



**List of Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework**

**Department : *Chemical Engineering***

**Programme Name : *B.Tech.***

***Academic Year : 2019-20***

**Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework:**

| Sr. No. | Course Code | Name of the Course                |
|---------|-------------|-----------------------------------|
| 01.     | CH01TMC01   | Environmental Sciences            |
| 02.     | CH01PMC01   | Induction Training Programme      |
| 03.     | CH6TPE31    | Fuel Combustion Energy Technology |
| 04.     | CH6TPE32    | Environmental Engineering         |
| 05.     | CH7TOE32    | Water Conservation and Management |
| 06.     | CH8TOE43    | Renewable Energy                  |



## Scheme and Syllabus

| SCHEME OF EXAMINATION             |              |                                  |              |   |   |                   |     |       |         |
|-----------------------------------|--------------|----------------------------------|--------------|---|---|-------------------|-----|-------|---------|
| B.TECH (FOUR YEAR) DEGREE COURSE  |              |                                  |              |   |   |                   |     |       |         |
| FIRST YEAR , CHEMICAL ENGINEERING |              |                                  |              |   |   |                   |     |       |         |
| SEMESTER I (COURSE-A)             |              |                                  |              |   |   |                   |     |       |         |
| EFFECTIVE FROM SESSION 2018-19    |              |                                  |              |   |   |                   |     |       |         |
| SL. NO.                           | SUBJECT CODE | SUBJECTS                         | PERIODS/WEEK |   |   | EVALUATION SCHEME |     |       | CREDITS |
|                                   |              |                                  | L            | T | P | IA                | ESE | TOTAL |         |
| <b>THEORY</b>                     |              |                                  |              |   |   |                   |     |       |         |
| 1                                 | CH01TBS01    | PHYSICS                          | 3            | 1 | 0 | 30                | 70  | 100   | 4       |
| 2                                 | CH01TES01    | BASIC ELECTRICAL ENGINEERING     | 3            | 1 | 0 | 30                | 70  | 100   | 4       |
| 3                                 | CH01TBS02    | MATHEMATICS-I                    | 3            | 1 | 0 | 30                | 70  | 100   | 4       |
| 4                                 | CH01THS01    | ENGLISH                          | 3            | 0 | 0 | 30                | 70  | 100   | 3       |
| 5                                 | CH01TMC01    | ENVIRONMENTAL SCIENCES           | 3            | 0 | 0 | ...               | ... | ..    | 0       |
| <b>PRACTICAL</b>                  |              |                                  |              |   |   |                   |     |       |         |
| 1                                 | CH01PBS01    | PHYSICS LAB                      | 0            | 0 | 3 | 30                | 20  | 50    | 1.5     |
| 2                                 | CH01PES01    | BASIC ELECTRICAL ENGINEERING LAB | 0            | 0 | 2 | 30                | 20  | 50    | 1       |
| 3                                 | CH01PES02    | ENGINEERING GRAPHICS & DESIGN    | 1            | 0 | 3 | 30                | 20  | 50    | 2.5     |
| 4                                 | CH01PMC01    | INDUCTION TRAINING PROGRAMME     | 0            | 0 | 2 | -                 | -   | -     | -       |
| TOTAL                             |              |                                  |              |   |   |                   |     |       | 20      |

IA - INTERNAL ASSESSMENT    ESE - END SEMESTER EXAM.    L- LECTURE    T- TUTORIAL    P-PRACTICAL

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| CODE/SUBJECT                     | L | T | P | CREDIT |
|----------------------------------|---|---|---|--------|
| CH01TMC01/ENVIRONMENTAL SCIENCES | 3 | 0 | 0 | 0      |

**ENVIRONMENTAL STUDIES**

90% Change

GR4 NC 04 Class

(Bilawal)

**Introduction to environmental studies:** Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. **Ecosystems:** Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). **Natural Resources Renewable and Non-renewable Resources:** Land resources and land use change; Land degradation, soil erosion and desertification. **Deforestation:** Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. **Water:** Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). **Energy resources:** Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. **Biodiversity and Conservation:** Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India;

Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. **Threats to biodiversity:** Habitat loss, poaching of wildlife, man wildlife conflicts, biological invasions; **Conservation of biodiversity:** in-situ and Ex-situ conservation of biodiversity. **Ecosystem and biodiversity services:** Ecological, economic, social, ethical, aesthetic and informational value. **Environmental Pollution:** Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. **Nuclear hazards and human health risks.** **Solid waste management:** Control measures of urban and industrial waste. **Pollution case studies.** **Environmental Policies & Practices.** **Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.** **Environment Laws:** Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. **International agreements:** Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). **Nature reserves, tribal populations and rights, human wildlife conflicts in Indian context.** **Human Communities and the Environment, Human population growth:** Impacts on environment, human health and welfare. **Resettlement and rehabilitation of project affected persons;** case studies. **Disaster management:** floods, earthquake, cyclones and landslides. **Environmental movements** Chipko, silent valley, Bishnois of Rajasthan. **Environmental ethics:** role of Indian and other religions and cultures in environmental conservation. **Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).** **Field work:** Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. **Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.** **Study of common plants, insects, birds and basic principles of identification.** **Study of simple ecosystems-pond, river etc.**

**Suggested Readings:**

1. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
2. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
3. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
4. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.



DEPARTMENT OF CHEMICAL ENGINEERING  
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**SCHEME FOR EXAMINATION**  
**B.Tech. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING**

**THIRD YEAR, SIXTH SEMESTER**

| S. No.           | Course No. | Subject                      | Periods |   |   | Evaluation Scheme |     |       |           | Credits |     |
|------------------|------------|------------------------------|---------|---|---|-------------------|-----|-------|-----------|---------|-----|
|                  |            |                              | L       | T | P | Sessional         |     |       | Sub Total |         |     |
|                  |            |                              |         |   |   | IA                | MSE | Total |           |         | ESE |
| 01.              | CH6TPC09   | Mass Transfer-II             | 3       | 1 | - | 20                | 20  | 40    | 60        | 100     | 4   |
| 02.              | CH6TPC10   | Process Dynamics and Control | 3       | 1 | - | 20                | 20  | 40    | 60        | 100     | 4   |
| 03.              | CH6TPC11   | Organic Chemical Technology  | 3       | - | - | 20                | 20  | 40    | 60        | 100     | 3   |
| 04.              | CH6TPE2X   |                              | 3       | 1 | - | 20                | 20  | 40    | 60        | 100     | 4   |
| 05.              | CH6TPE3X   |                              | 3       | 1 | - | 20                | 20  | 40    | 60        | 100     | 4   |
| 06.              | CH6TOE2X   |                              | 3       | 0 | - | 20                | 20  | 40    | 60        | 100     | 3   |
| <b>PRACTICAL</b> |            |                              |         |   |   |                   |     |       |           |         |     |
| 01.              | CH6PPC06   |                              | -       | - | 3 | 30                | -   | 30    | 20        | 50      | 2   |
| 02.              | CH6PPC07   |                              | -       | - | 3 | 30                | -   | 30    | 20        | 50      | 2   |
| <b>TOTAL</b>     |            |                              | 18      | 4 | 6 |                   |     |       |           | 700     | 26  |

IA - Internal Assessment  
Total Marks - 700

MSE - Mid Semester Examination  
Total Periods - 28

ESE - End Semester Examination  
Total Credits - 26

*V. Chakrabarti*  
24/5/17  
BOS held on 24<sup>th</sup> May 2017  
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D. Chemical Engineering  
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*M. Mandal* *R. Singh* *K. Singh* *S. Chakrabarti*  
24/5/17

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Professor  
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**LIST OF PROFESSIONAL ELECTIVES OFFERED BY THE DEPARTMENT OF CHEMICAL ENGINEERING FOR V and VI SEMESTER**

| Semester | Subject Code (PE) | Subject                                 |
|----------|-------------------|---|
| V        | CH5TPE11          | Engineering Material                    |
|          | CH5TPE12          | Fundamentals of Biochemical Engineering |
|          | CH5TPE13          | Food Engineering                        |
|          | CH5TPE14          | Polymer Technology                      |
| VI       | CH6TPE21          | Process Equipment Design-I              |
|          | CH6TPE22          | Fertilizer Technology                   |
|          | CH6TPE31          | Fuel Combustion Energy Technology       |
|          | CH6TPE32          | Environmental Engineering               |

PE - Professional Elective

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*M. Mandal* *R. Singh* *K. Singh* *S. Chakrabarti*  
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**CH6TPE31: Fuel Combustion Energy Technology (310)**

**Unit I : Solid Fuel :** Classification of fuel, Origin, Composition, Characteristics and analysis of coal washing & storage of coal, Physical & chemical processing of coal, Various classification systems of coal briquetting, Carbonization, Gasification of coal.

**Liquid fuels:** Origin, composition, characteristics and classification of crude oil, crude oil processing cracking and reforming, storage and handling of liquid fuel

**Gaseous fuel:** Classification of gaseous fuel, Natural gas, Coal gas, Coke oven and blast furnace gas, producer gas, water and Carbureted water gas

**Unit II: Fuel Combustion Calculation:** Fundamentals of various combustion calculations with numerical examples.

**Unit III: Combustion Process:** General Principles of combustion, Flame, Draught, Limits of Inflammability, Types of combustion Process- Surface, Submerged, Pulsating, Slow combustion.

**Unit IV: Energy Conservation:** Energy consumption pattern in various sectors, various ways of energy conservation in various process industries including petroleum.

**Unit V: Non - Conventional Energy Technologies :** General principles with applications and technology of Biomass Energy, Solar Energy, Geothermal Energy, Wind Energy, Nuclear Energy, Hydal, Tidal and Ocean Energy.

**Text Book:**

1. Elements of Fuel Combustion & Energy Engineering by S.N. Saha, Dhanpat Rai Publication Co. Pvt. Ltd. New Delhi, 2014

BOS held on 24<sup>th</sup> May 2017

*S. Saha*  
24/5/17  
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**CH6TPE32: Environmental Engineering (3 1 0)**

**Unit I : Environmental Pollution and Its Effect :** Environment and its components, Sources and type of pollutants, General effects on man, animal, vegetation and property.

**Unit II : Air Pollution :** Air quality criteria and standards, Ambient air sampling and analysis, Stack emission standards, Stack sampling and analysis, Meteorology and dispersion of air pollutants, Atmospheric lapse rate and stability, Plume behavior, Control of gaseous and particulate pollutants from mobile and stationary sources.

**Unit III : Water Pollution :** Water quality criteria and effluent discharge standards, Domestic and industrial sources of waste water, Waste water sampling and analysis methods as per BIS specifications, Physico-chemical and biological methods of waste water treatment, Recovery of material from process effluents.

**Unit IV: Pollution Due to Hazardous Industrial Waste :** Nature of hazardous waste materials from various chemical and allied industries, Methods of disposal, destruction and reuse, Nuclear wastes and their management.

Solid waste from commercial, domestic and industrial sectors-composition and characterization, recycle, resource recovery and disposal.

**Unit V: Environmental Pollution Management :** Case studies of air and water pollution control in chemical industries.

**Text Books:**

1. Environmental Pollution Control Engineering by C. S. Rao, New Age International Ltd.
2. Environmental Engineering by N N Basak, Tata McGraw-Hill Pub. Co. Ltd.
3. Essentials of Environmental Studies by K. Joseph and R. Nagendran, Pearson Education (Singapore) Pvt. Ltd.

BOS held on 24<sup>th</sup> May 2017

*VSD*  
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*24/5/17*  
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**SCHEME FOR EXAMINATION**  
**B.Tech. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING**

**FOURTH YEAR, SEVENTH SEMESTER**

| S. No.    | Course No. | Subject                              | Periods |   |   | Evaluation Scheme |     |       |     |           | Credits |
|-----------|------------|--------------------------------------|---------|---|---|-------------------|-----|-------|-----|-----------|---------|
|           |            |                                      | L       | T | P | Sessional         |     |       | ESE | Sub Total |         |
|           |            |                                      |         |   |   | IA                | MSE | Total |     |           |         |
| 01.       | CH7TPC13   | Process Equipment Design- II         | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 02.       | CH7TPC14   | Chemical Reaction Engineering-II     | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 03.       | CH7TPC15   | New Separation Processes             | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 04.       | CH7TPE4X   |                                      | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 05.       | CH7TOE3X   |                                      | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| PRACTICAL |            |                                      |         |   |   |                   |     |       |     |           |         |
| 01.       | CH7PPC08   | Minor Project                        | -       | - | 6 | 30                | -   | 30    | 20  | 50        | 3       |
| 02.       | CH7PPC09   | Vocational Training Viva Cum Seminar | -       | - | 3 | 50                | -   | 50    | -   | 50        | 2       |
| TOTAL     |            |                                      | 15      | 5 | 9 |                   |     |       |     | 600       | 25      |

IA - Internal Assessment

MSE - Mid Semester Examination

ESE - End Semester Examination

Total Marks - 600

Total Periods - 29

Total Credits - 25

BOS held on 15<sup>th</sup> May 2018

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**SCHEME FOR EXAMINATION**  
**B.Tech. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING**

**FOURTH YEAR, EIGHTH SEMESTER**

| S. No.    | Course No. | Subject                                     | Periods |   |   | Evaluation Scheme |     |       |     |           | Credits |
|-----------|------------|---|---------|---|---|-------------------|-----|-------|-----|-----------|---------|
|           |            |   | L       | T | P | Sessional         |     |       | ESE | Sub Total |         |
|           |            |   |         |   |   | IA                | MSE | Total |     |           |         |
| 01.       | CH8TPC16   | Process Equipment Design- III               | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 02.       | CH8TPC17   | Project Engineering, Economics & Management | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 04.       | CH8TPE5X   |   | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| 06.       | CH8TOE4X   |   | 3       | 1 | - | 20                | 20  | 40    | 60  | 100       | 4       |
| PRACTICAL |            |   |         |   |   |                   |     |       |     |           |         |
| 01.       | CH8PPC10   | Project                                     | -       | - | 8 | 60                | -   | 60    | 40  | 100       | 4       |
| TOTAL     |            |   | 12      | 4 | 8 |                   |     |       |     | 500       | 20      |

IA - Internal Assessment

MSE - Mid Semester Examination

ESE - End Semester Examination

Total Marks - 500

Total Periods - 24

Total Credits - 20

BOS held on 15<sup>th</sup> May 2018

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LIST OF OPEN ELECTIVES OFFERED FOR VII and VIII SEMESTER

| Semester | Subject Code (OE) | Subject                           |
|----------|-------------------|-----------------------------------|
| VII      | CH7TOE31          | Transport Phenomena               |
|          | CH7TOE32          | Water Conservation and Management |
| VIII     | CH8TOE41          | Optimization Techniques           |
|          | CH8TOE42          | Process Modeling & Simulation     |
|          | CH8TOE43          | Renewable Energy                  |

B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

**CH7TOE32: Water Conservation and Management (3 1 0)**

Introduction, Water Cycle, Water Storage, Water Quality, Water Conservation in Homes, Water Conservation in Work Place; Water Management-Water Quality, Controlling Use and Quality of Water, Water Flow Management, Water Quality Control, Testing Water Salinity, Preserving Water Quality, Minimizing Evaporation, Water Sanitation, Water Audits, Water Conservation in Agriculture, Water Conservation in Process Industries, Water Conservation in Construction Industries, Water Conservation in Service Industries.

**Text Books :**

1. Water Conservation, Management and Analysis by V. Madireddi and Subba Rao, Readworthy Publications (P) Ltd
2. Protection and Conservation of Water Resources by Hadrian F. Cook, John Wiley & Sons Inc.
3. Water Resources, Conservation and Management by S.N. Chatterjee, Atlantic Publishers & Dist.

*Geetha*  
15/05/18

*Manish*  
15/05/18

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*Ajani*  
15/05/18

*Pradeep*  
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B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

**CH8TOE43: Renewable Energy (3 1 0)**

**Introduction-** World Energy Status, Current Energy Scenario in India, Environmental Aspects of Energy Utilization, Energy and Sustainable Development.

**Solar Energy - Basic Concepts, Flat Plate and Concentrating Collectors, Solar Desalination, Solar Photo Voltaic Conversion, Solar Cells.**

**Wind Energy - Availability, Wind Power Plants, Wind Energy Conversion Systems, Site Characteristics, Types of Wind Turbines.**

**Energy from Biomass - Biomass Resources, Biomass Conservation Technologies- Direction Combustion, Pyrolysis, Gasification, Anaerobic Digestion, Bioethanol and Biodiesel Production.**

**Other Renewable Sources - Tidal Energy, Geothermal Energy, Hydroelectric.**

**Text Books :**

1. Renewable Energy Resources by John Twidell and Tony Weir, Taylor & Francis
2. Renewable Energy Sources and Emerging Technologies by D.P. Kothari, K. C. Singal, Rakesh Ranjan, PHI Learning Pvt Ltd.
3. Renewable Energy Sources for Sustainable Development by Narendra Singh Rathore, N. L. Panwar, New India Publishing Agency

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