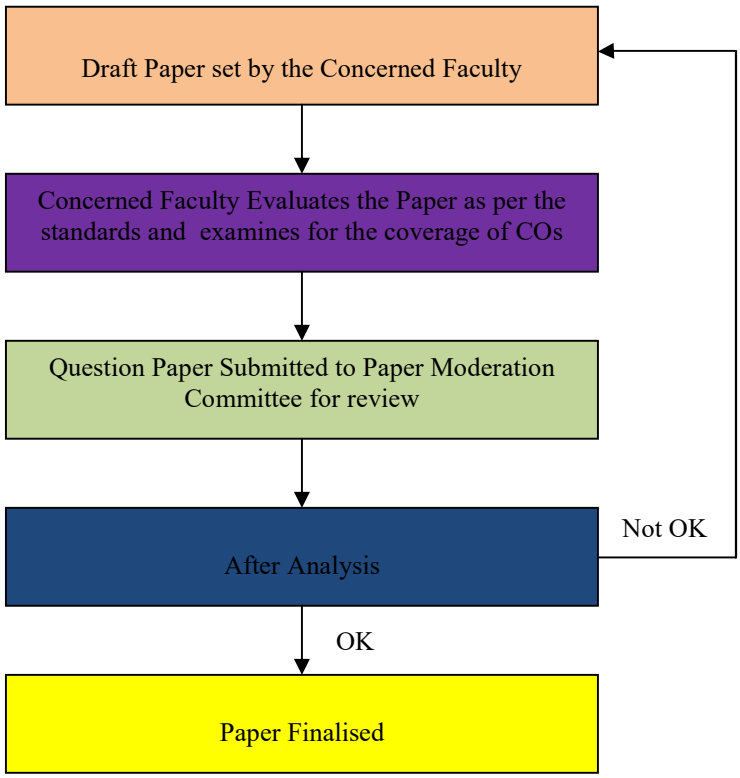

Figure B.2.2.2a: Process to Ensure the Quality of Internal Semester Question Papers

Paper Moderation Committee includes following members:

1) Head of the Department
2) Course Coordinator
3) Subject Expert

B. **To ensure the quality of the internal semester question papers the following process is adopted**:

- Regular midterm exams are held in strict adherence to the academic calendar of the institute.
- The question papers are set in such a way that the COs maps the questions asked.
- The question papers are examined and verified by the HOD to ensure the standard of the paper and ensures that the COs of the course are covered. The questions papers are modified if HOD is not satisfied with standard requirements of the question paper.
- The questions asked are well balanced to ensure that all the components such as knowledge, comprehension, application, analysis etc are encompassed.

C. To ensure the quality of the assignments following procedure is adopted:

- At least two assignments are given before midterm and after the midterm (before the commencement of the major exam)
- The assignments are designed to map the COs of the course.
- The assignments are designed to cover both theoretical and numerical portion of the course.
- The assignments cover knowledge, comprehension, application, analysis etc. of the course.
- The assignments may have questions designed by the faculty or an open book type.
- The evaluated assignments are returned to the students with the remarks of faculty so as to point out the mistakes.
- The marks earned by the students are displayed on the notice board for transparency so that the students come to know about the marks before final submission to the controller of examinations.

D. To ensure the quality of evaluation following procedure is place in the department:

- The scheme of evaluation and solution to the problems in the question papers are prepared by the respective faculty in advance.
- The CO coverage and the marks allotted are recorded by the faculty.

- The evaluated answer books are returned by the faculty to the students to ensure the transparency so that the students come to know about the marks before final submission to the controller of examinations.
- Student's feedback is received by the faculty regarding the evaluation of each question.
- The students are encouraged to discuss any doubt or discrepancy regarding the evaluation.
- The marks of the students are forwarded only when the students are satisfied with evaluation.
- It is the statutory procedure of the institute to show the evaluated answer books to the students , once the students give in writing the that they have seen the answer books . The marks are forwarded to the concerned quarters.

E. Process to ensure questions from outcomes/learning level perspective.

- For each subject, a tentative question list is prepared according to the COs.
- While setting the question paper, previous institute exam papers of at least three years are taken into consideration to avoid repetition of questions.
- While setting a question paper an attempt is made to follow Bloom's taxonomy. The questions are prepared according to the level of toughness (viz., analyzing the problems, implementation of modern tools, formulating the problems etc).

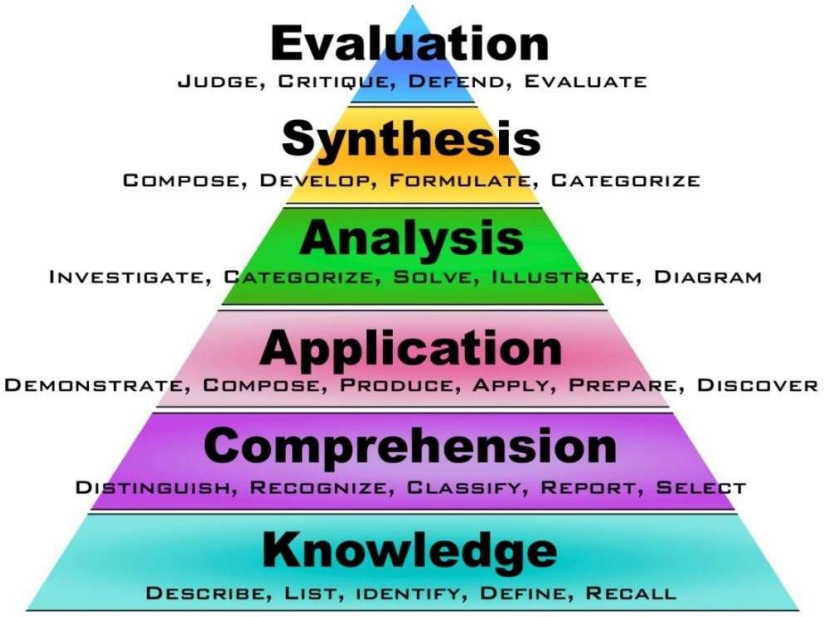

Figure B.2.2.2b: Bloom's Taxonomy Pyramid

- **The questions asked are of three categories:**

1) Approximately one third of the questions is of elementary level and can be answered by an average student, which require fundamentals of the course.
2) Approximate one third of the questions need analysis and use of content covered as per syllabus.
3) Remaining one third of the questions are based on advanced level. The solution of these questions/problems requires certain amount of critical thinking, analysis and knowledge.

MINOR EXAMINATION ANALYSIS/ QUESTION PAPER
Spring Semester (2019): Minor Examination

Subject: Energy Engineering (ChBC-64) **Maximum Marks: 30**
Answer all questions. **Time Allowed: 1h 30min**

CO1	Basic understanding about various energy sources and their significance with respect to energy and environmental sustainability.
CO2	Knowledge about the processing/generation of fuels and their significant characteristics for various applications.
CO3	Design of the systems for efficient fuel utilization and maximum recovery of heat
CO4	Understanding energy audits and management of the non conventional energy utilizing systems.

1. (a) A producer gas contains 8% CO_2; 1% C_2H_4; 15% CO; 5% CH_4; 12% H_2; 5% 0_2 and 54% N_2 (volume). When it is burned with air, the products of combustion contain 10% CO_2, 1% CO, 8% O_2, and 81% N_2. Calculate
   i. Volume ratio of air supplied to the producer gas burnt assuming both are at the same temperature and pressure
   ii. %excess air used. — 06 CO2

   (b) Explain the various steps involved in production of producer gas. — 04 CO2

2. (a) What are the various drives involved in petroleum recovery? — 04 CO1

   (b) A byproduct coke oven produces 10,000 m^3 of gases per hour having the following analysis by volume: C_6H_6= 5%; C_7H_8=5%; CH_4=40%; CO=7%; H_2=35%; CO_2=5%; N_2=3%. The gases leaving the oven at 2 atm pressure at 350 ^{0}C. After cooling to 50^{0}C, benzene and toluene are completely removed by condensation. Calculate
   i. Average molecular weight of the gases leaving the oven and the condenser
   ii. Weight of gases leaving the oven and condenser
   iii. Volumetric composition of gases leaving the condenser
   iv. Weight of benzene and toluene condensed. — 06 CO2

3. (a) Differentiate between fluidized bed combustion and fixed bed combustion. — 03 CO1

   (b) In petroleum refining, differentiate between atmospheric residue and vacuum residue. — 03 CO1

   (c) Briefly describe the methods of production of acetylene. — 04 CO1

ASSIGNMENT: 1

CO1	Basic understanding about various energy sources and their significance with respect to energy and environmental sustainability.
CO2	Knowledge about the processing/generation of fuels and their significant characteristics for various applications.
CO3	Design of the systems for efficient fuel utilization and maximum recovery of heat
CO4	Understanding energy audits and management of the non conventional energy utilizing systems.

CO1: Project on most environmentally sustainable energy source: case study.
CO2, CO4: Explain nanotechnology energy and its significance.
CO3: Design a system for best recovery of waste heat from chemical and metallurgical processes.

MAJOR EXAMINATION ANALYSIS/ QUESTION PAPER
Spring Semester (2019): Major Examination

Subject: Energy Engineering (ChBC-64) **Maximum Marks: 60**
Answer any four questions. **Time Allowed: 3 h**

CO1	Basic understanding about various energy sources and their significance with respect to energy and environmental sustainability.
CO2	Knowledge about the processing/generation of fuels and their significant characteristics for various applications.
CO3	Design of the systems for efficient fuel utilization and maximum recovery of heat
CO4	Understanding energy audits and management of the non conventional energy utilizing systems.

1. (a) Describe the three types of geothermal power plants and state the advantages and disadvantages of each. 06 (CO1)
   (b) What is an energy audit report and its principle? Explain in brief the two main classifications of energy audit reports. 05 (CO4)
   (c) Describe the two commercial coke making processes. 04 (CO2)
2. (a) When pure carbon is burnt in air, some of it is oxidized to CO_2 and CO. If the ratio of N_2 to O_2 is 7.18 and the ratio of CO to CO_2 is 2, what is the percentage of excess air used. Exit gases contain only N_2, O_2, CO and CO_2. 06 (CO3)
   (b) Discuss the working principle of a pressurized nuclear water reactor. 05 (CO3)
   (c) Define the following:
      i. Flash point
      ii. Fire point
      iii. Pour point
      iv. Char value
      04 (CO2)
3. (a) Write down the principles, construction and the working of the solar cell. State the various generations of solar cells. 05 (CO3)
   (b) Describe with the help of diagram, the differences between a rotary cup burner and a swirling burner. 04 (CO3)
   (c) Write a short note on wind energy. Discuss the various advantages and disadvantages of wind generated electricity. 04 (CO1)

(d) Write down the Boudouard reaction and the Neumann reversal reaction. 02 (CO1)

4. (a) Write down the various methods of production of acetylene gas. Write down the industrial applications and advantages of using acetylene gas. 05 (CO3)

(b) Identify the major setbacks for utilizing nuclear fusion reactions as an alternative energy source. 05 (CO4)

(c) Thoroughly explain the production of hydrogen gas by steam reforming method. 05 (CO3)

5. (a) Discuss the production and composition of water gas. 05 (CO2)

(b) Design a biogas plant for a small dairy of 90 grown up cows and 40 calves. The following data are available for the design:

i. Average gobar available/cattle/day= 10 kg
ii. Average biogas available/kg gobar/day= 0.03 m^3
iii. Average percentage of solid in gobar= 18
iv. The bulk density of gobar, 1,130 kg/m^3
v. The maximum allowable capacity of a digester for a small plant=50 m^3
vi. Optimum ratio of gobar to water in the slurry=1:1

Calculate the following:

a) Height and diameter of the digester
b) Height and diameter of the gas holder and purifier 10
c) Dimension of the slurry mixing tank. (CO3)

MID-TERM EXAMINATION, SEPTEMBER 2018
MATERIAL AND ENERGY BALANCE ChBC-32
Class:3rd Max. Marks: 30

Qn .No.	Blooms Taxonomy	CO	Questions
1	Comprehension Knowledge	CO1	A gaseous mixture has following composition (By Volume); Methane 80 %, Ethane 10 %, Chlorine 8 % and Nitrogen 2 %. Find ; i) Composition in mole % ii) Composition in wt. % iii) Average molecular wt. iv) Density (Kg/m^3) at STP and at 30 ^{0}C and 740 mmHg. Specific Gravity at STP and at 30 ^{0}C and 740 mmHg (Given composition of air by vol. 21% O_2 and 79 % N_2).
2	Knowledge Application Evaluate	CO2	Convert 600 ft-lb_f/s into HP
3	Application	CO2	The efficiency **η** of a fan depends upon density **ρ** and viscosity **μ** of fluid, angular velocity **ω** and diameter **D** of rotor and fluid discharge **Q** .Express **η** in terms of dimensionless parameters .Use Buckingham's pi theorem.
5	Knowledge Application	CO1	Discuss the importance and formulation of material balance calculations with reference to a cement plant.

END TERM EXAMINATION, NOVEMBER 2018
MATERIAL AND ENERGY BALANCE ChBC-32
Class: 3rd Max. Marks: 60

Qn .No.	Blooms Taxonomy	CO	Questions
1	Knowledge	CO1	Write the steps to be followed in material balance calculations.
2	Knowledge Application	CO1	A gaseous mixture has following composition (By Volume); Methane 80%, Ethane 6 %, Propane 8 % and Nitrogen 6 %. Find ; Composition in wt. % Average molecular wt. Density in Kg/m^3 at STP. Density in Kg/m^3 at 30 ^0C and 740 mmHg.
3	Knowledge Application	CO2	What is the criterion of selection of repeating variables in Buckingham Pi Theorem?
4	Comprehension Application	CO3	An aqueous solution of Na_2CO_3 (Mol wt. 106) is containing 25 % carbonate by weight .90 % of carbonate is recovered as $Na_2CO_3.10 H_2O$ by evaporation of water and subsequent cooling to 278 K. The solubility of Na_2CO_3 at 278 Kis 9.5 kg. Na_2CO_3 per 100 Kg. of water. On basis of 100 Kg. of solution treated. Determine the following a. Quantity of crystals formed b. Amount of water evaporated c. Amount of mother liquor obtained.
5	Application	CO3	Draw schematic diagram of a triple effect evaporator and write the general material balance equations for this.
6	Comprehension	CO1	A combustible gaseous mixture has following composition by (wt. %);CO 25 %, CO_2 4 %, O_2 0.4 % and N_2 70.6 %.The gas is burned with 10 % excess air .If combustion is only 97% complete. Calculate; i) The composition in Vol. % of gaseous products formed per Kg of gas burned. ii) The composition in Wt. % of gaseous products formed per Kg of gas burned iii) Average molecular Wt. of product gaseous mixture.
7	Application	CO4	Show that under ideal conditions mole % of a gaseous mixture corresponds to Vol. %.
8	Application	CO2	Calculate the standard heat of formation of liquid Methanol ,given the standard heat of combustion of liquid Methanol is -726.55 kJ/mol and the standard heat of formation of gaseous CO_2 and liquid H_2O are respectively -393.51 and 285.84 kJ/mol.
9	Knowledge Comprehension	CO3 CO4	Write short notes upon the following; i) Specific heats of solids and liquids (Comparison) ii) Theoretical flame temperature(TFT) iii) Kopps Rule iv) Hess's Law of constant heat summation

Total CO attainment is calculated taking 40% of internal assessment and 60% of end term assessment and overall CO attained is the average of total attainment.

- Total Attainment = 0.4*(Internal Assessment) + 0.6*(End term Exam)
- Overall CO attainment for a particular course = Average of Total Attainment

Formula for calculation of PO attainment:

PO1 = Matrix product (Row of course attainment matrix and Column of that particular PO column of CO-PO matrix) / (No. of COs of that course * maximum PO attainment level).

e.gPO1 = (3*3+2.2*3+2.6*3+2.6*3+2.6*3)/ (6*3)

NOTE: The same formula has been used in criteria 3 for calculating the attainment values of POs.

Evaluation process: course work

Evaluation Process- Class test/ mid-term test schedules and procedures for systematic evaluation, internal assessments.

Assessment is based upon the efficacy process being followed.

Evaluation process and test schedules are all followed and monitored in accordance to the guidelines of academic section of the Institute as follows.

Mid term	Assignment	End semester exam	Grand total
30	10	60	100

But for the academic year 2019-2020 it had been differed due to abrogation of Article 370 and subsequent COVID-19 lockdown, the following evaluation schemes were adopted.

Autumn 2019:

Assignment	End semester exam	Grand total
10	90	100

Spring 2020:

Maximum SGPA in Previous Semesters	Assignments as Mid Term Examination	Comprehensive Viva-Voce Examination	Grand total
30	30	40	100

Grading criteria (Absolute Values)

A+	A	B+	B	C+	C	D
>90	81-90	71-80	61-70	51-60	40-50	<40

Seminar and Presentation Evaluation

Assessment is based upon the methodology being followed and its effectiveness

A group of teachers along with Seminar coordinator evaluate the performance of students based on their presentation and viva-voce examination as per below format.

S. No.	Student Name	Seminar Report (40)	PPT Preparation (20)	Viva and Presentation (40)	Total Marks (100)	Grade

Mechanism for addressing evaluation related grievances

Assessment is based upon the efficiency of the mechanism being followed.

- A transparent evaluation mechanism is followed as the answer sheets of mid-term examinations are shown to the students one week after the exam (date as mentioned in the institute academic calendar).
- The grades are displayed on the notice board prior to its finalization and submission to the controller of examination.

2.2.3 Quality of student projects (20) **Claimed 17**

A. Process for identification of students projects

The process for project identification by students, guide allotment, continuous monitoring and evaluation are elaborated as:

B. Identification of projects and allocation methodology to Faculty Members

- The department assigns the job of monitoring of students projects to one of the senior faculty member known as project coordinator.
- The student's project activity starts at the commencement of the 7th semester.
- Students are divided into groups of maximum of 3 students.
- The students choose their supervisor and topic as per their field of interest so that the students explore their talent.
- There is no compulsion at the departmental level regarding the choice of supervisor or topic, however sometimes project coordinator may change the topic and assign new supervisor to balance out the project load among all the faculty members of the Department.
- This students frame the groups having the similar interests.
- The project proposal is submitted to the prospective supervisor for his perusal. Depending upon the feasibility of the proposal it is further submitted to the project coordinator for approval. The proposal includes a summary and the breakup of the cost of project.
- After Project coordinator's approval, the students start the literature survey to clearly define the problem and design of the project.

Project COs

CO1	Apply the knowledge of chemical engineering to design or fabricate a system.
CO2	Identify chemical engineering research problems.
CO3	Apply knowledge of chemical engineering to solve energy and environmental problem.
CO4	Ability to write a research proposal.

The project proposal is evaluated as per the following scheme:

Criteria	Marks
Project Report	50
External Viva	25
Presentation	25
Total	**100**
Project Evaluation Committee Criteria Marks Awarded	

Table B.2.2.3a: Process for Continuous Monitoring of Student Projects

Students are directed to maintain a project diary to record the activities on day to day basis regarding the project work. The record includes the details of their interactions with the project supervisor. The Project evaluation committee and the project guide together analyzes the nature of the project during the different stages of evaluation and make sure that the work is environment friendly, ensures safety, ethics and is cost effective.

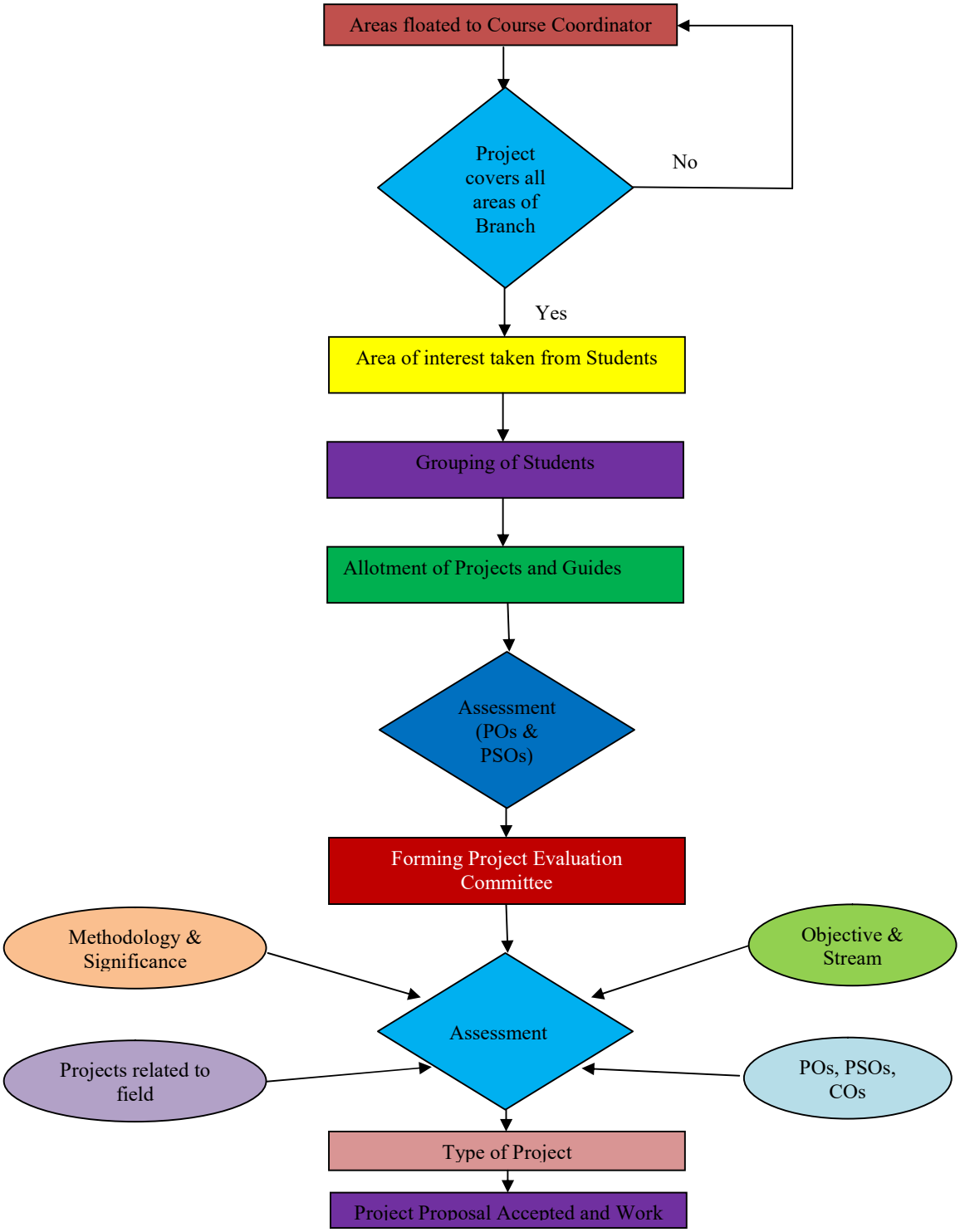

Figure B.2.2.3a: Flow Diagram of Project Report

C. Process to ensure the quality of student projects

- The Project evaluation committee and the project guide together will analyze the nature of the project during the different stages of evaluation and make sure that the work is environment friendly, ensures safety, ethics and is cost effective.
- The projects are classified into different areas and their relevance to PO's and PSO's are identified to ensure its quality.

D. Process for Evaluation and Monitoring

To ensure the foolproof monitoring and evaluation of the Student projects following is done:

- The project work is divided into small components.
- Each component of the work is assigned to each student in the group.
- The supervisor maintains a diary regarding the work carried out by the students working under him.
- The supervisor interacts periodically usually after 1 week with the students to determine the progress and to evaluate the contribution of each student.

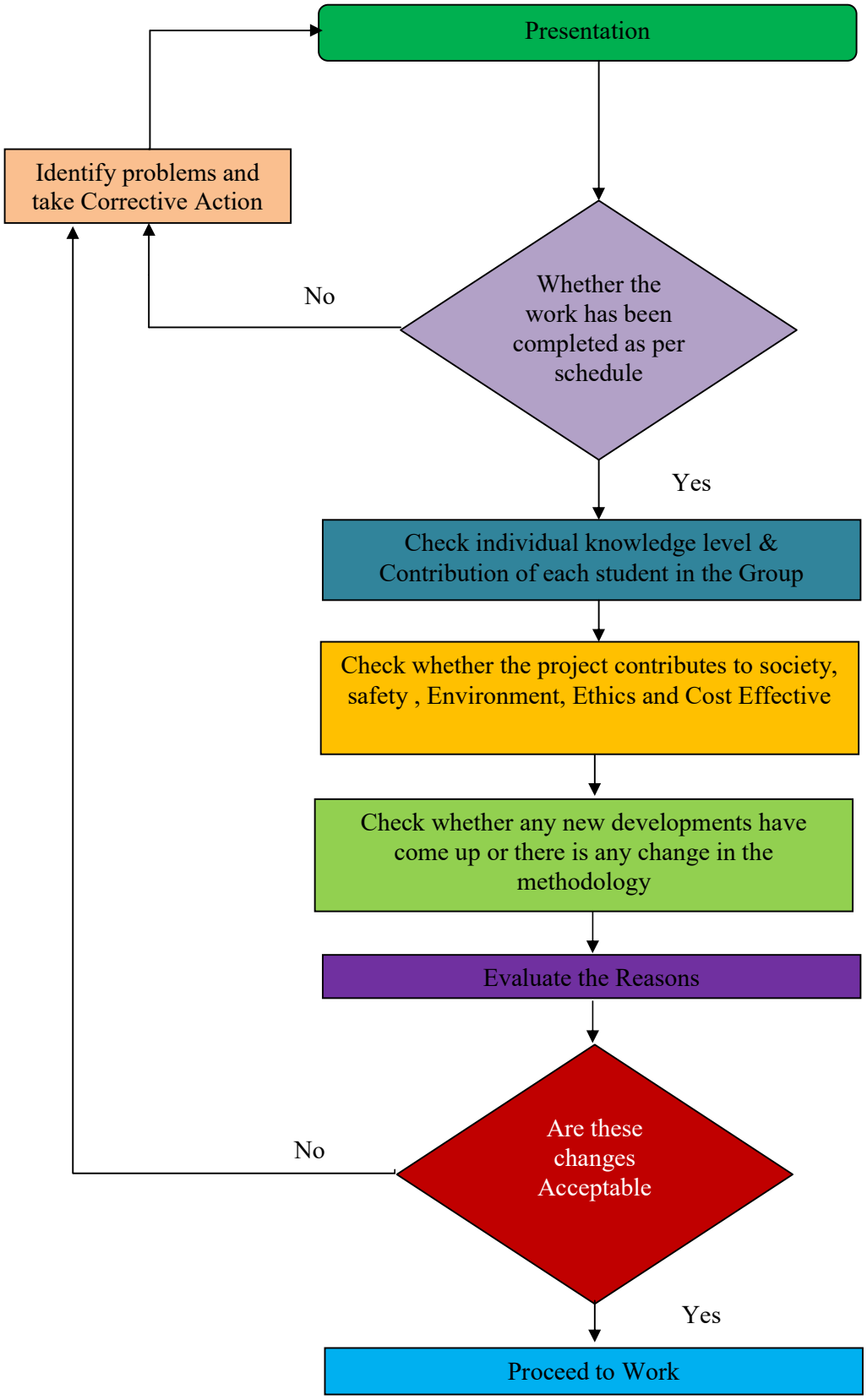

Figure B.2.2.3b: Process for Monitoring of the Student Project

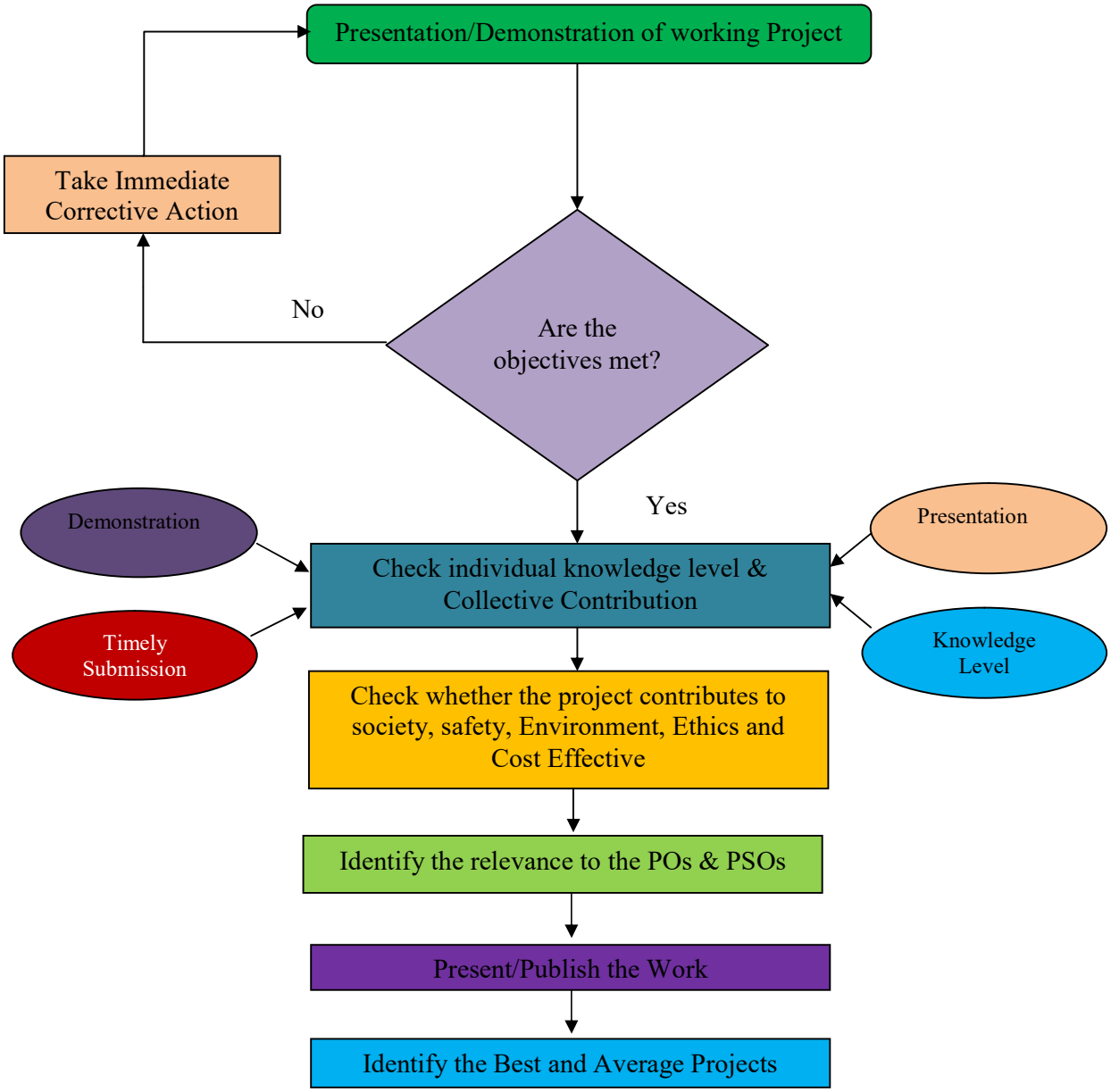

Figure B.2.2.3c: Evaluation Process of the Student Project

- Members of the project group prepare and submit their report.
- The report records all aspects of the work, highlighting all the problems faced and the approach/method employed to solve such problems.

E. Project Related to Industry

There were no projects related to industry.

F. Process of Evaluation

- The Departmental project evaluation committee meets twice in the 7th and 8th semesters to assess the progress of the projects.
- The departmental Project evaluation committee and the project guide together will analyze the nature of the project during the different stages of evaluation and make sure that the work is environment friendly, ensures safety, ethics and is cost effective.
- Students, with the help of project guide should publish their work in relevant journals.

G. Process to assess Individual and Team Performance

As has been stated above, the students remain in constant touch with the supervisor. During their interaction the supervisors enquire from the group members about the progress of the work. This process helps the supervisor to determine the performance of the individual and the team. The students are awarded marks based on participation during the sessions with the supervisor so that none of the students lag behind and can perform well both individually and on a team scale. Individual learning and performance is assessed in the following ways-

- Some faculty members add an individual component to group projects (e.g., a short essay, journal entries); some combine a group project with an individual test or quiz. Both group and individual performance are then reflected in the total project grade (e.g., some faculty members make the group grade worth 50% and the individual grade worth 50%; others split it 80%/20%. There's no perfect breakdown, but the grading scheme reflects goals for student learning.

H. Quality of Completed Projects/Working Prototypes

To ensure the quality of the student projects, following steps are taken at the Departmental level:

- A departmental committee is constituted comprising of all supervisors as members and HOD as chairman. At the end of 7th semester students are advised to present the work completed so far in front of the committee. This work is evaluated for one credit point.
- Each group presents the content of work they have completed by PPT. The presentation is followed by the question-answer session. Based on the question answer session marks are awarded to the students.
- The committee also advises the students regarding the deficiencies or modifications in the project and accordingly the students incorporate the possible changes in their project work.
- The final exam of the project work is held at the end of the 8th semester.
- A committee constituted by the HOD and approved by the director, comprising of the departmental members, an external member of the sister department (nominated by the director) and HOD as chairman examines project.

- A presentation is given by the students one by one in the group in front of the committee which is followed by the question - answer session and the examination of the prototype developed.
- The committee members record the marks awarded to each student which are then submitted to the HOD and final award is arrived at after adding the awards recorded by project coordinator during midterm evaluation.

List of good major projects for the academic years along with their relevance to the Pos and PSOs , Safety , Environment and Cost is shown in **Table B.2.2.3b:**

S. No.	Project Title	Project	Area	Contribution	Relevance to POs and PSOs	ENVIRONM	SAFETY	ETHICS	COST
1.	Modelling of Methanol Crossover In DMFC	Good	Fuel cells	• A mathematical model for methanol crossover of direct methanol fuel cell (DMFC) is presented. • The activity of the proton generation reaction of methanol becomes low and the DMFC performance reduces in the high current density region because the concentration of methanol solution of 1M is too low.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO12, PSO1, PSO2, PSO3.	Y	Y	Y	Y
2.	Production of 100 Tons Per Day of Pure Hydrogen Gas From Refinery Off Gas Stream	Good	Energy	Technology of production of pure hydrogen gas from refinery off gas stream Simulation of production process	PO1, PO2, PO3, PO4, PO5, PO6,, PO9, PO10, PO12	N	Y	N	Y

3.	Effect on Mixing of Fluid Streams in a Micro Channel	Good	Microchannels	• Numerical analysis has been carried out to investigate the effect on mixing of the position of the fluid stream interfaces in a rectangular microchannel. Both single- and two interface fluid streams have been considered for study at various Reynolds numbers • Design of microfluidic devices studies includes, understanding the effect of mixing in micromixers and the mechanism of the mixing of fluid streams.	PO1, PO2,PO3, PO4,PO5, PO7, PO9, PO10, PO12	Y	Y	N	Y
4.	Preparation and characterization of acetalized poly (vinyl alcohol) based hybrid organic-inorganic Nano composite polymer membrane embedded with SiO_2 nanoparticles	Good	Membrane science	• Acetalized PVA based membrane incorporated with silica nano particles was successfully prepared. • The acetalization of the membrane and incorporation of silica promises better membrane stabilities. Such membranes could be industrially very useful for the separation of the effluents like surfactants and dyes in high temperature and variable PH feeds.	PO1, PO2, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y

5.	Fouling of cation exchange membrane	Good	Ion Exchange Membranes	• Fouled membranes such as selemion CMV and Ralex CMH membranes were treated with acid (HCl and H_2SO_4 • Results showed that right conc of HCl serves good agent for removing foulants from the membrane.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y
6.	Development of ion exchange membranes ZrW/PVA and SnP/PVA for Direct methanol fuel cell.	Good	Membrane and Material	• Cation exchange membranes were successfully prepared by incorporating Inorganic material into polymeric matrix. • Electrochemical properties such as transport number, ion exchange capacity and proton conductivity were determined.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y
7.	Production of bio diesel from sun flower seeds	Good	Energy	• Physicochemical characterization may be useful in extraction of bio diesel from the sunflower seed.	PO1, PO2, PO3, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y
8.	Modelling and simulation of sorbose production by fermentation.	Good	Biochemical	• Identification of the mathematical representation of the process which may be helpful for bioprocess development on sorbose production by fermentation.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y
9.	Modelling of pyrolysis of biomass	Good	Biomass conversion	• Characterization techniques studied. • Kinetic parameters evaluation through various models.	PO1, PO2, PO3, PO5, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y

10.	Characterization of locally available biomass	Good	Energy	• Characterization of biomass may be helpful in utilization of the locally available biomass wastes such as walnut shells for energy generation.	PO1, PO2, PO6, PO7, PO9, PO10, PO12	Y	Y	Y	Y
11.	Brand analysis of various cements in the state of J&K (India)	Good	Environmental Engg.	• Quality assessment of various brands of cement (OPC-43 grade) available in J&K. • Quality assessment facility for cement, developed in the lab (analytical).	PO1, PO2, PO6, PO7, PO8, PO9, PO10, PO12	Y	Y	Y	Y
12.	Power law fluid flow and heat transfer around a circular cylinder in laminar flow regime.	Good	Computational fluid	• Covers wall effect on the steady forced convection heat transfer characteristics of incompressible power law fluids from an isothermal circular cylinder. • All engineering parameters like drag coefficients, Nusselt number etc. have been studied.	PO1, PO2, PO4, PO6, PO9, PO10, PO12	Y	Y	Y	Y
13.	Isobaric vapor liquid equilibrium data of binary mixture	Good	Multiphase	• Data was generated for o-xylene and p-xylene that will be helpful for the separation of O-xylene and p-xylene.	PO1, PO2, PO4, PO6, PO9, PO10, PO12	Y	Y	Y	Y
14.	Water pollution modelling of dal lake using QUAL2K	Good	Environmental engineering	• QUAL2K model for river and water quality was applied to predict the water quality and environmental capacity of Dal Lake. • Results showed that NH3-N, TN and TP pollution loads of river needs to be reduced by certain amount (percentage) to satisfy the water quality objectives.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO12	Y	Y	Y	Y

15.	Enhancement of heat transfer in helical coil heat transfer using nano fluids	Good	Heat transfer	• Heat transfer is enhanced using nano fluids in the helical coil heat exchanger. • Various parameters like Nusselt number, friction factor, pressure drop characteristics and performance was standard	PO1, PO2, PO3, PO4, PO6, PO9, PO10, PO12	Y	Y	Y	Y
16.	Hydrothermal carbonization of PotamogetonCrispus into solid fuel	Good	Energy	• Weed from Dal Lake was subjected to high thermal carbonization to form solid biofuel known as hydro char. • Biofuel has huge potential to serve as an alternative fuel.	PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO12	Y	Y	Y	Y
17.	Characterization of Almond Hulls	Good	Bio resource Technology	The proximate and ultimate analysis was encouraging for thermo chemical conversion. The thermal degradation behaviour was studied using thermo-gravimetric analysis. The functional characterization of almond hull was carried out using FTIR. Scanning electron microscopy analysis indicated the rough, fibrous texture and heterogeneous structures of biomass. Further, the X-ray diffraction analysis showed the crystalline structure. Presence of fermentable sugars was also confirmed by XRD and FTIR. The characterization revealed that almond hulls may be used as a potential candidate for energy generation through thermo-chemical conversion processes.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO12 PSO1, PSO2, PSO3	Y	Y	Y	Y

Table B.2.2.3b: Types and relevance of the projects and their contribution towards the attainment of POs and PSOs

I. Evidences of Papers Published /Awards Received by Projects etc.

S.No.	Name of the Journal	Students	Paper Title	Guide
1.	Journal of Energy Research and Environmental Technology	Aqib Ashraf, Aamir Suhail Khatana, Hindaal Mustafa	Modification of CO_2 Capture Techniques by Carbon Nanotubes: A Review Volume 5, Issue 3, pp 86-88, 2018	Dr. Malik Parvez Ahmad

Table B.2.2.3c

2.2.4 Initiatives related to industry interaction (10)

Claimed 8

Industry Institute interaction continuously supply input to better teaching-learning processes, create awareness of industrial environment among the students, provide real practical knowledge to students and may boost self-confidence for some to even become entrepreneurs.

A. Industry supported laboratories

There is no lab supported by industry.

B. Industry involvement in the program design and Curriculum

As has been stated in the process for designing the program curriculum (2.1.1) an important feedback is sought from industry where the students get employed so that the performance of the students is enquired. Depending upon the performance as revealed by the feedback of the employer necessary changes are made in the curriculum
In light of the vision and mission of the department, industry involvement in the program design and curriculum are based on following surveys-

Chemical Engineering Department **National Institute of Technology, Srinagar** **INDUSTRY FEEEDBACK FOR CURRUCULAM DESIGN**	
The purpose of this survey is to obtain Employer's input on the quality of education of undergraduate programs in NIT, Srinagar. Your sincere cooperation would enable us to improve the quality of our graduates as per your requirements	
Name of Company/ Organization	

Mailing address			
Sector Private/Public/Academia			
What are the pertinent employability skills to stay updated in current industry trends and thereby improve the quality of the undergraduate program?	Logical Thinking	Good Aptitude	Excellent Communication

Rate NIT Srinagar Graduates working in your organization using the following criterion.
Put tick mark Knowledge, Skills, Abilities, Attitude and other Attributes expected out of NIT Srinagar graduates.

No.	**Overall, are you satisfied with**	**Excellent (3)**	**Good (2)**	**Satisfied (1)**
1	Capacity for development and analysis of engineering problems and formulation of appropriate solutions, retaining professional and ethical responsibilities.			
2	Aptitude for self education, ability to learn new skills and a clear appreciation for the value of life-long learning to update professional knowledge.			
3	Understanding professional engineering solutions for sustainable development and their application in global, national and societal contexts.			
4	Competence for acquiring new skills and applying them in research and development.			
5	Fundamental knowledge in mathematics and electronics science and professional fluency in English both communicative and technical forms.			
6	Dexterity in differentiation of management techniques and possession of leadership skills that enable successful function of multi-disciplinary teams.			

C. Industry involvement in partial delivery of any regular courses for students

To promote good Institute-Industry Interaction for our Institute, following schemes have been undertaken.

- Providing industrial training and other inputs to teaching-learning processes so as to develop awareness about the job functions in the industry among students.
- Arranging visits for students to various industries.
- Engineers from industry to deliver lectures.

Organizing workshops by Industry/Institute Experts summarized in Table B.2.2.4a:

Sl. No.	Venue	Domain Area of Curriculum Covered	Topic	Resource Person	Designation
1.	Hi-Tech Room	Environmental engineering	Environmental issues	Mr. Kaisar Parvaiz	General manager (J&K cement industry)
2.	Hi-Tech Room	Energy and Environmental Eng.	Microalgae based industrial effluent treatment and restoration of polluted water	Dr.V. Sivasubramanian	Director, PERC, Chennai
3.	Hi-Tech Room	Fuels	Alternative fuels- future perspectives	Dr. V.C. Srivastava	IITRoorkee (Chemical Eng.)
4.	Hi-Tech Room	Fuels	Plasma Technology for Biomass	Dr. Vimal Kumar	IITRoorkee (Chemical Eng.)
5.	Hi-Tech Room	Environmental	Dal is calling	Dr. ShafiqaPir	Technical Officer LAWDA
6.	Hi-Tech Room	Energy	Bio Diesel	Dr. Anantharanman	NIT Trichy
7.	Hi-Tech Room	Refinery	Petroleum Refinery	Er. Junaid Ashraf Shah	Production Engr. IOCLHaldia Refinery

Table B.2.2.4a

D. Impact analysis of industry institute interaction and actions taken thereof

- Interaction between the student and the industry improves upon the attitude, knowledge and skills, such as to fit any desirable organization in the future.
- The ability to apply engineering knowledge is improved by the internship program since it provides a platform to apply theoretical knowledge learned in the classroom practically.

- Practical knowledge is improved, which in turn helps to elevate their career opportunities.
- Placement opportunities are improved.
- The effectiveness of this practice can be gauged by the great response of the participants for the workshops.
- The feedback is obtained from the students at the end of 8th semester to assess the achievement of the objectives of the industrial training/ summer training/internship/ industrial tour.

2.2.5 Initiatives related to industry internship/summer training (10) **Claimed 10**

A. Objectives

- Internship is introduced to expose students to practical working environment
- It exposes the students with industrial /real time problems.
- It helps the students in solving/understanding real-life problems through application of engineering analysis, design, evaluation and creation.
- It changes the behavioural aspects of student to better cope with industrial environment.
- It provides a good platform for job training and develops a network for students which can be useful in enhancing their career prospects.

B. Initiatives

- Identification of relevant Chemical Engineering industries by communicating with the companies through stake holders.
- Inviting the companies for internship cum placement drive.
- Orientation by HOD and directorate of Internships before sending students to various industries.
- Distribution of Internship manuals and Internship Allotment orders to the students.

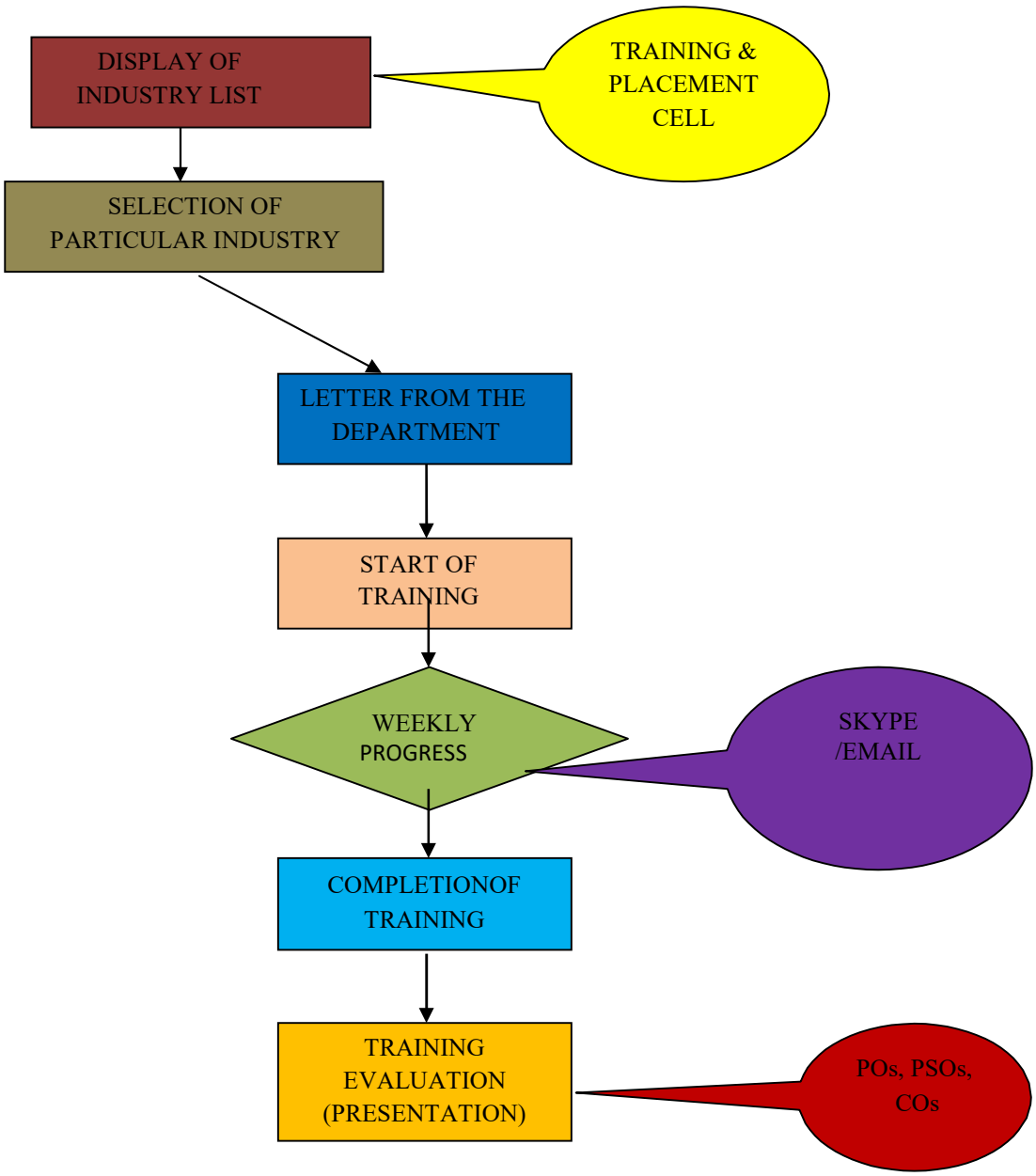

Figure B.2.2.5a: Industrial Training Process

C. Industrial training/tours for students

The faculties of the Department constantly try to interact with industries like BARC, JK Cements and Khyber Cements Khonmoh etc. for industrial visits of the students.

D. Industrial/internship/summer training of more than two weeks and post training Assessment

The main objective of interaction between the industry and institute is to improve the quality of technical education adequately to meet the needs of the industry and economy. Internships offer students a practical experience in the industry relating to the field of study. The bridge between industry and academic institute prepare engineering students for jobs in multinational companies by exposing them to new technology and engineering methodologies.
Some of the interactions are listed below:

- All the students have to undergo a six week industrial training before 6th semester.

2017-2021 Batch				
Sl. No.	**Name of Student**	**Area of Training**	**Name of Industry**	**Duration**
1.	Sandeep Singh Tomar	Drilling of coal Bed Methane	ONGC	30 Days
2.	Rajeev Kumar	Pollution Control Research Institute (PCRI)	Bharat Heavy Electricals Limited, Haridwar	30 Days
3.	Abhishek Verma	Testing of Petroleum products.	IOCL	56 Days
4.	Sobiya Ashraf	Manufacturing of cement.	Jammu and Kashmir Cements Limited	28 Days
5.	Berjees Naseer Ahangar	Entire process	Trumboo Cement Industries (TCI)	30 Days
6.	Kanak Garg	General Management and Food Quality Check	Nestle India Pvt. Ltd.	31 Days
7.	Yenugula David Venkat	Refinery and Petrochemical Engineering	Indian Institute of Chemical Engineers(IIChE)	30 Days
8.	Himanshu Kumar	Production	IOCL Barauni Refinery	31 Days

		Department		
9.	Manu Dogra	Chemical Engineering Division & Current Good Manufacturing Pilot Plant (cGMP)	Indian Institute of Integrative Medicine,(Council of Scientific and Industrial Research) Canal Road, Jammu (CSIR-IIIM Jammu)	31 Days
10.	Debasmita Mondal	Metlab	ALTCC GAZIABAD	21 Days
11.	Himani Bhagat	Jammu	LPG bottling plant-IOCL	42 Days
12.	Lavanya Rajoria	FABRICATION DEPARTMENT	BHARAT ELECTRONICS LIMITED	28 Days
13.	Akash Kumar	water treatment	UPRVNL	28 days
14.	Abhishek Bharati	High density polyethylene and linear low density polyethylene	GAIL	28 Days
15.	Vangara Pavan Kumar	emulsion polymerization in micro-reactors and CFD	CSIR-IICT HYDERABAD	60 Days
16.	Amoldip Singh Narang	HVAC and Research and development	Bharat Petroleum Corporation	30 Days
17.	Mohd Zakariya Farooqi	Research Intern	Indian Institute of Technology Delhi	40 Days
18.	Pramod Kumar	Air ,water and soil analysis	BHEL HARIDWAR	28 Days

19.	Ashish Kumar Jha	Air, water and soil analysis	Pollution Control Research Institute, BHEL, Haridwar	30 Days
20.	Junaid Farooq	Pulwama	JKCEMENTS	30 Days
21.	Suhail Kumar	Air, water and soil analysis	BHEL HARIDWAR	30 Days
22.	Shivam Spolia	Air,Water &Soil analysis	B.H.E.L	31 Days
23.	Sachi Singh	Jharkhand,Bokaro	SAIL,steel authority of india limited.	28 Days
24.	Junaid Farooq Pandit	Cement production process	JKCEMENTS	56 Days
25.	Manish Saini	Gas Cracker Unit	GAIL AURAIYA U.P.	28 Days
26.	Sachi Singh	Jharkhand,bokaro Bihar,kahalgaon	SAIL NTPC	28 Days 30 Days
27.	Poornima Gupta	Product department	IOCL Barauni Refinery Bihar	30 Days
28.	Sharyar Jeelani	Foods and Beverages	FIL Industries Private Limited	30 Days
29.	Anand Dadoriya	GPU(GAS PROCESSING UNIT)	GAIL(India) Limited	28 Days
30.	Vikas Kumar	air water and soil analysis	bharat heavy electricals limited haridwar	28 Days
31.	Yawar Ahmad Sheikh	Industrial Training Programme	ALTTC Ghaziabad	28 Days
32.	Anshika	Chemical	BSNL Ghaziabad	28 Days
33.	Yasmeena Ashraf	Whole industry	FIL industries limited	30 Days

34.	Imtiyaz Zahoor	Cement manufacturing	JK CEMENTS LTD. , FIL INDUSTRIES	30 Days 30 Days
35.	Pritee Kumari	Production	Indian Oil Corporation Limited	28 Days
36.	Imtiyaz Hussain	Ghaziabad, UP	ALTTC Ghaziabad	28 Days

Table B.2.2.5a: Details of Industrial Training attended by Students for year 2019-2020

2016-2020Batch				
Sl. No.	**Name of Student**	**Area of Training**	**Name of Industry**	**Duration**
1	Nikhil Singh Pradeep Manhas	Coke Oven Gas	Rourkela steel plant, SAIL	15 Days
2	Siddharta Gupta		HAL, Lucknow	30 Days
3	Juwala Kumar Siddharta Gupta Ravi Verma AmanThapa Mir FazaL	Ammonia production plant	NFL, Nangal	30 Days
4	Jai Prakash Singh	Ethanol production from molasses	Indian Glycol Ltd, Kashipur, Uttarakhand	35 Days
5	Ashish Raina Nikhil Singh	AVU, FCCU, VBU, CCRU	IOCL Mathura	29 Days
6	AyehsaGupata	Petroleum Industry (R&D)	IOCL, Boroni	28 Days
7	Neeraj Kumar Ashish rana	Adhesive	Adhesive Pedilite, Himachal Pradesh	30 Days

8.	ShehlaNazir	R&D	FIL Industries Ltd, Rangreth	30 Days
9.	Deepesh Kumar Haroon Rashid Muneeb Bashir	Field Orientation and GSUA optimization	ONGC, Gujarat	30 Days
10.	ShubhamSinghal Akash Thakur	Ion exchanger resin	DRDO, Jodhpur	30 Days
11.	Madihafarooq	R&D	FIL Industries Ltd, Rangreth	60 Days
12.	MeenakshiBaghat Shah Siamoon Illyas Bashir	Agrochemicals	Saraswati Agrochemicals, Jammu	30 Days

Table-B.2.2.5b: Details of Industrial Training attended by Students for year 2018-2019

2015-2019 Batch				
Sl. No.	**Name of Student**	**Area of Training**	**Name of Industry**	**Duration**
1	Nikhil Sangwal Syed Faizan AsrarRahmat Naveed Ahsan Mir Shifayat Vishnu Zahid Akbar Aadil Hamid AnshulRasyotra Lalit Yadav Kunnal Gupta Dawood Rashid Midhat Yassin Syed Humayoun	Petroleum Industry	ONGC, Surat	30 Days
2	Deepak Pingal	Petroleum Industry	ONGC, Gujarat	25 Days
3	Maida Lateef	Cement Industry	Jammu & Kashmir	30 Days

	Amina SabbahGuljan Aaqib Ashraf		Cement Industry	
4	Shriyansh Rahul Kumar	Petroleum Industry	IOCL BarauniRefinery	28 Days
5	Abhishek Vishnu Kumar Ahmad Ali	Petroleum Industry	IOCL BarauniRefinery	29 Days
6	Anish Singh ShubhamMalav Amit Pratap PashupatModgil	Petroleum Industry (R&D)	ONGC, Ahmedabad	26 Days
7	HafeezHackla AamirSuhail LalitBasotra	Petroleum Industry	ONGC, Panvel	32 Days
8.	Pankaj Sonkar	Academic Institute	IIT, Kanpur	40 Days
9.	AmanKundal Nishant Sharma Abdul Muqsit Vineet Kumar ManikLamba	Fertilizer	National Fertilizer Limited, Punjab	30 Days
10.	Alok Kumar Vishnoi	Energy	BARC Mumbai	57 Days
11.	Pradyuman Singh	Uflex	Uflex	28 Days
12.	Dheeraj Sharma Rishi Pal Pankaj Kumar	Energy	ONGC, Dehradun	40 Days
13.	KapilVerma Gaurav Meena Ravi Kumar	Energy	ONGC, Jaipur.	42 Days
14.	Vishal Panhotra	Research	Jammu Uni	30 Days
15.	Tanisha Mahajan	Research	IIT Delhi	62 Days
16.	Vivek Raj Nikhil Kumar	Energy	BARC Mumbai	90 Days
17.	Hindal Mustafa Abdul Bari	Cement Industry	J&K Cement Industry	30 Days

	AaqibMushtaq			
18.	KeshavKalsi	Petroleum Industry	ONGC, Mumbai	31 Days
	Shubham			
	UpkarKesar			
19.	Abhishek Thapa	Paint Industry	Berger	32 Days
20.	RuqaiyahKhurs heed	Food and Beverages	Fil Industries	31 Days

Table B.2.2.5c: Details of Industrial Training attended by Students for year 2017-2018

E. Impact Analysis of Industrial Training

The purpose of the industrial internship gets the students acquainted with the work culture of the companies and realizes the importance of team work while working within the framework to get a better insight into the practical aspects of the industry. Post training assessment of the practical training is evaluated at the end of the 6th semester, by a committee constituted by the HOD. It carries 2 credits. The students give a PPT wherein they give a detailed report of the work done. The presentation is followed by an interaction session. The students maintain a hard copy of the work done and is maintained in department as record. The credits are awarded based on the presentation, interaction and the practical training record. Moreover, at the end of industrial training, the students are provided with the feedback forms to rate their industrial training/internship such as to identify the level of achievement. The feedback is obtained from the students at the end of 6th semester to assess the achievement of the objectives of the industrial training/ summer training/internship/ industrial tour.

Feedback form for student's undergone industrial training

Name of the student: **Enrolment No. :**

Name of the industry:

Area in which the student has undergone training:

Did the student get hands on experience on the facilities in the plant?

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

Did you become aware of any new technologies in relation to what they have learnt in the corresponding subject? Yes/No

Were you able to analyze the facilities layout of the plant and could you suggest any improvement? Yes/No

How do you rank the working culture an atmosphere in the plant?

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

Based on the information obtained from the feedback forms the rating is done as

Year:			
Feedback (%)	No. of Students	Feedback (%)	No. of Students
41-50		71-80	
51-60		81-90	
61-70		91-100	

F. Student's feedback on initiative

The feedback is obtained from the students at the end of 6th semester to assess the achievement of the objectives of the industrial training/ summer training/internship/ industrial tour.

Feedback Form to Assess the Industrial Training

Name of the student: **Enrolment No. :**

1. Rank the departmental initiative about the seriousness regarding industrial training etc.

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

2. Did the faculty help you in choosing the proper industry

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

3. Rank the exposure to the practical working environment

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

4. Did you become aware about the practical aspects in the industry

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

5. Did you notice some interesting facts and new technologies adopted in the industry

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

6. Would you suggest your juniors to undergo training there

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐

7. Do you want to join this industry as a permanent employee

Excellent	☐	**Good**	☐	**Average**	☐	**Fair**	☐	**Poor**	☐