**RIT, RAIPUR**

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

## SCHEME OF TEACHING AND EXAMINATION

## M.E. (Third Semester) Chemical Engineering (Environmental Engineering)

| .No. | Board of Studies | Code | Subject | Periods per week | | | Scheme of Exam Theory / Practical | | | Grand Total | Credits L+(T+P)/2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | ESE | CT | | | |
| 1 | Chemical Engg. | 530311(19) | Nanotechnology | 3 | 1 | - | 100 | 20 | 20 | 140 | 4 |
| 2 | Refer Table -III | Elective - III | | 3 | 1 | - | 100 | 20 | 20 | 140 | 4 |
| 3 | Chemical Engg. | 530321(19) | Preliminary Work On Dissertation | - | - | 30 | 100 | - | 100 | 200 | 15 |
| 4 | Chemical Engg. | 530322(19) | Seminar based on Dissertation | - | - | 2 | - | - | 20 | 20 | 1 |
| **Total** | | | | **6** | **2** | **32** | **320** | **40** | **140** | **500** | **24** |

ESE: End Semester Examination CT: Class Test TA: Teacher's Assessment L: Lecture
T: Tutorial P: Practical

**Table - III**

| Elective – III | | | |
|---|---|---|---|
| **S.No.** | **Board of Studies** | **Code** | **Subject** |
| 1 | Chemical Engg. | 530331 (19) | Non Conventional Energy Sources |
| 2 | Chemical Engg. | 530332 (19) | Down Stream Processing |
| 3 | Chemical Engg. | 530333 (19) | Environmental Biotechnology |

**Note (1) – 1/4$^{th}$ of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.**

**Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.**

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: M.E. Third Branch: Chemical Engg. (Environmental Engg.)
Subject: Nanotechnology Code: 530311(19)
Total Theory Periods: 30 Total Tutorial Periods: 10
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted :02

Note: Internal choice may be given in any three units.

**Unit I** Introduction to Nanotechnology: Background, Definition, and Application of Nanomaterials in Environmental Engg.

**Unit II** Nanomaterial Synthesis And Applications, Physical Chemistry of Solid Surfaces.

**Unit III** Nanostructures: -- Zero-Dimensional Nanostructures: Nanoparticles; One- Dimensional Nanostructures: Nanowires and Nanorods; Two- Dimensional Nanostructures: Thin Films; Special Nanomaterials. Characteristic Properties of Nanoparticles.

**Unit IV** Nanofabrication: -- Introduction, Stamping Techniques, Molecularly Thick Films For Lubrication.

**Unit V** **Nanodevices: -** MEMS/NEMS Devices and Applications, Micro fluids and Their Application To Lab-On-A-Chip.

**Text Books:**

1 Guozhong Cao “Nanostructures and Nanomaterials”, Imperial College Press,London

**Reference books:**

1. Bhushan, “Handbook of Nanotechnology”, Springer Publication

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: M.E. Third
Branch: Chemical Engg.(Environmental Engg.)
Subject: Non-Conventional Energy Sources
Code: 530331(19)
Total Theory Periods: 30
Total Tutorial Periods: 10
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted :02

Note: Internal choice may be given in any three units.

**Unit I** Energy Scenario: Indian and Global Energy Crises, Classification of Various Energy Sources, Renewable And Non-Renewable Energy Sources, Remedial Measures to Energy Crises.

**Unit II** Energy Conservation Laws of Energy Efficiency, Ways of Conserving Energy in Chemical And Allied Industries, Better Housekeeping, Scope of Improvement in Design of Equipments, Waste Heat Recovery.

**Unit III** Concept of Multiple Effect And Recycling, Energy Audit.

**Unit IV** Bioenergy, Biogas Plant And Their Operation, Biomass And Its Conversion Route to Gaseous And Liquid Fuels, Its Potential And Generation By Windmills.

**Unit V** Nuclear Energy: Status, Nuclear Raw material, Nuclear Reactor And Their Classification, Generation of Nuclear Power, Nuclear Installation in India And Their Capacity Generation, Limitation of Nuclear Energy, Reprocessing of Spent Nuclear Fuel, Cogeneration of Fuel And Power Energy From Tidal And Ocean, Thermal Resources.

**Text Books:**

1 Brame J.S. angd King J.G. Edward Amold “Fuels: Solid, Liquid & Gases”

**Reference books:**

1. Sukhatme S.P., Solar Energy.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: M.E. Third | Branch: Chemical Engg.(Environmental Engg.)
Subject: Down Stream Processing | Code: 530332(19)
Total Theory Periods: 30 | Total Tutorial Periods: 10
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted :02

Note: Internal choice may be given in any three units.

**Unit 1:-** Role & Important of Downstream Processing in Chemical Processes, Problems And Requirements of Product Purification, Physiochemical Basis of Separation Process.

**Unit 2:-** Primary Separation And Recovery Process- Cell Distribution Methods For Intracellular Products, Removal of Insoluble, Biomass ( And Particulate Debris), Separation Techniques, Flocculation And Sedimentation, Centrifugation And Filtration Methods.

**Unit 3:-** Enrichment Operations – Membrane Based Separation & Its Applications. Precipitation Methods With Salts, Organic Savants & Polymers. In Sits Product Removal.

**Unit 4:-** Product Resolution / Fractionation – Adsorptive Chromatographic Separation Processes, Electrophoretic ( All Electrophoresis Techniques Including Capillary Electrophoresis) Hybrid Separation Technologies ( Membrane Chromatography, Electro Chromatography Etc ).

**Unit 5:-** Downstream Processing of Industrial Microbial Products – Particle Separation, Cell Disintegration, Extraction, Concentration, Purification & Drying.

**Text Books:**


1. Asenjo J.N. “Separation processes in Biotechnology”, 1993, Marcel Inc.
2. Biotechnology by B. D. Singh, Kalyani Publishers


**Reference Books:**


1. Belter P A & Cussler E, “Bioseparations” , Wiley, 1985
2. “Product Recovery in Bioprocess technology”, BIOTOL Series, VCH, 1990
3. Wankat P. C. “Rate controlled separation”,elsevier ,1990

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: M.E. Third | Branch: Chemical Engg.(Environmental Engg.)

Subject: Environmental Biotechnology | Code: 530333(19)

Total Theory Periods: 30 | Total Tutorial Periods: 10

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted :02

Note: Internal choice may be given in any three units.

**Unit 1:-** Introduction to Environment– Concept of Ecology & Ecosystem, Environmental Pollution, (Water, Soil & Air). Noise And Thermal Pollution, Their Sources And Effect.

**Unit 2:-** Sewage And Waste Water Treatment, Aerobic And Anaerobic Treatment, Conventional And Advanced Treatment Technology. Emerging Biotechnological Processes in Wastewater Treatment And Various Microorganism Used in it.

**Unit 3:-** Bioremediation And Biorestoration – Reforestation Through Micro Propagation, Development of Stress Tolerant Plants, Use of Mycorryza For Reforestation, Wormiculture Technology, Composting.

**Unit 4:-** Microbial Leaching And Mining– Extraction of Metal From Ores, Recovery Of Metals From Solutions, Microbes in Petroleum Extraction. Introduction to Biofertilizer, Biopesticides, Bioinsecticides And Bioherbicides.

**Unit 5:-** Degradation of Xenophobic Compounds– Organisms Involve in Degradation of Chlorinated Hydrocarbons, Substituted Simple Aromatic Compounds, Polyaromatic Hydrocarbons And Pesticides.

**Text Books:**


2. Environmental Biotechnology by Alan Scrogg (1999) : Langman.

3. Foster C.F, John ware D.A., " Environmental Biotechnology" , Ellis Horwood, Ltd; 1987.


**Reference Books:**


1. Stanir R.Y., Ingraham J. L. wheelis M. L., Painter R. R.," General microbiology", Mcmillan Publications 1989.