

Programme Template

1. Name of the Programme and Code	Dual Degree Programme: Bachelor of Technology and Master of Technology in Chemical Engineering, CH7
2. Degree (UG/PG)	UG+PG
3. Minimum Duration of the Programme (Specify for FT and PT, if applicable)	10 semesters
4. Maximum Duration of the Programme (Specify for FT and PT, if applicable)	14 semesters
5. Capacity (Max. Student Strength) of the Programme	46
6. Number of Regular Faculty Members Involved as Teaching Faculty in the Programme	All CH faculty members (28)
7. Minimum Credit Requirements for the Degree	184

8. Articulate the Program Learning Outcomes (PLO)

[For example see: Objectives vs. Outcomes and Student Outcomes]

A Dual Degree graduate in Chemical Engineering will

PLO1. Apply knowledge of basic science and engineering principles to analyze and solve chemical engineering challenges.

PLO2. Use contemporary engineering tools and methods necessary for safe practices in chemical engineering.

PLO3. Communicate effectively, embrace teamwork, and demonstrate integrity and leadership.

PLO4. Identify and analyze challenging problems and solutions that impact industries and society

PLO5. Apply chemical engineering principles and analytical skills to provide solutions to multidisciplinary problems, ensuring efficiency and sustainability.

PLO6. Apply advanced knowledge and research skills to develop innovative and sustainable solutions for evolving industrial and societal needs.

9. Map PLOs with Institute Learning Outcomes (ILOs) of the Degree

[Indicate '1' for weak, '2' for good, and '3' for excellent relation. Leave the cell blank to indicate no relation]

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
ILO1	2		3	2	1	
ILO2		1	3			3
ILO3	2	2		3	3	2
ILO4				2	3	3
ILO5	1	2			2	3

10. Number of non-Project Programme
Core Credits

68 (DC: 58, PC: 10)

11. Number of Programme Elective Credits

18 (DE: 6, PE: 12)

12. Number of Open Credits

9 (OC: 3, OE: 6)

13. Number of Project Core Credits

26

14. Details of Creative Expression and Ethical Reasoning (CEER) Component in the Programme [Only for UG]

Number of Credits Assigned	5
Courses Involved and Credits Accounted [e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]	1. CHL3008 Equipment and Plant Design (1 credit) 2. CHD7811 Cornerstone Project (1 credit) 3. CHD7814 Major Project Part-I (1 credit) 4. CHD7815 Major Project Part-II (1 credit) 5. MEP1000 Engineering Visualization (0.5 credits)

		6. MEP1001 Manufacturing for Product Innovation (0.5 credits)
15. Details of Emerging Trends (ETT) Component in the Programme [Only for UG]		
	Number of Credits Assigned	5
	Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	1. CHL1000 Introduction to Chemical Engineering (0.5 credit) 2. CHL3001 Data Analysis and Machine Learning in Process Systems (2 credits) 3. CHL2006 Biopharmaceutical Technology (1 credit) * CHL2007 Electrochemical Technology (1 credit) * CHL2008 Chemical Materials Technology (1 credit) * 4. CHL7004 Quality Management in Process Industries (1.5 credits) * Any ONE of the three courses
16. Details of Environment and Sustainability (E&S) Component in the Programme [Only for UG]		
	Number of Credits Assigned	6
	Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	1. CHL2005 Introduction to Chemical Reaction Engineering (0.5 credits) 2. CHL3005 Reaction Engineering for Environment and Sustainability (1.5 credits) 3. CHL3007 Process Technology and Economics (1 credit) 4. CHL2002 Chemical Engineering

		Thermodynamics (0.5 credit) 5. CHL3004 Mass Transfer Operations (0.5 credit) 6. CHL3003 Fluid Particle Mechanics (0.5 credit) 7. CHL2006 Biopharmaceutical Technology (0.5 credit) * CHL2007 Electrochemical Technology (0.5 credit) * CHL2008 Chemical Materials Technology (0.5 credit) * 8. CHL7003 Sustainable Process Engineering (0.5 credits) 9. CHL7005 Advanced Chemical Reaction Engineering (0.5 credits) * Any ONE of the three courses
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17. Details of Research/Technical Communication Component in the Programme [Only for PG]

Number of Credits Assigned	5
Courses Involved and Credits Accounted <i>[e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]</i>	1. CHD7811 Cornerstone Project (0.5 credits) 2. CHD7812 Minor Project (0.5 credits) [#] CHT7813 Summer Internship (0.5 credits) [#] 3. CHD7814 Major Project Part-I (1.5 credits) 4. CHD7815 Major Project Part-II (2.5 credits) [#] Any ONE of the two courses

5. Details of Professional Ethics Component in the Programme [Only for PG]

Number of Credits Assigned	1
Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	VEV739/VEV740 Special Module in Professional Ethics (1 credit) (subjected to the approval from NRCVEE)

6. Details of External Connect Component in the Programme [Only for PG]

Number of Credits Assigned	3
Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	CHT7813 Summer Internship (3 credits)

7. List of prescribed courses in all baskets (BS, GE, DC, DE)

Basic Sciences (BS)	General Engineering (GE)	Departmental/Programme Core (DC/PC)	Departmental/Programme Elective (DE/PE)

Basic Sciences (BS): Institute core

No.	Course title	L-T-P	Credits
1	MTL1001 Mathematics I Calculus	3-1-0	4
2	MTL1002 Mathematics II Linear Algebra and Differential Equations	3-1-0	4
3	PYP1000 Physics Laboratory	0-0-4	2
4	CMP1000 Chemistry Laboratory	0-0-4	2

Total: 12 Credits

Basic Sciences (BS): Department recommended

No.	Basket	Course title	L-T-P	Credits
1	Physics	PYL1001 Introduction to Electrodynamics	2-1-0	3
2	Chemistry	CML1002 The Art and Science of Building Molecules and Materials	2-1-0	3
3	Biology	SBL1100 Biology for Engineers: Microbes in Health and Disease	2-0-0	2
4	Biology	SBP1100 Experimental Biology for Engineers	0-0-2	1

Total: 9 Credits

Basic Sciences (BS): Student's choice: 3 credits

General Engineering (GE): Institute core

No.	Course title	L-T-P	Credits
1	COP0100 Computer Literacy	0-0-2	1
2	COL1000 Introduction to Programming-I	1-0-1	1.5
3	COL1001 Introduction to Programming-II	1-0-1	1.5

Total: 4 Credits**General Engineering (GE): Department recommended**

No.	Basket	Course title	L-T-P	Credits
1	Mechanical Sci.	MEP1000 Engineering Visualization	0.5-0-3	2
2	Mechanical Sci.	MEP1001 Manufacturing for Product Innovation	0.5-0-3	2
3	Electrical Sci.	ELL1000 Introduction to Electrical Engineering	2-1-2	4
4	Computational & Data Sci.	MTL1108 Introduction to Probability and Statistics	3-1-0	4
5	Computational & Data Sci.	COL1101 Programming with Data Structures	3-0-2	4

Total: 16 Credits**General Engineering (GE): Student's choice: 4 credits****Department recommended HU/SSW distribution:****Humanities (HU): 9 credits****Self, Society, and World (SSW): 6 credits**

Department Core (DC):

No.	Course no.	Course title	L-T-P	Credits
1	CHL1001	Transport Phenomena (1 st DC course)	3-1-0	4
2	CHL1000	Introduction to Chemical Engineering	1-0-0	1
3	CHL1002	Material and Energy Balances	2-1-0	3
4	CHL2001	Numerical Analysis for Chemical Engineers	3-0-2	4
5	CHL2002	Chemical Engineering Thermodynamics	3-1-0	4
6	CHL2003	Fluid Mechanics	3-0-0	3
7	CHL2004	Heat and Mass Transfer	3-1-0	4
8	CHL2005	Introduction to Chemical Reaction Engineering	3-1-0	4
9	CHL2006	Biopharmaceutical Technology*	3-0-0	3
	CHL2007	Electrochemical Technology*	3-0-0	3
	CHL2008	Chemical Materials Technology*	3-0-0	3
		* Any ONE of these three courses		
10	CHL3001	Data Analysis and Machine Learning for Process Systems	3-0-2	4
11	CHL3003	Fluid Particle Mechanics	3-0-0	3
12	CHL3004	Mass Transfer Operations	3-0-0	3
13	CHL3005	Reaction Engineering for Environment and Sustainability	3-0-0	3
14	CHL3006	Process Dynamics and Control	3-1-0	4
15	CHL3007	Process Technology and Economics	3-0-0	3
16	CHL3008	Equipment and Plant Design	1-0-2	2
17	CHP3101	Chemical Engineering Laboratory-I	0-0-3	1.5
18	CHP3102	Chemical Engineering Laboratory-III	0-0-3	1.5
19	CHP3103	Chemical Engineering Laboratory-III	0-0-3	1.5
20	CHP3104	Chemical Engineering Laboratory-IV	0-0-3	1.5

Total: 58 Credits

Department Electives (DE): 6 Credits

No.	Course no.	Course title	L-T-P	Credits
1	CHL2006	Biopharmaceutical Technology* * DE only if not taken under DC	3-0-0	3
2	CHL2007	Electrochemical Technology* * DE only if not taken under DC	3-0-0	3
3	CHL2008	Chemical Materials Technology* * DE only if not taken under DC	3-0-0	3
4	CHD2801	Mini Project-I	0-0-6	3
5	CHD3801	Mini Project-II	0-0-6	3
6	CHL7XXX	ALL CHL7XXX courses (except CHL7001 and CHL7002)		

Programme Core (PC):

No.	Course no.	Course title	L-T-P	Credits
1	CHL7003	Sustainable Process Engineering	3-0-0	3
2	CHL7004	Quality Management in Process Industries	3-0-0	3
3	CHL7005 CHL7006 CHL7007	Advanced Chemical Reaction Engineering* Advanced Transport Phenomena* Advanced Chemical Engineering Thermodynamics* * Any ONE of these three courses	3-0-0	3
4	VEV739/ VEV740	Special Module on Professional Ethics [subject to approval by NRCVEE]	0.5-0-1	1
5	CHD7811	Cornerstone Project	0-0-6	3
6	CHD7812 CHT7813	Minor Project [#] Summer Internship [#] [#] Any ONE of these two courses	0-0-6	3
7	CHD7814	Major Project Part-I	0-0-16	8
8	CHD7815	Major Project Part-II	0-0-24	12
9	CHN7714 CHN7715	Teaching Practicum [^] Research Practicum [^] [^] Any ONE of these two courses in each of the 9 th and 10 th semesters	0-0-8 0-0-8	- -

Total: 36 Credits**Programme Electives (PE): 12 Credits.** The list is enclosed.

8. Nominal Semester-wise Academic Plan

Semester	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6	Course 7	Course 8	L	T	P	Credits	NGU	Contact hrs
I	MTL1001 Mathematics I Calculus	CML1002 The Art and Science of Building Molecules and Materials	ELL1000 Introduction to Electrical Engineering	COP0100 Computer Literacy	COL1000 Introduction to Programming-I	CMP1001 Chemistry Laboratory								
	3-1-0 4	2-1-0 3	2-1-2 4	0-0-2 1	1-0-1 1.5	0-0-4 2			8	3	9	15.5		20
II	MTL1002 Mathematics II Linear Algebra and Differential Equations	PYL1001 Introduction to Electrodynamics	MEP1000 Engineering Visualization	MEP1001 Manufacturing for Product Innovation	COL1001 Introduction to Programming-II	CHL1001 Transport Phenomena	PYP1000 Physics Laboratory							
	3-1-0 4	2-1-0 3	0.5-0-3 2	0.5-0-3 2	1-0-1 1.5	3-1-0 4	0-0-4 2		10	3	11	18.5		24
III	CHL1000 Introduction to Chemical Engineering	CHL1002 Material and Energy Balances	CHL2001 Numerical Analysis for Chemical Engineers	CHL2002 Chemical Engineering Thermodynamics	SBL1100 Biology for Engineers: Microbes in health and disease	SBP1100 Experimental Biology for Engineers	MTL1108 Introduction to Probability and Statistics	HU/SSW-1						
	1-0-0 1	2-1-0 3	3-0-2 4	3-1-0 4	2-0-0 2	0-0-2 1	3-1-0 4	3-0-0 3	17	3	4	22		24
IV	CHL2003 Fluid Mechanics	CHL2004 Heat and Mass Transfer	CHL2005 Introduction to Chemical Reaction Engineering	CHL2006/7/8 Biopharmaceutical Technology OR Electrochemical Technology OR Chemical Materials Technology	COL1101 Programming with Data Structures	BS								
	3-0-0 3	3-1-0 4	3-1-0 4	3-0-0 3	3-0-2 4	3-0-0 3			18	2	2	21		22
V	CHL3003 Fluid Particle Mechanics	CHL3004 Mass Transfer Operations	CHL3005 Reaction Engineering for Environment and Sustainability	CHL3001 Data Analysis and Machine Learning for Process Systems	CHP3101 Chemical Engineering Laboratory-I	DE-1	HU/SSW-2							
	3-0-0 3	3-0-0 3	3-0-0 3	3-0-2 4	0-0-3 1.5	3-0-0 3	3-0-0 3		18	0	5	20.5		23
VI	CHL3006 Process Dynamics and Control	CHL3007 Process Technology and Economics	CHL3008 Equipment and Plant Design	CHP3102 Chemical Engineering Laboratory-II	CHP3103 Chemical Engineering Laboratory-III	DE-2	HU/SSW-3							
	3-1-0 4	3-0-0 3	1-0-2 2	0-0-3 1.5	0-0-3 1.5	3-0-0 3	3-0-0 3		13	1	8	18		22

VII	CHL7003	CHL7004	CHL7005/7006/ 7007#	CHP3104	VEV739/740	OC-1	HU/SSW-4	GE							
	Sustainable Process Engg.	Quality Management in Process Industries	Adv. Chemical Reaction Engg. OR Adv. Transport Phenomena OR Adv. Chem. Engg. Thermo. OR PE	Chemical Engineering Laboratory-IV	Special Module on Professional Ethics*										
	3-0-0 3	3-0-0 3	3-0-0 3	0-0-3 1.5	0.5-0-1 1	3-0-0 3	3-0-0 3	3-1-0 4	18.5	1	4	21.5			23.5
Winter	CHD7811 Cornerstone project 0-0-6 3														
VIII	CHL7005/7006/ 7007#	CHD7811	PE	PE	HU/SSW-5	OE-1									
	Adv. Chemical Reaction Engg. OR Adv. Transport Phenomena OR Adv. Chem. Engg. Thermo. OR PE	Cornerstone Project													
	3-0-0 3	0-0-6 3	3-0-0 3	3-0-0 3	3-0-0 3	3-0-0 3			15	0	6	18			21
Summer	CHT7813 Summer Internship / CHD7812 Minor Project 0-0-6 3														
IX	CHD7814	PE	OE-2					CHN7714/ CHN7715^							
	Major Project Part-I							Teaching Practicum/ Research Practicum							
	0-0-16 8	3-0-0 3	3-0-0 3					0-0-8	6	0	16	14			22
X	CHD7815							CHN7714/ CHN7715^							
	Major Project Part-II							Teaching Practicum/ Research Practicum							
	0-0-24 12							0-0-8	0	0	24	12			24
									Total Credits			184			

Any ONE of these three courses in the entire program

^ Any ONE of these two courses in each of the 9th and 10th semesters

* Subjected to the approval from NRCVEE

9. Average Contact Hours per Faculty <i>per Week</i> , for this Programme	2.6 (only DC/PC + DE/PE)
10. Average Credit Students per Faculty per Semester, for this Programme	92 (only DC/PC + DE/PE)
11. If the program is a revision of an existing program, please list the major changes made.	• Following new courses are introduced under DC: a. Introduction to Chemical Engineering b. Data Analysis and Machine Learning for Process Systems c. Electrochemical Technology d. Chemical Materials Technology e. Equipment and Plant Design • Relevance to society: Sustainability component and environment aspects to be included in the course "Reaction Engineering for Environment and Sustainability. • Many courses are restructured. • The course "Transport Phenomena" is now shifted to 1st year. • Total credits reduced from 188 to 184. • 8 courses in DC category have P component as compared to 6 at present • Emphasis on project-based learning: Choice with student for doing mini project as a PE in place of a lecture course in 8th semester in parallel with cornerstone project • Relevance to industry: Introduction of a core course on "<i>Quality Management in Process Industries</i>" (6 sigma standards, lean manufacturing, fault diagnosis, safety protocols)

	• Introduction of a cornerstone project, summer internship, professional ethics course as per the curriculum concept note
12. Please elaborate on,	
a) how flexibility for the students has increased?	• The list of DC courses includes a basket of the following three courses. Based on interest, student will have a choice to take any one of these. Biopharmaceutical Technology Electrochemical Technology Chemical Materials Technology • Student will be able to select a few courses under BS and GE categories. • New courses available as electives • Student can choose one out of three advanced courses in PC category • Choice of doing a course-based PE or mini project in 8th semester
b) how engagement and interaction with the student have increased?	• Through <i>Introduction to Chemical Engineering</i>, students will interact with most of the faculty members in the department. • New courses such as “<i>Data Analysis and Machine Learning for Process Systems</i>” and “<i>Equipment and Plant Design</i>” have 2 hours of Practical component each to enhance the engagement. • Student can choose a mini project as PE instead of a lecture course for an early interaction with the faculty supervisor.

c) how hands-on learning is emphasized in the program?	• Cornerstone Project, Internship, and Minor and Major Projects are aimed at providing hands-on learning experience. • New courses such as “Data Analysis and Machine Learning for Process Systems” and “Equipment and Plant Design” have 2 hours of Practical component each to enhance the hands-on learning.
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