

Bachelor of Technology in Chemical and Biochemical Engineering

Indian Institute of Technology Dharwad is starting a four-year B.Tech. program in *Chemical and Biochemical Engineering*. The proposed program is available to senior secondary students who have passed the JEE Advanced examination. The major emphasis of this program is to provide students with a multidisciplinary learning experience within the framework of National Education Policy – 2020. The main goal of the program is to educate and train students in the overlapping segments of Engineering, Biology and Chemistry as well as provide exposure to various aspects of Arts, Humanities, Social Sciences, and Engineering in order to contribute to the holistic development of the participant. The design of the programme allows the students to broaden their scope beyond chemical engineering and learn principles of biology and chemistry which will be highly useful in their future career. The design is also expected to allow the students to pursue higher academic or professional careers in the interdisciplinary areas of chemical engineering.

The four-year program is divided into eight semesters over four years. The first semester of the course will be common for all undergraduate students at the institute. The students are eligible for branch/program change as per the institute rules and regulations (refer to branch change rules) after the completion of the first semester. In the next four semesters, various other courses and the chemical engineering, biology and chemistry that are fundamental to the program will be taught. Beginning in the fifth semester, students have the freedom to select appropriate courses based on their areas of interest. Through the core courses, the students get rigorous exposure to Transport phenomena, fluid & solid mechanics, heat transfer, Reaction engineering (Chemical Engineering), molecular & cell biology and bioinformatics (biology) and catalysis, computational and organic & physical chemistry (chemistry) at the level suitable for the program. The students can opt for a Bachelor thesis in the final year of their curriculum.

Overall the program strikes a delicate balance of flexibility and rigor. Students can earn nearly one fourth of their total credits through different electives. The core requirements of the program are divided as 3:1 between Chemical Engineering and Biology & chemistry with theoretical courses supplemented by cutting-edge laboratory experiences. In addition to this, students are encouraged to pursue their interests with industries through internships/co-op programs. They can also work towards establishing start-ups and becoming future entrepreneurs.

Semester wise Course Structure and Credits for Chemical Engineering Program

Semester wise total credits

| Semester | Total Credits |
|--------------|---------------|
| I | 37 |
| II | 37 |
| III | 36 |
| IV | 34 |
| V | 33 |
| VI | 33+6 |
| VII | 24+12 |
| VIII | 24+12 |
| TOTAL | 258+30 |

Note: Yellow highlights are mandatory credits for honors. No minor in Chemical Engineering is proposed at this time.

First semester common

| Course Code | Course Name | L | T | P | Credits |
|----------------------|--|---|---|---|-----------|
| MAXXX | Calculus-1 | 3 | 1 | 0 | 4 |
| MAXXX | Calculus-2 | 3 | 1 | 0 | 4 |
| PH 101 | Quantum Physics and Applications | 2 | 1 | 0 | 6 |
| CH 101 | Fundamental concepts and applications of chemistry | 3 | 0 | 0 | 6 |
| BB 101 | Introduction to Modern biology | 2 | 1 | 0 | 6 |
| CHXXX | Hands on Science Laboratory | 0 | 0 | 3 | 3 |
| CSXXX | Introduction to Programming -1 (Using C) | 3 | 0 | 2 | 4 |
| EEXXX | Introduction to Programming -2 (Using Python) | 3 | 0 | 2 | 4 |
| HS 101 | Introduction to Fine Arts | | | | P/NP |
| HS 102 | Design Thinking and Creativity | | | | P/NP |
| NO 101 | National Sports Organization | | | | P/NP |
| Total credits | | | | | 37 |

Chemical Engineering (The courses in the gold color will be taught ME faculty)

BSBE

Chemistry

HSS

| SEMESTER II | | | | | |
|----------------------|--|---|---|---|---------------|
| Course Code | Course Name | L | T | P | Total Credits |
| ME 113 | Hands on Engineering Laboratory | 0 | 0 | 3 | 3 |
| ME 111 | Engineering Graphics Laboratory | 1 | 0 | 3 | 5 |
| CS201 | Data structures and algorithms | 3 | 0 | 0 | 6 |
| CS211 | Data structures and algorithms Lab | 0 | 0 | 3 | 3 |
| EE 101 | Introduction to Electrical Systems and Electronic Circuits | 3 | 0 | 1 | 6 |
| MA 102 | Linear Algebra | 3 | 1 | 0 | 4 |
| MA 103 | Differential Equations – I | 3 | 1 | 0 | 4 |
| ChE | Introduction to chemical Engineering/process calculations | 3 | 0 | 0 | 6 |
| NSO 102 | Sports | | | | P/NP |
| TOTAL CREDITS | | | | | 37 |

| SEMESTER III | | | | | |
|----------------------|--|---|---|---|---------------|
| Courses | Course Name | L | T | P | Total Credits |
| 1 | Introduction of Transport Phenomenon | 3 | 0 | 0 | 6 |
| 2 | Introduction to Thermodynamics (ME207) | 3 | 0 | 0 | 6 |
| 3 | Fluid Mechanics (ME203) | 3 | 0 | 0 | 6 |
| 4 | Data analysis (EE201) | 3 | 0 | 0 | 6 |
| 5 | Engineering mechanics | 3 | 0 | 0 | 3 |
| 6 | ChE lab-1 (Thermodynamics and fluid mechanics (ME224)) | 0 | 0 | 3 | 3 |
| 7 | Biomolecules | 3 | 0 | 0 | 3 |
| 8 | Organic Chemistry | 3 | 0 | 0 | 3 |
| TOTAL CREDITS | | | | | 36 |

| SEMESTER IV | | | | | |
|----------------------|---|---|---|---|---------------|
| Courses | Course Name | L | T | P | Total Credits |
| 1 | Introduction to Heat Transfer (ME301) | 3 | 0 | 0 | 6 |
| 2 | Solid Mechanics (ME206) | 3 | 0 | 0 | 3 |
| 3 | Introduction to numerical algebra | 2 | 1 | 0 | 4 |
| 4 | Electrochemistry | 3 | 0 | 0 | 3 |
| 5 | Biophysical Methods | 3 | 0 | 0 | 3 |
| 6 | Mass Transfer | 3 | 0 | 0 | 6 |
| 7 | Chemical Engineering Lab II (heat transfer ME314 and Solid mechanics (ME218)) | 0 | 0 | 3 | 3 |
| 8 | Introduction to computational chemistry | 3 | 0 | 0 | 3 |
| 9 | Basics of cell biology and genetics | 3 | 0 | 0 | 3 |
| TOTAL CREDITS | | | | | 34 |

| SEMESTER V | | | | | |
|----------------------|---|---|---|---|---------------|
| Courses | Course Name | L | T | P | Total Credits |
| 1 | Reaction Engineering | 3 | 0 | 0 | 6 |
| 2 | Economics (HS201) | 3 | 0 | 0 | 6 |
| 3 | Chemical Engineering Lab III (mass transfer and reaction engineering) | 0 | 0 | 3 | 3 |
| 4 | Systems and computational biology/Bioinformatics | 3 | 0 | 0 | 3 |
| 5 | Catalysis | 3 | 0 | 0 | 3 |
| 6 | Programme elective-1 | 3 | 0 | 0 | 6 |
| 7 | Programme elective-2 | 3 | 0 | 0 | 6 |
| TOTAL CREDITS | | | | | 33 |

| SEMESTER VI (Yellow highlights are courses must for honors) | | | | | |
|--|--|----------|----------|----------|--------------------------|
| Cour ses | Course Name | L | T | P | Total Credits |
| 1 | Process Equipment Design and Economics | 3 | 0 | 0 | 6 |
| 2 | Process Control (EE303) | 3 | 0 | 0 | 6 |
| 3 | Environmental studies (CH301) | 3 | 0 | 0 | 6 |
| 4 | Programme elective-3 | 3 | 0 | 0 | 6 |
| 5 | Programme elective-4 | 3 | 0 | 0 | 6 |
| 6 | Scientific presentation | 0 | 0 | 3 | 3 |
| 7 | Chemical reaction engineering-II | 3 | 0 | 0 | 6 |
| TOTAL CREDITS | | | | | 33(+6) |

| SEMESTER VII (Yellow highlights are courses must for honors) | | | | | |
|---|--|----------|----------|----------|--------------------------|
| Cour ses | Course Name | L | T | P | Total Credits |
| 1 | HSS Elective (From Basket-1/ Basket-2) | 3 | 0 | 0 | 6 |
| 2 | Institute Elective – 1 | 3 | 0 | 0 | 6 |
| 3 | Institute Elective – 2 | 3 | 0 | 0 | 6 |
| 4 | BTP – 1 (or) Programme elective-5 | 3 | 0 | 0 | 6 |
| 5 | Advanced transport phenomenon | 3 | 0 | 0 | 6 |
| 6 | Programme elective-6 | 3 | 0 | 0 | 6 |
| TOTAL CREDITS | | | | | 24(+12) |

| SEMESTER VIII (Yellow highlights are courses must for honors) | | | | | |
|--|---|----------|----------|----------|--------------------------|
| Cour ses | Course Name | L | T | P | Total Credits |
| 1 | Institute Elective – 3 | 3 | 0 | 0 | 6 |
| 2 | Institute Elective – 4 | 3 | 0 | 0 | 6 |
| 3 | Institute Elective – 5 / HSS Elective (From Basket-1/ Basket-2) | 3 | 0 | 0 | 6 |
| 4 | BTP – 2 (or) Programme elective -7 | 3 | 0 | 0 | 6 |
| 5 | Programme elective-8 | 3 | 0 | 0 | 6 |
| 6 | Programme elective-9 | 3 | 0 | 0 | 6 |
| TOTAL CREDITS | | | | | 24(+12) |

Programme elective baskets

Chemical Engineering

BSBE

Chemistry

| Chemical Engineering | BSBE | Chemistry |
|---|---|---|
| Introduction to Computational Fluid Dynamics | Enzyme and protein engineering | Chemical biology and Medicinal Chemistry |
| Composite Materials: Manufacture, Properties & Applications | Introduction to Biochemical Engineering | Material science and polymer chemistry |
| Advanced Heat Transfer | Bio-separations | Instrumental methods for Structure Determination |
| Fluid Flow and Heat Transfer in Porous Media | Tissue engineering | Sustainable energy and energy materials (CH302) |
| Colloid and Interfacial Engg. | Neurobiology | Introduction to sophisticated characterization techniques |
| Safety in Chemical Industry | | |
| Process Plant Utilities | | |

Honors in ChE:

1. Chemical reaction engineering-II
2. Advanced transport phenomena
3. Programme elective-6
4. Programme elective-8
5. Programme elective-9
6. BTP-1 and 2-mandatory

Total credits - 258

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First and second semesters common courses – 68

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HSS (Compulsory) + Environmental + Data analysis + Intro to
Numerical Algebra 12+6+6+4=28

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Institute Electives – 30

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ChE - (Core 72)

Chem- (Core 12)

BSBE- (Core 12)

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Department elective/BTP: 36

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Total - 258

| Sr. No. | Type of courses | Courses | Credit | % in total credit | % in core ChE |
|---------|----------------------------|--|--------|-------------------|---------------|
| 1 | Institute core | First year courses | 68 | 26.35% | |
| | | HSS + Environmental studies+ data analysis | 28 | 10.85% | |
| 2 | Institute Electives | Institute Elective | 30 | 11.62% | |
| 3 | Programme Core | ChE core | 72 | 27.90% | 75% |
| | | BSBE + Chemistry Core | 24 | 9.30% | 25% |
| 4 | Programme Electives | Departmental electives / BTP | 36 | 13.95% | |
| | | Total | 258 | 99.97% | |