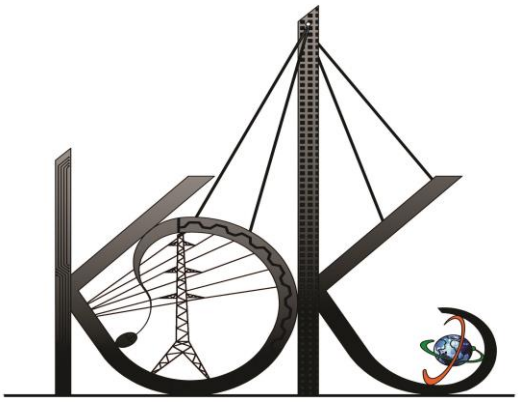
KDK COLLEGE OF ENGINEERING, NAGPUR.



Session (2023 – 24)

Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

INDEX

List of Courses related to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

Sr. No.	Course Code	Name of Course	Name of Program	Topic Related to
1	BEIT307T	Universal Human Values	Information Technology	Professional Ethics & Human Values
2	BEIT506T	Industrial Economics and Entrepreneurship Development	Mechanical Engineering	Professional Ethics & Human Values
3	BEIT308T	Environmental Engineering (Audit)	Information Technology	Environment & Sustainability
4	BTCHEE701T	Energy Management & Audit	Electrical Engineering	Professional Ethics & Human Values
5	BTCHEE702T	Electrical Installation Design	Electrical Engineering	Professional Ethics & Human Values
6	BTCHEE703T	Electric & Hybrid Vehicles	Electrical Engineering	Professional Ethics & Human Values
7	BEELE406T	Environmental Studies	Electrical Engineering	Environment & Sustainability
8	BEEE305T	Renewable Energy Sources	Electrical Engineering	Environment & Sustainability
9	BEME4053	Professional Ethics	Mechanical Engineering	Professional Ethics & Human Values
10	BEME406P	Sports	Mechanical Engineering	Professional Ethics & Human Values
11	BEME406P	Yoga	Mechanical Engineering	Professional Ethics & Human Values
12	BEME406P	National Service Scheme (NSS)	Mechanical Engineering	Professional Ethics & Human Values

13	BTCHEE703T	Introduction to Smart Gird	Electrical Engineering	Professional Ethics & Human Values
14	BEETC5040T	Industrial Economics and Entrepreneurship Development	Electronics and Telecommunication Engineering	Professional Ethics & Human Values
15	BEETC606T	Effective Technical Communication	Electronics and Telecommunication Engineering	Professional Ethics & Human Values
16	BTCHEE801T	Electrical Safety Standards	Electrical Engineering	Professional Ethics & Human Values
17	BEETC803P	Project Phase-2	Electronics and Telecommunication Engineering	Professional Ethics & Human Values
18	BEETC409A	Universal Human Values	Electronics and Telecommunication Engineering	Professional Ethics & Human Values
19	BECVE605T	Environmental Engineering (open Elective-I)	Electronics and Telecommunication Engineering	Environment & Sustainability
20	BECSE305T	Ethics in IT	Computer Science Engineering	Professional Ethics & Human Values
21	BECSE306T	Universal Human Values	Computer Science Engineering	Professional Ethics & Human Values
22	BTCHEE803T	Power Quality	Electrical Engineering	Professional Ethics & Human Values
23	BTCVE702T	Sustainable Resource management	Civil Engineering	Environment & Sustainability
24	BECVE605T	Environmental Engineering-II	Civil Engineering	Environment & Sustainability
25	BECVE 303T	Environmental Engineering – I	Civil Engineering	Environment & Sustainability
26	BTCVE703T	Air Pollution & Solid Waste Management	Civil Engineering	Environment & Sustainability

27	BTCVE703T	Hydropower Engineering	Civil Engineering	Environment & Sustainability
28	BTCVE704T	Water & Wastewater Treatment	Civil Engineering	Environment & Sustainability
29	BTCVE704T	Irrigation Management	Civil Engineering	Environment & Sustainability

Syllabus related to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

1. Universal Human Values

Rashtrasant Tukadoji Maharaj Nagpur University,

Nagpur Faculty of Engineering and Technology

B.E 3rd sem (IT)

Subject: Universal Human Values (Theory)

CREDITS: 02

Teaching Scheme: 2 Hours/Week: **Examination Scheme:**

University Assessment: 35 Marks **College Assessment: 15 Marks**

Aim: To inculcate sensitivity among students towards themselves and their surrounding including family, society and nature

Objective: The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration, about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course outcomes: By the end of the course,

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. Students would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

Unit 1

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education. (6 hours)

Unit 2

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body. (6 hours)

Unit 3

Values in relationship, the five dimensions of human endeavour, the holistic perception of harmony in existence.(6 hours)

Unit 4

Basics for ethical human conduct, defects in ethical human conduct, human rights violations and social disparities, value based life. (6 **hours)**

Text Book: Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Indian Ethos and Modern Management: Amalgam of the best of the ideas from the East and the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004
4. Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009

2. Industrial Economics and Entrepreneurship Development

BEIT506TINDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP DEVELOPMENT

(Theory Credit: 03)

Teaching Scheme: **Examination Scheme:**

Lecture: 4 Hours/week **Theory: T (U): 80 Marks T (I): 20 Marks**

Tutorial: Nil **Duration of University Exam. : 03 Hours**

==========

Objective:
Study of this subject provides an understanding of the scope of an industrial economics and entrepreneurship development, key areas of business development, sources of finance, project preparation, methods of taxation and tax benefits, significance of entrepreneurship and economic growth, application of engineering skills in entrepreneurial activities etc.

UNIT I:
Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

UNIT II:
Market structures- Monopoly, Oligopoly, and Monopolistic competition. Pricing strategies, business integration- forward backward integration, economies of scale, diseconomies of scale, liberalization, privatization and globalization. Business cycles, optimum size of firm.

UNIT III:

The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Capital formation, Inflation, Recession and stagnation, Inclusive growth, Public-Private partnership for development, Multiplier effect, Accelerator effect.

UNIT IV:

Entrepreneurship meaning, Major Motives Influencing an Entrepreneur, Factors Affecting Entrepreneurial Growth. Project Formulation, Product development, Market Survey and Research, Demand forecasting techniques,Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT V:

Need – Sources of Finance, Term Loans, Capital Structure, venture capital. Angel funding, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Direct, Indirect Taxes.

UNIT VI:

Sickness in small Business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, safeguard measures against variation in currency value, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

TEXT BOOKS:

Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.

Modern Economic Theory By, K.K. Dewett. S.Chand.

Industrial Economics. By, JagdishSheth, Pearson Publication.

"Entrepreneurial Development" By, S.S.KhankaS.Chand& Co. Ltd. Ram Nagar New Delhi, 1999.
Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.

Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.

REFERENCE BOOKS:

Business Economics. By, K.Rajgopalchar. Atalantic Publishers.

Microeconomics. By, Robert Pindyk

Business Economics. By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.

Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.

Financing Small Scale Industries in India, By, K.C.Reddy.Himalaya Publication.

3. Environmental Engineering (Audit)

Rashtrasant Tukadoji Maharaj Nagpur

University Syllabus for B.E. III Semester (IT)

Course Code					
Category	**Mandatory Courses**				
Course Title	**Environmental Science**				
Scheme & credits	**L**	**T**	**P**	**Credits**	**Semester**
	2	**0**	**0**	**0**	**III**

Course Outcomes

On successful completion of the course, the students:

1. Identify different types of air pollutions as well as explain their causes, detrimental effects on environment and effective control measures.
2. Recognize various sources of water pollutants and interpret their causes and design its effective control measure
3. Illustrate various types of pollutants and waste management.
4. Analyze various social issues related to environment and challenges in implementation of environmental laws.

Syllabus

Unit-I Air pollution and its control techniques: (6 lectures)

Contaminant behavior in the environment, Air pollution due to SOx, NOx, photochemical smog, Indoor air pollution Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle. Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs). Techniques to control Air pollution, ambient air quality and continuous air quality monitoring, Control measures at source, Kyoto Protocol, Carbon Credits.

Unit-II Water pollution and its control techniques: (6 lectures)

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, microplastics Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal and its utility. Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills

Unit-III Other Environmental Pollution& Waste Management: (6 lectures)

Soil pollution: Soil around us, Soil water characteristics, soil pollution. Causes, effects & control : noise pollution, nuclear & radiation hazards, marine pollution (Oil spills & Ocean Acidification) Solid waste

management: Composting, vermiculture, landfills, hazardous waste treatment, bioremediation technologies, conventional techniques (land farming, constructed wetlands), and phytoremediation. Degradation of xenobiotics in environment: Petroleum hydrocarbons, pesticides, heavy metals Introduction, types of e-wastes, environmental impact, e-waste recycling, e-waste management rules.

Unit-IV Social Issues and the Environmental Laws (6 lectures)

Concept of Sustainable development Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental Laws (brief idea only) Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act Issues involved in enforcement of environmental legislation. Different government initiatives (brief idea only)- National ambient air quality standard 2009, Swachh Bharat Abhiyan, National afforestation program and Act- 2016, National River conservation plan and National Ganga River basin authority, Formation of National Green Tribunal

Activity

1. Field Trip & Report Writing
2. Case-study & Report Writing

Books suggested:

1) Benny Joseph, Environmental Studies, Mc Graw Hill Education (India) Private Limited
2) B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut
3) P Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann
4) D. D. Mishra, S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.
5) Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin Heidelberg
6) Indian Environmental Law: Key Concepts and Principles edited by Shibani Ghosh, Publisher, Orient BlackSwan, 2019. ISBN, 9352875796.
7) P. Thangavel & Sridevi, Environemental Sustainability: Role of Green technologies, Springer publications

4 Energy Management and Audit

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

B.TECH. (Electrical Engineering) (CBCS)

7th Semester Electrical Engineering (CBCS)

Syllabus of Professional Elective : III

ENERGY MANAGEMENT AND AUDIT

Subject Code : BTCHEE701T

Teaching Scheme
Theory-03Hours/Week

Examination Scheme
Th (U)=70 M (I)=30 M
Duration of University Exam:- 3 Hours

Course Objective:	
1	To understand the need of energy audit.
2	To impart the knowledge about mechanism of energy audit.

Course Outcome:	
After Successful Completion of this course students will be able to :	
CO 1	Explain present energy scenario with need of energy audit and energy conservation.
CO 2	Recommend appropriate type of Energy Audit looking into user requirements.
CO 3	Prepare process flow, material and energy balance diagrams.
CO 4	Prepare energy action plan and strategy for monitoring and targeting as expected of Energy manager
CO 5	Select proper energy conservation mechanism for Electrical and Mechanical Systems.

Unit 1:Basics of Energy Management and Conservation **(08 Hrs)**

Global and Indian energy scenario, Global environmental concerns, Climate Change, Concept of energy management, energy demand and supply,Energy Conservation -Basic concepts, Energy conservation in household, transportation, agricultural, service and industrial sectors, Lighting & HVAC systems in buildings.

Unit2:EnergyAudit **(07 Hrs)**

Definition, need, and types of energy audit, Energy management (audit) approach, Understanding energy costs, bench marking, Energy performance, Energy audit instruments, Highlights of Energy Conservation Act.

Unit3 :Material and Energy balance **(06 Hrs)**

Facility as an energy system, Methods for preparing process flow, material and energy balance diagrams, Cogeneration and waste heat recovery.

Unit4: Energy Action Planning, Monitoring and Targeting **(07Hrs)**

Energy Action Planning –Key elements, Force field analysis, Energy policy, roles and responsibilities of energy manager and energy auditors.

Monitoring and Targeting - Defining monitoring & targeting, Elements of monitoring & targeting, Managerial fuctions in Monitoring and Targeting.

Dr P T Kamble

(A M Mendhe)

(N-E-Hiwase)

Unit 5: Electrical Energy and Thermal Energy Management **(08Hrs)**

Electrical Energy Management - Methods to minimize supply-demand gap, reactive power management, demand side management, energy conservation in electric motors.

Thermal Energy Management –Energy conservation in boilers ,steam turbines and furnaces.

Text Book:

1. Amit Kumar Tyagi, "Handbook on Energy Audits and Management", TERI Publication, 1st Edition, 2000.
2. Wayne C.Turner, "Energy Management Handbook", WileyInter Science Publication, 8th Edition, 2012.

Reference Books:

1. Refer '**Bureau of Energy Efficiency**' website: ***http://beeindia.gov.in/en/programmes***
2. Archie W.Culp, "Principles of Energy Conservation", McGrawHill, 1st Edition, 1979.
3. P.O'Callaghan, "Energy Management", McGraw-HillBookCompany,1st Edition, 1993.
4. Thuman A.and MehtaD.Paul, "Handbook of Energy Engineering", The Fairmount Press, 6th Edition, 2008.
5. Y.P.Abbi, ShashankJain, "Handbook of Energy Audit and Environment Management", 1st Edition, TERI Publication.

5. Electrical Installation Design

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.TECH. (Electrical Engineering) (CBCS)
7th Semester Electrical Engineering (CBCS)
Syllabus of Professional Elective : IV
ELECTRICAL INSTALLATION DESIGN
Subject Code : BTCHEE702T

Teaching Scheme
Theory-03Hours/Week

Examination Scheme
Th (U)=70 M (I)=30 M
Duration of University Exam:- 3 Hours

Course Objective:	
1	To learn methodology of electrical loads, types of electric loads & selection of busbar and cables
2	To study switching and protection devices along with short circuit calculations.
3	To study Power and control circuit for industrial application utilizing Reactive power Management.
4	To learn industrial installations and earthling system design.
5	To study design of substations used for industrial installations.

Course Outcome: After Successful Completion of this course students will be able to	
CO 1	Understand concept of electrical load assessment and basics of busbar and cables.
CO 2	Identify switches for smooth functioning of protective scheme utilized for short circuit calculations.
CO 3	Analyze Power and control circuit for industrial application utilizing Reactive power Management.
CO 4	Apply industrial installations and earthling system design.
CO 5	Inferring the design of 11kV and 33 kV substations for industrial installations .

Unit 1: **(08 Hrs)**
Electrical load assessment:
Categories of load, types of loads, connected load, demand factor, Maximum demand, diversity factor, load factor, power factor, TOD Tariff, Industrial Electric Bills.
Cables, conductors & bus-bars:
Construction, selection, installation, overload & short circuit ratings, rating factors; Overhead line conductors.

Unit 2: **(07 Hrs)**
Switching & protection devices:
Types, specifications; selections of isolators, switches, switch fuse units, MCB, ELCB, MCCB,ACB, VCB, SF6 breakers,
Symmetrical Short Circuit Calculations:
Determining symmetrical short circuit currents at various locations for selecting proper circuit breaker rating & determining value of series reactors for limiting short circuit current.

(N-E Hiwase) (A M Mendhe) Dr P T Kamle

Unit 3: **(07 Hrs)**

Electric supply to Induction Motors in industries:

Types of motors, SLD and working of DOL/ Star-Delta/ Autotransformer starters; types, specifications,

Reactive power management in industries:

Reactive power compensation in industries using static capacitors, use of Power Triangle, Calculating payback period for capacitor investment due to reduced system currents.

Unit 4: **(07 Hrs)**

Design of Industrial Electrical Installations:

Preparing load list, assessing various factors associated with loads, selection of transformer, busbars, cables, switchgear, protective devices, earthling system, testing, commissioning.

Unit 5: **(07 Hrs)**

Substations:

11kV & 33 kV, indoor/ outdoor substations, plan/ elevations, Earthling Arrangement,, types of earthling, methods of measurement of earthings.IE Rules applicable to residential, commercial & industrial installations.

List of Books:

Text Book:

1. A.S.Pabla, "Electric Power Distribution system"Tata McGraw-Hill.
2. P. V. Gupta, M. L. Soni, U. S.Bhatnagar "Course in Electrical Power", Dhampat Rai and Sons.,1987.
3. S. Rao "Electrical Substation Engineering & Practice", Kanna Tech. Publ., 1992.

Reference Books:

1. V. K. Jain, Er. V.K. Jain & Er.Amitabh Bajaj, "Design of Electrical Installations", Laxmi Publications Pvt Limited, 01-Jan-1993.
2. C. L. Wadhwa, "Electrical Engineering Handbook".
3. Indian Electricity Regulation 1956.

(U-E-Himase) (A M Mandhe) Dr P T Kamble

6. Electric and Hybrid Vehicles

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

B.TECH. (Electrical Engineering) (CBCS)

7th Semester Electrical Engineering (CBCS)

Syllabus of Professional Elective : V

ELECTRIC AND HYBRID VEHICLES

Subject Code : BTCHEE703T

Teaching Scheme
Theory-03Hours/Week

Examination Scheme
Th (U)=70 M (I)=30 M
Duration of University Exam:- 3 Hours

Course Objective: The students will be able to	
1	Choose a suitable drive scheme for developing an electric hybrid vehicle depending on Resources.
2	Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
3	Choose proper energy storage systems for vehicle applications
4	Identify various communication protocols and technologies used in vehicle networks.

Course Outcome:	
After Successful Completion of this course students will be able to demonstrate the ability to have:	
CO 1	Explain electric vehicle characteristics and typologies.
CO 2	Identify and analyze the process of power management system
CO 3	Analyze various power electronics devices in electric vehicles.
CO 4	Outline the types and size of electric motors in electric and hybrid vehicles.
CO 5	Identifying electric motor and internal combustion engine match and energy management strategies.

Unit-I : Introduction to Electric Vehicle (EV) & Hybrid Vehicle(HV): **(07Hrs)**

A brief history of Electric and Hybrid vehicles, basic architecture of hybrid drive train and analysis of series drive train., vehicle motion and the dynamic equations for the vehicle, types of HV and EV, advantages over conventional vehicles, limitations of EV and HV, impact on environment of EV and HV technology, disposal of battery, cell and hazardous material and their impact on environment.

Unit-2 : Power Management and Energy Sources of EV and HV: **(08Hrs)**

Power and Energy management strategies and its general architecture of EV and HV, various battery sources, energy storage, battery based energy storage and simplified models of battery, Battery Management Systems (BMS), fuel cells, their characteristics and simplified models, Super capacitor based energy storage, its analysis and simplified models, flywheels and their modeling for energy storage in HV/BEV, hybridization of various energy storage devices, Selection of the energy storage technology.

(U.F.Hiware) (A M Mendhe) Dr P T Kamde

Unit-3 :Power Converters: **(07 Hrs)**

Introduction, various power electronics converter typologies and its comparisons, Control of convertor operations in EV and HV, battery chargers used in EV & HV. DC-DC converters for EVs, Buck and Buck-Boost Converters, Multi-quadrant DC-DC converters, DC-DC converter applications, DC-AC converters for EVs, Three-phase DC-AC converters, Voltage control of DC-AC inverters using PWM.

Unit-4 : DC and AC Machines & Drives in EV & HV: **(07 Hrs)**

Various types of motors, selection and size of motors, Induction motor drives and control characteristics, Permanent magnet motor drives and characteristics, Brushed & Brush-less DC motor drive and characteristics, switched reluctance motors and characteristics, IPM motor drives and characteristics, mechanical and electrical connections of motors.

Unit-5 : Integration of Subsystems: **(07Hrs)**

Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicle, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy strategies.

Text Books:

1. Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2nd Edition, 2003.
2. James Larminie, John Lowry, "Electric Vehicle Technology", Wiley publications, 1st Edition, 2003.

Reference Books:

1. B D McNicol, D A J Rand, "Power Sources for Electric Vehicles", Elsevier publications, 1st Edition, 1998.
2. Seth Leitman, "Build Your Own Electric Vehicle" MC Graw Hill, 1st Edition, 2013.

(U E Himane)

(A M Mendhe)

Dr P T Karule

7. Environmental Studies

BEELE406T	ENVIRONMENTAL STUDIES	L = 3	T = 0	P = 0	Credits = 0
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
• Student will be able to learn the natural sources available. • Students will also learn about ecosystem, biodiversity, pollution. • Student will also learn the effect on environment on social aspects and Human population.	The student on completion of course will understood the • Ecosystem • Environmental issues related with social and human population. • Biodiversity and its conversion

Unit 1 : Multidisciplinary nature of environmental studies

Definition, scope and importance (2 lectures)

Need for public awareness.

III

Unit 2 : Natural Resources :

Renewable and non-renewable resources :

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources : Growing energy needs, renewable and non renewable, energy sources, use of alternate energy sources. Case studies.
f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resoureces for sustainable lifestyles. (8 lectures)

Unit 3 : Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lectures)

Unit 4 : Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- Inida as a mega-diversity nation

V

- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lectures)

Unit 5 : Environmental Pollution

Definition

- Cause, effects and control measures of :-

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Diaster management : floods, earthquake, cyclone and landslides. (8 lectures)

VI

Unit 6 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rahabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness. (7 lectures)

Unit 7 : Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.

VII

- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies. (6 lectures)

Unit 8 : Field work

- Visit to a local area to document environmental assetsriver/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

8. Renewable Energy Sources

III Semester B.E. (Electrical Engineering)
RENEWABLE ENERGY STUDIES
Total Credit- 04
Subject Code:-BEEE3O5T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hours/Week	Duration of University Exam:- 3 Hours
Practical:-	

Course Objectives

Students will be able to –

- Demonstrate understanding of the different types of renewable energy technologies that are currently available, and how they are used to provide energy.
- Identify strengths and limitations associated with the different renewable energy technologies.
- Identify the current major uses of energy (i.e., in agriculture, manufacturing, residential, etc.).

Course Outcomes:

After studying the course, the students will be able to demonstrate the ability to

CO1. Memorize the fundamental of solar radiation geometry
CO2. Identify and analyse the process of power generation through solar photovoltaic
CO3. Highlighting the various applications of Solar Energy.
CO4. Outline the site requirement criteria for wind farm & compare different types of wind generators.
CO5. Identifying non-conventional Energy sources such as Geothermal, MHD, Biomass, Fuel cell, Tidal, Ocean for generating Electricity.

Unit I- Solar Radiation & its Measurement (06 Hrs)

Solar Radiation & its Measurement: Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces.

Unit 2 – Solar Photovoltaic power generation (10 Hrs)

Solar Photovoltaic power generation: Physics of solar cells, Characteristic of solar cell, series and parallel connection, types of solar cell, module manufacturing, partial shading, bypass and blocking diode, load calculation, different panel calculations and selection (Monocrystalline, Polycrystalline etc), Calculation of Solar rooftop setup (rating): stand alone PV system with battery and grid connected PV system with Net Metering, Introduction to MPPT.

Unit-3 Application of Solar Energy **(07 Hrs)**

Application of Solar Energy: Solar water heating, space heating, space cooling, solar thermal heat conversion, Solar Cooking, Solar pumping, Solar Water pumping for agriculture purposes, Calculation of solar setup required in solar water pumping, Solar Green Houses, Hydrogen production from Solar Energy.

Unit – 4 Wind Energy **(10 Hrs)**

Basic principles of wind energy conversion, wind energy conversion system, wind data & energy estimation, site selection consideration, basic components of wind energy conversion system (WECS), classification of WEC system, generating system, energy storage, application of wind energy. Stand-Alone and Grid Connected Wind-Electrical Power System

Unit- 5 Other Nonconventional Energy Source **(07 Hrs)**

Brief Introduction to operating principles only: Small scale hydro electric power generation, Energy from Bio –Mass, Geothermal Energy, MHD power generation, Fuel cell, Energy from Ocean, Ocean thermal electric conversion (OTEC), Claude & Anderson cycles, Hybrid cycle, Energy from Tides ,Estimation of Energy & Power in simple single basin ,Tidal system

Text Books:

1. Non Conventional Energy Sources G.D. Rai, Khanna publishers
2. Non Conventional Energy Resources B. H. Khan 2nd , The McGraw Hill Companies
3. Solar Energy: Principles of thermal collection and storage, S. P. Sukhatme 2nd edition, Tata McGraw Hill Publishing Company Ltd.
4. Solar Photovoltaics: Fundamental, Technologies and Applications, Chetan Singh Solanki , 3rd Edition, PHI Learning Pvt. Ltd.
5. Non-Conventional Energy Sources and Utilization, R.K. Rajput, S. Chand Publications.
6. Non-Conventional Energy Resources, D S Chauhan, S K Srivastava, New Age International Publishers

Reference Books:

1. Fundamentals of Renewable Energy Processes, Aldo Vieira da Rosa, Juan Carlos Ordóñez, Fourth Edition, Elsevier Academic Press
2. Wind and Solar Power Systems: Design, Analysis, and Operation, Mukund R. Patel and Omid Beik, THIRD EDITION CRC PRESS(TAYLOR & FRANCIS)
3. Renewable & Efficient Electric Power Systems, Gilbert Masters John,, Wiley and son's publications.
4. Solar Energy , Robert Foster, Majid Ghassemi and Alma Cota, CRC Press
5. Renewable Energy Systems, David M. Buchla, Thomas E. Kissell, Thomas L Floyd, 1st edition, Pearson Publication
6. Ocean Energy: Tide and Tidal Power, R. H. Charlier, Charles W. Finkl, **SPRINGER**

Reference Links:

- http://www.nptel.iitm.ac.in/
- www.ocw.mit.edu

9. Professional Ethics

RTM Nagpur University
Mechanical Engineering

Professional Ethics Syllabus
(Theory) BEME405T

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
IV	**Professional Ethics**	3	-	-	3	30	70	100	03

Sr. No.	Course Objective The objective of this course is–
1	The objective of this course is to inculcate the sense of social responsibility among learners and to make them realize the significance of ethics in professional environment so as to make them a global citizen

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Understand basic purpose of profession, professional ethics and various moral and social issues
CO2	Analyze various moral issues and theories of moral development
CO3	Realize their roles of applying ethical principles at various professional levels
CO4	Identify their responsibilities for safety and risk benefit analysis.
CO5	Understand their roles in dealing various global issues

Professional Ethics SYLLABUS (Theory)	
Contents	No of hours
Unit I Human Values, Morals, values and Ethics, Integrity, Work ethics, Service learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage ,	**08**
Unit II Engineering Ethics, Senses of 'Engineering Ethics', Variety of moral issues, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory ,	**07**
Unit III Engineering as Social Experimentation, Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law ,	**07**
Unit IV Safety, Responsibilities and rights, Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk, Collective Bargaining, Professional Rights, Employee Rights	**07**
Unit V Global issues, Multinational Corporations, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Corporate Social Responsibility	**07**

References:

Text Books Recommended:

1. **Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.**
2. **Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S. Chand Publications**
3. **Ethics in Engineering by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.**
4. **Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.**
5. **Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman, and M. Jayakumaran – University Science Press.**
6. **Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan, and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.**
7. **Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill – 2013**

10. Sports

RTM Nagpur University
Mechanical Engineering –
IV Sem SPORTS

Course Code- BEME406P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III & IV	SPORTS	0	0	3		00	00	00	00

Sr. No.	COURSE OBJECTIVE
1	Through sports, students should able to build a wide range of abilities and skills such as leadership, confidence, teamwork, patience, self-reliance, trust, and many more which facilitate the overall development of an individual
2	Students should learn to manage time between their lectures, sports, and personal life.

EXPECTATION FROM INSTITUTES
1. Provide sports facilities 2. Provide platforms for participation in events 3. Develop interest for sports amongst students 4. Conduct regular events (every month) in college for all indoor and outdoor sports

11. Yoga

RTM Nagpur University
Mechanical Engineering –
IV Sem YOGA

Course Code- BEME406P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III &IV	YOGA	0	0	3		00	00	00	00

Sr. No.	COURSE OBJECTIVE
1	To introduce basic wellness principles and practices of Yoga to students
2	To bring awareness of the fundamentals of Yoga for wellness in their daily lives
3	To bring peace and harmony in the society at large by introducing the Yogic way of life.

EXPECTATION FROM TRAINERS

1. Brief to origin of Yoga,
2. History and Development of Yoga: Vedic Period, Classical Period, Post classical period, Modern Period.
3. Etymology and Definitions of Yoga in classical Yoga texts
4. Meaning, Aim and Objectives of Yoga,
5. Misconceptions about Yoga;
6. True Nature of Yoga;
7. Principles of Yoga;
8. Basis of Yoga.

12. National Service Scheme (NSS)

RTM Nagpur University
Mechanical Engineering –IV Sem
National Service Scheme

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III & IV	National Service Scheme (NSS)	0	0	3	00	00	00	00	00

Sr. No.	COURSE OBJECTIVE
1	1. Understand the community in which they work. 2. Understand themselves in relation to their community. 3. Identify the needs and problems of the community and involve them in problem-solving. 4. Develop among them a sense of social and civic responsibility. 5. Utilize their knowledge in finding practice solutions to individual and community problems. 6. Develop competence required for group-living and sharing of responsibilities. 7. Gain skills in mobilizing community participation. 8. Acquire leadership qualities and democratic attitudes 9. Develop capacity to meet emergencies and natural disasters. 10. Practice national integration and social harmony

EXPECTATION FROM TRAINERS

5. To assist and guide the NSS unit for implementation of NSS programs at college level
6. To advise in organizing camps, training and orientation programs for the NSS volunteers
7. To visit the NSS units for monitoring and evaluation.
8. To ensure implementation of NSS regular activities and special camping programs

RTM Nagpur University
Mechanical Engineering –
IV Sem

National Cadet Corps (NCC)

Course Code- BEME406P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III &IV	National Cadet Corps (NCC)	0	0	3		00	00	00	00

ABOUT NCC
1. NCC is the Indian military cadet corps wing of the Indian armed forces. 2. NCC offers training to the students of schools and colleges. 3. This is not compulsory training for all students.

Sr. No.	OUTCOMES EXPECTED
1	During the training of NCC, candidates should get the basic military training. This training should be conducted to develop the interest of young students in all three forces; the army, the navy and the air force of India. Students should be able to check their abilities to join the Indian Defence Services.

Sr. No.	AIM
1	To create an organized, trained and motivated youth, create soldiers for the nation, develop the leadership skills in the youth.

13. Elective-III: Renewable Energy Systems

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

B.TECH. (Electrical Engineering) (CBCS)

7th Semester Electrical Engineering (CBCS)

Syllabus of Professional Elective : V

INTRODUCTION TO SMART GRID

Subject Code : BTCHEE703T

Teaching Scheme
Theory-03Hours/Week

Examination Scheme
Th (U)=70 M (I)=30 M
Duration of University Exam:- 3 Hours

Course Objective: The students will be able to	
1	1. To provides overview of smart grid and its potential in different types of power sectors
2	To focus on background and fundamental building blocks of smart grid.
3	To emphasizes on renewable energy source integration in present grids as well as in micro andnano grid.

Course Outcome:	
After Successful Completion of this course students will be able to demonstrate the ability to have:	
CO 1	Present energy scenario and feature s of smart grid
CO 2	Identify components and computational tools for smooth functioning of smart grid.
CO 3	Analyze the various protection issues of smart grid.
CO 4	Design smart grid with options like automation.
CO 5	Sustainable energy options for the smart grid.

Unit 1: Introduction to Smart Grid **(06 Hrs)**

Introduction to Smart Grid, need and importance of Smart Grids compared to existing system, Architecture of Smart Grid, Elements and technologies of Smart Grid system, Indian Electricity Grid Codes and Indian energy scenario, smart grid market.

Unit 2: Smart grid Communication and Performance **(08 Hrs)**

Communication and measurement requirements, Network need for diverse Smart Grid applications, wired and wireless communication technologies with challenges, smart meters, Congestion management effect, Static Security assessment (SSA) and contingencies.

Unit 3: Smart Grid Protection **(07 Hrs)**

Introduction, Protection of micro grids and smart grids, different protection issues in Smart Grid, IEC 61850 & communication-aided protection systems

Unit 4: Computational Tools for Smart Grid Design **(07 Hrs)**

Introduction to computational tools, Decision support Tools (DS), Heuristic Optimization, Evolutionary Computational Techniques, Adaptive Dynamic Programming Techniques, Hybridizing optimization techniques and applications to the smart grid, Computational Challenges.

Unit 5: Renewable Energy and Storage:

(08 Hrs)

Sustainable energy options for the smart grid, Penetration and variability issues associated with sustainable energy technology, Demand-response issue, Electric vehicles and Plug-in Hybrids, PHEV Technology, Environmental Implications, Storage Technologies, Tax Credits.

Text Book:

1. A Keyhani and M Marwali "Smart Power Grids", Springer Publication, 1st Edition, 2012.
2. Arun Phadke and James Thorp "Computer Relaying for Power Systems", John Wiley publication, 1st Edition 2009.

Reference Books:

1. Ramesh Bansal, "Power System Protection in Smart Grid Environment", CRC Press, 1st Edition, 2019.
2. Smart Grids, Infrastructure, Technology and Solutions, S. Borlase, "Smart Grid: Technology and Applications", Wiley 2012.

14. Industrial Economics and Entrepreneurship Development

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication/ Electronics & Telecommunication Engineering/Electronics Engineering
B.Tech.5 th Semester

Subject: INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP DEVELOPMENT.

Examination Scheme:

Units: 05.

Marks: Internal - 30
External - 70

Objective
Study of this subject provides an understanding of the scope of an industrial economics and entrepreneurship development, key areas of business development, sources of finance, project preparation, methods of taxation and tax benefits, significance of entrepreneurship and economic growth, application of engineering skills in entrepreneurial activities etc.

Course Outcomes:After completing the course, students will be able to:

CO1. Understand different types of business structure.

CO2. Acquire the knowledge of different market structures and New economic policy

CO3. Grasp the functions of banks, taxations system and implications of Inflation.

CO4. Identify various sources of finance

CO5. Analyse the problems of Small Scall Industries and government's policies for them.

1. Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

2. Market structures- Monopoly, Oligopoly, and Monopolistic competition. Pricing strategies, business integration- forward backward integration, economies of scale, diseconomies of scale, liberalization, privatization and globalization, Business cycles, optimum size of firm.

3. The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Inflation, Recession, Inclusive growth, Public-Private partnership for development

4. Need – Sources of Finance, Term Loans, Capital Structure, venture capital. Angel funding, Financial Institution, management of working Capital, Break Even Analysis, Taxation – Direct, Indirect Taxes.

5. Sickness in small Business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

TEXT BOOKS

Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.

Modern Economic Theory By, K.K. Dewett. S.Chand.

Industrial Economics. By, Jagdish Sheth, Pearson Publication.

"Entrepreneurial Development" By, S.S.KhankaS.Chand& Co. Ltd. Ram Nagar New Delhi, 1999.

Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.

Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.

Entrepreneurial Development. By, S.Anil Kumar. New Age International.

Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.

REFERENCE BOOKS:

Business Economics. By, K.Rajgopalchar. Atalantic Publishers.

Microeconomics. By, Robert Pindyk

Business Economics.By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.

Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.

Financing Small Scale Industries in India, By, K.C.Reddy.Himalaya Publication.

15. Effective Technical Communication

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Electronics and Communication / Electronics & Telecommunication Engineering /Electronics Engineering

B.Tech. 6th Semester

Subject: Effective technical Communication (Theory)

Course Code :BEETC606T CREDITS: 02

Teaching Scheme Examination Scheme

Lectures: 2 Hours/Week Duration of Paper: 02 Hours

Tutorial: 1 hour/week University

Assessment: 35 Marks

College Assessment: 15 Marks

Objective: At the end of the semester, students will have enough confidence to face competitive examinations(IELTES/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.)to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Course Outcomes: After completing the course, the students will be able to

1. acquire knowledge of structure of language.
2. Build vocabulary and face interview process and can become employable.
3. develop business writing skills.
4. Understand technical and scientific writing skills.

Course Structure

Unit1.FunctionalGrammar: (6 hours)

Common errors, Transformation of Sentences (Change the voice, Change the narration,

transformation of Simple , Compound, Complex sentences), Use of Phrases, Idioms& Proverbs.

UnitII. English for Competitive Exams & Interview Techniques:

(6hours)

Prefix, Suffix, Word building processes, **English** words /phrases derived from other languages, Technical Jargons, Synonyms/Antonyms, Verbal Analogies, Give one word for, Types &Techniques of Interview

Unit III.Formal Correspondence and Analytical Comprehension

(6hours)

Job applications and Resume Writing, Business Letters,(Enquiry, Quotation, Orders, Complaints), Writing Memorandum, Circulars, notices, e-mail etiquettes, Unseen Comprehension passages

UnitIV. Technical &Scientific Writing:

(6hours)

Features of Technical Writing, Technical Report writing, Writing Manuals, Writing Project and research Proposals, Writing Research papers.

- **Reference Books:**
- EffectivetechnicalCommunicationbyBarunK.Mitra,OxfordUniversityPress,
- *TechnicalCommunication-PrinciplesandPractice*byMeenakshiRaman&Sharma,OxfordUniversityPress,2011, ISBN-13-978-0-19-806529-
- *HowtoPrepareaResearchProposal*:GuidelinesforFundingandDissertationsintheSocialandBehavioralSciencesbyKrathwohl&RDavid
- *TechnicalWriting-ProcessandProduct*bySharonJ.Gerson&StevenM.Gerson,3rdedition,PearsonEducation Asia, 2000
- *Developing Communication* skills by Krishna Mohan & Meera Banerjee
- *Functional English by* Dr. P. Mahato and Dr. Dora Thompson, Himalaya Publications

16. Electrical Safety and Standards

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.TECH. (Electrical Engineering) (CBCS)
8th Semester Electrical Engineering (CBCS)
Syllabus of **Electrical Safety & Standards.**
Subject Code : BTCHEE801T

Teaching Scheme
Theory-03Hours/Week

Examination Scheme
Th (U)=70 M (I)=30 M
Duration of University Exam:- 3 Hours

COURSE OUTCOMES	
Upon successful completion of the course, the student must be able to	
CO1	Understand the Indian power sector organization and Electricity rules, electrical safety in residential, commercial, agriculture, hazardous areas .
CO2	Outline the electrical safety during installation, testing and commissioning procedure.
CO3	Make use of specification of electrical plants and classification of safety equipment for various hazardous locations.
CO4	Understand Safety Management & Standards in Electrical Systems.

SYLLABUS

Unit No.	Contents	Hours
1	**Introduction To Electrical Safety, Shocks And Their Prevention:** Terms and definitions, objectives of safety and security measures, Hazards associated with electriccurrent and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings andshop.	8
2	**Electrical Safety in Residential, Commercial and Agricultural Installations:** Wiring and fitting –Domestic appliances –water tap giving shock –shock from wet wall –fan firing shock –multi-storied building –Temporary installations – Agricultural pump installation –Do's and Don'ts for safety in the use of domestic appliances.	7
3	**Electrical Safety during Installation, Testing and Commissioning, Operation and Maintenance**: Preliminary preparations –safe sequence –risk ofplant and equipment –safety documentation –field quality and safety -personal protective equipment –safety clearance notice –safety precautions –safeguards for operators –safety.	7
4	**Electrical Safety in Hazardous Areas:** Hazardous zones –class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipment's for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.	6
5	**Safety Management of Electrical Systems:** Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees. **Review of IE Rules and Acts ,their Significance**: Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and fire fighting facility. The Electricity Act, 2003,	8

Learning Resources
Text Books:
1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988. 2. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997
Reference Books:
1. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth Company, 1978. 2. John Codick, "Electrical safety hand book", McGraw Hill Inc., New Delhi, 2000. 3. Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1998. 4. Wadhwa, C.L., "Electric Power Systems", New Age International, 2004.

17. Project Phase-2

B. Tech. Eighth Semester (CBCS)

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engineering)

Project phase 2

Subject Code: BEETC-803P **[L:0 –P:12- T:0 – 12]** **Credit: 0-6-0-6**

Course Objectives:

The object of Project Work II is to enable the student to extend further the extend project taken up under Project Phase-I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry

Course Outcome: By the end of the course, the students shall be able to

1. Analyze or Design the Electronics /telecommunication /allied Engineering problems by using appreciate methodology in a team work.
2. Interpret the communication skills of team members and
3. Use of Modern tools in the field of Electronics Engineering

Guidelines:

- In continuation to semester VII project work, the group of the students shall collect all necessary information pertaining to the project and analyse it.
- The group of the students shall prepare and submit a detailed report on the project.
- Student group shall try to implement project in minimum cost and learn financial aspect of project.
- Preferably project definition shall be in discussion and association with any industry
- The report shall be type written on A4 size papers and hard bound as per prescribed norms.
- Broadly the report shall include: Introduction, Literature Review, Problem definition, Data collection and analysis, Results (Numerical / Experimental), Conclusions and discussions.
- Acquaintance with survey and research methods and their use in conducting systematic investigations, use of data analysis tools, computational methods and style of report, preparation and presentation shall form basis of evaluation.
- The group shall prepare and present a seminar based on this work before an external examiner

N. G. Bawane

18. Universal Human Values

RashtrasantTukadoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E IVthsem (ETC/ECE/EN)

Subject: Universal Human Values (Theory)

CREDITS: 03

Teaching Scheme: 3 Hours/Week:

Examination Scheme: University Assessment: 70 Marks
College Assessment: 30 Marks

Aim: To inculcate sensitivity among students towards themselves and their surrounding including family, society and nature

Objective: The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration, about themselves(humanbeing), family,society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being,family,society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course outcomes: By the end of the course,

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. Students would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Students would understand values in relationship.
4. Students would understand the role of a human being in ensuring harmony in society and nature.
5. Students would distinguish between ethical and unethical practices at work place and would contribute for making a value based society

Unit 1

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education.

(6 hours)

Unit 2

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body, Understanding Harmony of I with the body, Sanyam, Aspects of Sanyam, Types of Sanyam,

benefits and obstacles in the path of Sanyam, Swasthya, Aspects of Swasthya, Determinants of Swasthya, Ways to maintain Swasthya.
(8 hours)

Unit 3

Values in relationship (nine universal values in relationships), Understanding values in human-human relationship; Meaning of Justice, Elements of Justice, Understanding meaning of Trust; Elements, Types and Dimensions of Trust, Difference between intention and competence.
(6 hours)

Unit 4

The five dimensions of human endeavour, the holistic perception of harmony in existence, Understanding harmony in society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. (8 hours)

Unit 5

Basics for ethical human conduct, definitiveness in ethical human conduct, human rights violations and social disparities, value based life, Competence in professional ethics
(8 hours)

Text Book: Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,ExcelBooks, NewDelhi,2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Indian Ethos and Modern Management: Amalgam of the best of the ideas from the East and the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004
4. Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009

19. Environmental Engineering (open Elective-I)

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VI	Total Hours Distribution per week		
Total Credit:03	Lecture (L): 03 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): Nil Hrs.
Subject Code	BECVE605T	Name of Subject: Environmental Engineering (Open Elective-I)	

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objective	
1	Understanding the concept and principles of environment.
2	To impart knowledge on the sources, effects and control techniques of water pollution.
3	To understand the behaviour of air pollutants and the strategies to control their presence in the ambient atmosphere.
4	To provide a comprehensive insights of the types, sources, generation, storage, collection, transport, processing and disposal of solid waste.

Course Outcome	
After completion of syllabus student able to	
1	Explore the components of biosphere and impact of human activity on environment.
2	Summarize the causes and sources of pollutants, and their impact on global environment.
3	Develop ethics and scientific awareness about waste generation and treatment.
4	Identify sources and types of wastes and its management.
5	Understand noise, noise pollution and control.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	1	1	1	2	3	1	3	1	1	1
CO 2	3	2	1	2	1	1	3	1	3	1	2	2
CO 3	2	2	1	1	1	2	2	1	2	1	1	1
CO 4	2	2	1	2	1	1	2	1	2	1	1	1
CO 5	2	1	1	2	1	1	2	1	2	1	1	1

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Introduction to Environment			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Definition, scope and importance of environmental studies. Ecosystem, types, structure and function of ecosystem.	01		1
Energy flow in ecosystem. Biodiversity and its importance, threats to biodiversity and conservation of biodiversity. Natural resources and associated problems.	02		1
Renewable and non-renewable resources, forest resources- Description, benefits, Effects due to deforestation, Water resources –Use and conservation. Mineral resources–mining activity.	02		1
Role and responsibility of engineer in environmental protection, health and safety. Fire hazards, prevention and precautions. Industrial hazards prevention and protection.	01		1
Protection from air and noise pollution. Environment protection act Wild life protection act. Forest conservation act.	01		1
Population growth aspects and importance and effects on environment. Human health and Human rights. Concept of carbon credits.	01		1
	08		
Unit No.2 Water Pollution & Waste Water Treatment Method			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Water resources, Classification of water, Origin, composition and characteristics of domestic waste water as well as industrial waste water, Biochemical oxygen demand, Water pollution laws and standards.	02		2
Water conservation, watershed management, Rain water harvesting: Definition, methods and benefits.	02		2
Water (prevention and control of pollution) act, Waste water, Classification of waste water, Chemical oxygen demand. Basic processes of water treatment.	01		2

Meaning of primary, secondary and tertiary treatment.	01		2
Flow chart of a simple effluent treatment plant, Theory of industrial waste treatment, Volume reduction, neutralization and precipitation methods.	01		2
	07		
Unit No.3 Air Pollution			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Standard definition of air pollution, Composition of natural air, Names of air pollutants, Classification of air pollutants, primary and secondary pollutants.	02		3
Classification of source of air pollutants on different bases, Definition of different types of aerosols.	01		3
Effect of air pollution on: human health, material properties, vegetation. Major toxic metals and their effects. Air (prevention and control of pollution) act.	01		3
Major environmental phenomenon e.g., acid rain, global warming, greenhouse effect, ozone layer depletion.	01		3
Air quality standards, Brief description of air pollution laws. Meteorological parameters influencing air pollution Environmental lapse rate, temperature inversion.	01		3
Role of national green tribunal in India, Function of Regulatory boards like CPCB and State Pollution Control Boards	01		3
	07		
Unit No.4 Energy Environment Climate Change			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
An overview of Bureau of Energy Efficiency (bee), The National Action Plan on Climate Change (NAPCC),	02		4
Schemes under The National Mission for Enhanced Energy Efficiency (NMEEE),	02		4
Energy Conservation Building Code (ECBC),	01		4
Bio diversity and its conservation, Sustainable development, Kyoto Protocol,	01		4
Conference of Parties (Cop), Clean Development Mechanism (CDM).	01		4
	07		
Unit No.5 Solid Waste Management & Noise Pollution			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Sources and classification of solid waste, Public health aspects, Disposal methods – open dumping, sanitary, land fill, Incineration, compositing.	02		5
Potential methods of disposal, Recovery and recycling of paper, glass, metal and plastic Sources of noise pollution.	02		5

Units of Noise pollution measurement, Allowable limits for different areas.	01		5
Problems of noise pollution and measures to control it, Noise pollution control devices brief discussion	02		5
	07		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference Book
1	Environmental Engineering	Peavy and Rowe	McGraw Hill India.	2013			
2	Noise Control: Principles and Practices	Bruel & Kjaer,	. B & K Pub., Denmark	2nd ed			
3	Wastewater Engineering: Treatment and Reuse		Metcalf and Eddy	4th ed			
4	Environmental pollution control Engineering	C.S. Rao					
5	Industrial waste and its treatment	Seth					

(Dr. Avinash N Shrikhande)
BoS (Civil Engg.) Chairman

20. Ethics in IT

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: III (C.B.C.S.)

BRANCH: COMPUTER SCIENCE & ENGINEERING

Subject : ***Ethics in IT*** Subject Code : **BECSE305T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
3 Hrs. (Theory)	3	30	70	100

Aim: To understand the ethical behavior of individuals, organizations towards IT Profession

Prerequisite(s): None

Course Objectives:

1	Ability to understand and meet ethical standards and legal responsibilities.
2	Create an awareness on professionals Ethics and Human Values.
3	Discuss the Privacy and Anonymity issues, Defamation and Hate Speech
4	Gain the knowledge of Copyrights, Patents and Trade Secret Laws.
5	Create and understand the awareness on Whistle-blowing

Course Outcomes:

At the end of this course Student are able:

CO1	Acquire knowledge about ethical values & principals.
CO2	Understand key issues of privacy protection policies.
CO3	Understand and apply Intellectual Property Rights and related law in reality.
CO4	Understand the core values that shape the ethical behavior of an engineer / IT Professional.
CO5	Identify the multiple ethical interests at stake in a real-world situation.
CO6	Develop cognitive skills in solving social problems.

Unit I: **[09 Hrs]**

An overview of Ethics: Ethics in IT, Ethics for IT professionals and IT users, IT professionals, Ethical behavior, IT professional malpractices, IT users. Educating Employees, contractors and part-time Workers **Computer and Internet Crime:**Types of Exploits, Reducing Vulnerabilities, Establishing a Security Policy, Prevention, Detection, Response.

Unit II: **[07 Hrs]**

Privacy: The right of Privacy, Recent History of Privacy Protection, Key Privacy and Anonymity issues, Governmental Electronic Surveillance, Data Encryption, Identity Theft, Consumer Profiling, Workplace Monitoring, Advanced surveillance Technology, Freedom of Expression: Key issues, Controlling Access to Information on the Internet, Defamation and Hate Speech.

Unit III: **[07 Hrs]**

Intellectual Property: Copyrights, Patents, Trade Secret Laws, Key Intellectual Property Issues, Plagiarism, Reverse Engineering, Open Source Code, Software Development, Strategies to Engineer Quality Software, Capability Maturity Model Integration for Software, Development of Safety-Critical Systems.

Unit IV: **[06 Hrs]**

Ethics of IT Organization: Need for Nontraditional Workers, Contingent Workers H-IB Workers, Whistle-blowing, Protection for Whistle-Blowers, Dealing with Whistle-Blowing Situation.

Unit V: **[07 Hrs]**

The Impact of Information Technology on the Quality of Life: The impact of IT on the standard of Living and productivity, The impact of IT on Health care costs, Electronic Health Records, Use of Mobile and Wireless Technology, Telemedicine.

Text books:

1. George Reynolds, "Ethics in information Technology" Cengage Learning

Reference books:

1. Deborah G.Johnson,"Computer Ethics",3/e Pearson Education.
2. Sara Baase, "A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet," PHI Publications.
3. Richard A.Spinello, "Case study in Information Technology Ethics", second Edition PHI Publications.
4. Duncan Lanford "Internet Ethics".
5. D. Micah Hester and Paul J. Ford "Computer and Ethics in the Cyber age".
6. Prof.A.R.Aryasri, Dharanikota Suyodhana "Professional Ethics and Morals" Maruthi Publications.
7. A.Alavudeen, R.KalilRahman and M.Jayakumaran "Professional Ethics and Human Values" - LaxmiPublications.

21. Universal Human Values

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: 3rd (C.B.C.S.)

BRANCH: COMPUTER SCIENCE & ENGINEERING

Subject : ***Universal Human Values*** Subject Code : **BECSE306T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
02 Hrs (Theory)	02	15	35	50

Aim: To inculcate sensitivity among students towards themselves and their surrounding including family, society and nature.

Prerequisite(s): None

Course Objectives:

1	Development of a holistic perspective based on self-exploration, about themselves (human being), family, society and nature/existence.
2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3	Strengthening of self-reflection.
4	Development of commitment and courage to act.

Course Outcomes:

At the end of this course Student are able to:

CO1	Become more aware of themselves, and their surroundings (family, society, nature)
CO2	Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO3	They would have better critical ability.
CO4	Become sensitive to their commitment towards what they have understand (human values, human relationship and human society).

Unit 1 **[06 Hrs]**

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education.

Unit 2 **[06 Hrs]**

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body.

Unit 3 **[06 Hrs]**

Values in relationship, the five dimensions of human endeavour, the holistic perception of harmony in existence.

Unit 4 **[06 Hrs]**

Basics for ethical human conduct, defects in ethical human conduct, human rights violations and social disparities, value based life.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Indian Ethos and Modern Management: Amalgam of the best of the ideas from the East and the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004
4. Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009

22. Power Quality

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.TECH. (Electrical Engineering) (CBCS)
Syllabus of Professional Elective-VII: Power Quality

8th Semester Electrical Engineering (CBCS)
Subject Code : BTCHEE803T

Course Outcomes:

After the study of this course, the students will be able to:

CO1: Explain importance of Power Quality and good grounding practices.

CO2: Describe the causes of flickers and transient over voltages and suggest corrective measures.

CO3: Discuss the causes and consequences of voltage sags and suggest mitigation techniques

CO4: Discuss the causes and effects of harmonics and suggest harmonic reduction techniques.

CO5: Explain the need, objectives and approaches of power quality monitoring and assessment.

Unit 1: Introduction — 8 Hours

Importance of power quality, terms, and definitions of power quality as per IEEE std. 1159. such as transients, short and long duration voltage variations, interruptions, short and long voltage fluctuations, imbalance, flickers and transients. Symptoms of poor power quality. Definitions and terminology of grounding. Purpose of groundings. Problems due to poor grounding and good grounding practices.

Unit 2: Flickers and Transient Voltages — 6 Hours

RMS voltage variations in power system and voltage regulation per unit system, complex power. Principles of voltage regulation. Various devices used for voltage regulation and impact of reactive power management. Various causes of voltage flicker and their effects. Various means to reduce flickers. Transient over voltages & their sources, impulsive transients, switching transients, Effects & Control of transient voltages.

Unit 3: Voltage Sag, Swells and Interruptions — 6 Hours

Definitions of voltage sag and interruptions. Economic impact of voltage sag. Major causes and consequences of voltage sags. Voltage sag characteristics. Voltage sag assessment. Influence of fault location and fault level on voltage sag. Areas of vulnerability. Assessment of equipment sensitivity to voltage sags. Mitigation measures for voltage sags, such as UPS, DVR, SMEs, CVT etc.

Unit 4: Waveform Distortion — 8 Hours

Definition of harmonics, inter-harmonics, sub-harmonics. Causes and effect of harmonics. Voltage versus current distortion. Harmonic indices. A.C. quantities under non-sinusoidal conditions. Harmonics series and parallel resonances. Consequences of harmonic resonance. Principles for controlling harmonics. Reducing harmonic currents in loads. K-rated transformer. Computer tools for harmonic analysis. Locating sources of harmonics. Harmonic filtering, passive and active filters. IEEE Harmonic standard519-1992.

Unit 5: Power Quality Monitoring — 8 Hours

Need of power quality monitoring and assessment, Power quality monitoring objectives and requirements. Initial site survey. Power quality Instrumentation. Selection of power quality monitors, selection of monitoring location and period. System wide and discrete power quality monitoring. Setting thresholds on monitors, data collection and analysis. Selection of transducers. Harmonic monitoring, Transient monitoring, event recording and flicker monitoring, Power quality indices and standards.

Text Books		
Title of Book	**Name of Author/s**	**Edition & Publisher**
Understanding power quality problems, voltage sag and interruptions	M. H. J. Bollen	IEEE press, 2000, series on power engineering
Electrical power system quality	R.C. Dugan, M.F. McGranghan, S. Santoso, H. Wayne Beaty	2nd, McGraw Hill Pub.
Reference Books		
Power system quality assessment	J. Arrillaga, M.R. Watson, S. Chan	John Wiley and sons
Electric power quality	G. J. Heydt	
Power system harmonics: Computer modeling and analysis	EnriquesAcha, Manuel Madrigal	John wiley and sons ltd
Power System Harmonics	J. Arrillaga& N. Watson	
IEEE std 519-1992/ IEEE std 1159 IEEE recommended practices and requirements for harmonics control in electrical power system		

23. Sustainable Resource Management

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	Total Hours Distribution per week		
Total Credit:03	Lecture (L): 03 Hrs.	Tutorial/Activity : - 0 Hrs.	Practical (P): - 0 Hrs.
Subject Code	BTCVE702T	Name of Subject: Sustainable Resource Management (Elective IV)	

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objective	
1	Students should be able to get knowledge of natural resources and sustainability
2	Students should be able to learn about Land, Soil and Water resources
3	Students should be able to learn about the different available conventional and non conventional energy resources
4	Students should be able to learn about various available forest and mineral resources
5	Students should be able to get knowledge of Natural Resource Conservation

Course Outcome	
After completion of syllabus student able to	
1	To be able to understand the various available natural resources with their objectives, demand and Social dimensions related to the sustainability.
2	To be able to understand the various available land, soil and water resources with their objectives, impacts, renewal and management
3	To be in a position to understand various Conventional and Non-renewable Energy Resources
4	To be in a position to understand the forest and mineral resources
5	To be in a position to understand the Natural Resource Conservation system

SYLLABUS

Unit No.1 Natural resources & Sustainability			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction to natural resources, objectives, Types of natural resources	02		1
India-general information of climate, land and soil, water resources, energy resources, agro climatic zones	01		
List of natural resources, Values of natural resources and Demands of Natural Resources	01		
Sustainability- definition, importance, environmental, economical and Social dimensions of sustainability	01		
Global, Regional and Local environmental issues, Insecurity of Resource Degradation, Climate Change	02		
	07		

Unit No.2 Land, Soil and Water resources			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction, objectives, Land resources, Land use pattern in India, Impact of land resource management, Introduction of Waste Land	02		2
Soil- Soil Profile, Soil Classification, Soil Erosion and Soil Degradation, Soil Conservation	01		
Water Resources, Different water resources, Hydrological cycle and its components	02		

Classification of water resources, Use of Water Resources, characteristics of water resources	01		
Supply and Renewal of Water Resource, Water Resources and Problems - The Indian Scenario	01		
	07		

Unit No.3 Energy Resources

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Energy Resources- Introduction, Objectives and list of Conventional and Non-renewable Energy Resources	01		3
Non-conventional forms of energy - Coal , petroleum , natural gas and lignite, resources and reserves available in India	02		
Renewable energy resources-Solar energy , Solar power; Wind energy, wind farms	01		
Geo-thermal energy ; Hydropower and micro-hydel power ; Tidal energy; Ocean.	01		
Thermal Energy Conversion(OTEC) Technology; Hydrogen as an alternate fuel	02		
	07		

Unit No.4 Forest and Mineral Resources

Details of Topic :	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction to forest Resources, Forest vegetation, status and distribution, contribution as resource	01		4
Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people	02		
Forest products, Developing and developed world strategies for forestry	01		
Mineral Resources- Origin of Mineral Resources, Mineral Resource Abundance and Distribution	02		
The Formation of Minerals, Locating and Extracting Mineral Resources	01		
	07		

Unit No.5 Natural Resource Conservation

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Conservation- Introduction, Objectives, Overexploitation of Natural Resources	01		5
Degradation and Depletion of Natural Resources, Land Degradation Deforestation, Soil Erosion	02		
Water Pollution, Air Pollution, Need for Conservation	01		
Key Issues in Natural Resource Management, Land Reclamation	01		

Conservation of Water Resources, Energy Conservation	02		
	07		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
	Ecology of Natural Resources.	Francois Ramade	John Wiley & Sons Ltd.	1984	Text book		
	Managing Natural Resources- Focus on Land and Water.	Harikesh N. Mishra	PHI Lerning Publication.	2014	Text book		
	Renewable Energy Resources: Basic Principles and Application,	Tiwari, G.N. and M. K. Ghosal.	Narosa Publishing.	2005	Text Book		
	Energy & Environment: A Primer for Scientists and Engineers, Addition-	Edward H. Thorndike	Wesley Publishing Company, Reading.	1976	Text Book		
	Trees and Forest Management.	West, P.W.	Springer Publication	2004	Text Book		
	Tropical Forest Ecology: The Basis for Conservation and Management.	Montagnini, Florencia, Jordan, Carl F.	Springer Publication	2007	Text Book		
	A New Century for Natural Resources Management.	Knight, Richard L.	Island Press.	1995	Text Book		
	Water treatment and Air pollution	Dr. R.M. Dhoble, Dr. R.N.Patil, Dr. A. M. Bhamburkar	Book Rivers Publication ISBN: 978-93-5515-327-2	2022	Text Book		
	Integrated Watershed Management:	Heathcote, I.W.	Principles and Practice.John Wiley.	1988			Reference book

	Forest Ecology	James P. Kimmins	Pearson Publication.	2006			Reference Book
	Forest Mensuration	Larr, Anthonie Van, AkcaAlparslan	Springer Publication	2007			Reference Book

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
	Handbook of Natural Resource and Energy Economics Volume-3		1993
	The Handbook of Natural Resources, CRC Press; 2nd edition (10 June 2020)		2020

(Dr. A.N. Dalhade) BOS Member

(Dr. Avinash N Shrikhande,) BOS (Civil Engg) Chairman

24. BECVE605T Environmental Engineering-II

Semester: VI

ENVIRONMENTAL ENGINEERING-II

BECVE605T **Evaluation Scheme: (80/20)**

(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs.**

COURSE OUTCOMES: The students shall be able to

1. Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
2. Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
3. To test the sample of waste water in the laboratory for physical & chemical characteristics.
4. Take-up functional planning, layout and design of water treatment plant components.
5. Take-up functional planning, layout and design of sewage treatment plant components.
6. Plan for rural sanitation provisions, perform functional design of septic tank,
7. Analyze the industrial waste water for its treatment units.
8. Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

Unit-I

General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.)

Unit - II

Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance.

Unit - III

Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatment - Screens, Grit chambers, oil & grease removal. Primary settling tank (including simple design)

Unit- IV

Secondary treatment - Principle of Biological Treatment Activated sludge process, trickling filter, (Indian Standard for disposal), Methods of disposal, Sewage farming, self purification of stream (Streeter Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion, sludge drying beds.

Unit - V

Rural sanitation; Pit privy, aqua privy, bio-gas recovery Septic tank including soak pit, including design problem (as per relevant I.S. Code) Sullage collection and disposal

Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and processes (flow equalization, neutralization, adsorption, chemical and biological treatment (in brief)

Unit VI

Air pollution and solid waste: Sources, classification, Effects, prevention and control. Introduction to carbon credit system and climate change

REFERENCE BOOKS

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication
2. S.K.Garg, "Environmental Engineering" -Vol II Standard Publication
3. G.S.Birdie, "Water Supply & Sanitary Engineering"
4. M.J.Macghee, "Water Supply & Sewage" – McGraw Hill Publication
5. M.N.Rao & HV.N.Rao, "Air Pollution" McGraw Hill Publication
6. C.S.Rao,"Enviromental Pollution Control Engineering".

25. BECVE 303T ENVIRONMENTAL ENGINEERING – I

Semester : III Semester

Objectives:

1. To prepare students to apply basic knowledge of environmental engineering in conventional civil engineering practice involving water supply engineering in particular.
2. The course will provide students knowledge regarding the sources, of water demands, population forecasting, and conveyance of water.
3. To prepare students to analyze, plan, and design of various phases of water supply systems.
4. To provide the students the knowledge regarding the various characteristics of water, estimation of the quantity of water.
5. The course will provide students with fundamentals of solid waste management

Outcomes:

a. The students would be able to understand the importance and necessity of water supply.
b. The students would be able to determine the capacity of water supply scheme.
c. The students would have the basic knowledge related to the conveyance systems and the appurtenances used.
d. The students would have knowledge of characteristics of water, drinking water standards and necessity of treatment.
e. The students would be able to design various units of conventional water treatment plant.
f. The students would be equipped with the basic knowledge related to design of water supply system.
g. The students should be able to understand of necessity of treatment, types of treatment processes and disposal methods for solid waste.

Syllabus :

Unit – I

Introduction: Importance and necessity of water supply scheme.

Water Demand: All types of water demand, empirical formulae, factors affecting per capita demand, variation in demand, design period, population forecasting methods and examples.

Sources of water: Rain water, Ground water-springs, infiltration galleries, Dug wells, tube wells, Surface water-stream, lake, river, impounding reservoirs, ponds & sea.

Intake structures: Location, types river, lake, canal, reservoir etc.

Unit – II

Conveyance of water: Types of pipes, joints, fittings, valves & appurtenances.

Hydraulic design aspects: Friction, Manning's, DarcyWeishbach& Hazen Williams equationand problem.

Rising main and pumps: Concept of rising main, Classification, working, merits and demerits, selection of pumps.

Unit – III

Water quality: Physical, Chemical and bacteriological characteristics of water, Health effects of various water characteristics, Standards of drinking water. (WHO 2011, CPHEEO, IS 10500). Water born diseases

Water treatment: Objective of treatment, unit operations and processes, house hold & community based rural water treatment, decentralized water treatment, flow sheet of conventional water treatment plant.

Aeration: Purpose, types of aerators, design of cascade aerator.

Coagulation and Flocculation: Definition, Principles, types of coagulants and reactions, coagulant doses, types of mixing and flocculation devices.

Unit – IV

Sedimentation: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank.

Clariflocculators: Principles and operation.

Filtration: Mechanism of filtration, types of filters-RSF, SSF, Pressure filters, elements of filters sand specification, operational problems in filtration, Design of SSF and RSF, Membrane filtration technique of water treatment.

Unit – V

Disinfection: Purpose, Mechanism, criteria for good disinfectant, various disinfectants, their characteristics, disinfection by chlorination using different forms of chlorine. Types of chlorination.

Distribution systems: Requirements of a good distribution system, methods of distribution systems and layouts, Leakage and leak detector, Study of fire hydrants.

Storage reservoirs for treated water: Types, capacity of reservoir, mass curve.

Unit – VI

Municipal solid waste management : Generation sources, composition, Methods of Collection, transportation, disposal, Recycle, Reuse.

Examples on simple hydraulic design of pipes, estimation of population and water quality, plain sedimentation tanks, cascade aerators, filters, pumps, dose of chlorine). Visit to Water treatment plant (compulsory).

Subject Code: BECVE 303 P PRACTICAL ENVIRONMENTAL ENGINEERING – I

Semester : III

BECVE 303 PPRACTICAL ENVIRONMENTAL ENGINEERING – I

A ny TEN (Total)

I. Any Seven

1. Determination of pH
2. Determination of Conductivity
3. Determination Chlorides
4. Determination of Solid's (Suspended & dissolved)
5. Determination of Turbidity
6. Determination of Acidity
7. Determination of Dissolved Oxygen
8. Determination of Membrane filtration technique.
9. Determination of Available Chlorine
10. Determination of Residual Chlorine
11. Jar Test
12. Bacteriological Plate count and MPN tests.
13. Determination of Alkalinity.

II. Only demonstration of COD, BOD.
III. Design of WTP using software.
IV. Brief Report on WTP Visit.

26. Air Pollution & Solid Waste Management

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 03 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE703T	Name of Subject: Air Pollution & Solid Waste Management (Elective-V)	

Examination Scheme			
Internal Marks:	Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives:

1.	The course will provide students knowledge regarding different aspects of air pollutants, its sources and effects, meteorological parameters, air sampling
2.	The course will prepare students to design equipments for air pollution to reduce its impact on environment
3	The course will provide students the knowledge regarding problems arriving in handling large amount of solid waste generated, its collection, transportation, and processing
4	The course will prepare students to learn emerging technologies for air pollution control, design safe collection and disposal methods.

Course Outcomes:

1.	Students will be able to understand different aspects of air pollutants, its sources and effects on man & materials and Meteorological parameters
2.	Students will be able to understand methods of air sampling & design equipments for air pollution to reduce its impact on environment
3	Students will be able to understand problems arriving in handling large amount of solid waste generated
4	Students will be able to understand problems arriving in its collection, transportation, and processing & to design safe collection and disposal methods
5	Students will be able to learn emerging technologies for air pollution control.

UNIT-I (07 Hrs.)

Introduction to air pollution: Definition, atmosphere & its zones, Classification and sources of air pollutants, Impacts of air pollution on human health, vegetation, animals, building materials, structures, and atmosphere, soil and water bodies, Global and regional environmental issues of air pollution: Ozone depletion, Climate change, Global warming, Acid rain.

Meteorological parameters: Primary and secondary parameters, atmospheric stability, plume behaviour. Wind rose diagram, Air Quality Index (AQI), Standards for air pollution (as per Indian Standards and CPHEEO),

UNIT-II (08 Hrs.)

Air sampling and measurement: Ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, (adsorption, absorption, incineration, condensation), site selection criteria, methods of estimation. Stack height determination

Air pollution controls methods and equipments: Principles of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters, cyclones and wet scrubbers

UNIT-III (07 Hrs)

Introduction to solid waste management(SWM): Structure , necessity and responsibility, Sources, Quantity and quality, Sources of solid waste, classification and components, physical and chemical characteristics, per capita contribution, sampling and analysis

Collection and transportation of solid waste: Method of collection, equipment used for collection and transportation, transfer stations, optimization of transport route.

UNIT-IV (07 Hrs)

Solid waste processing: Methods of processing, merits and demerits of various methods, 3R concept

Disposal methods: Composting of waste, methods of composting, factors affecting composting Sanitary land filling: Site requirements, methods, leachate management

UNIT –V (07 Hrs)

Incineration: Principles of incineration, types of incinerators, advantages and disadvantages, Pyrolysis, Gasification, Refuse derived fuel(RDF), Biogas

Control of gases: Carbon Footprint, Emerging technologies and strategies to mitigate air pollution, Current challenges and way forward

REFERENCE BOOKS:

1. M.N. Rao & H.V.N.Rao, " Air Pollution", Tata McGraw Hill Publishing Co. Ltd.

2. C.S.Rao, "Environmental Pollution Control Engineering", Wiley Estern Ltd. New Delhi.

3. Gurjar, B.R., Molina, L., Ojha, C.S.P. (Eds.), "Air Pollution: Health and Environmental Impacts", CRC Press. 2010.

4. A. D. Bhide, & Sunderesan B.B., "Solid Waste Management in developing countries, INSDOC, N. Delhi

5. Treatment and Disposal of Solid and Hazardous Wastes Kindle Edition by Debashish Sengupta, Brajesh K. Dubey, Sudha Goel

6. Solid and Hazardous Waste Management, Second Edition by M. N. Rao

7. Municipal Solid Waste Management by P Jayarama Reddy

8. Municipal solid waste management rules Handbook

(Dr. A.N. Dabhade)
BoS Member

(Dr. Avinash N Shirkhande,)
BoS (Civil Engg) Chairman

27. Hydropower Engineering

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	Total Hours Distribution per week		
Total Credit: 03	Lecture (L): 3 Hrs.	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE703T	Name of Subject: Hydropower Engineering (Elective-V)	

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objective	
1	To impart the knowledge for understanding of various aspects of hydropower development
2	Demonstrate the ability to apply knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes
3	Understand the design of hydro power plant
4	Understand various types of Civil Engineering structures used in hydropower development and design aspects
5	Knowledge about electrical aspects of power unit and understand the importance of these items.

Course Outcome	
After completion of syllabus student able to	
1	To understand about the sources of water power and estimation of its potential
2	To learn the concept, design, investigation of power canals and its components
3	To understand the concept, design, investigation about various parts of power units.
4	To understand the concept, investigation about various parts of a power house.
5	To impart the knowledge about electrical aspects of power unit and understand the importance of these items.

SYLLABUS

Unit No.1 Introduction			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
sources of energy, importance of water power, Hydropower development, Estimation of water power potential	03		1
Types of hydro power plant : classification of hydel plants, Run of river plants, General Arrangements of Run of River Plants, Valley Dam plants, Diversion Canal Plants, High Head diversion plants, Storage and pondage, Tidal power plant - Recent experiences in wave power development.	03		1
Pumped storage power plants, Small and mini Hydropower systems - Power demand, general description of layout; topographic requirements of each above.	02		1
	08		

Unit No.2 Water Conveyance System &Penstock			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Power Canals, Alignment, Design criteria for Power canals, Flumes, Covered conduits and Tunnels	03		2
Penstocks: general classification; design criterion; economical diameter; Anchor blocks, Conduit valves, Bends and manifolds.	05		2
	08		
Unit No.3 Water Hammer & Surge Tank			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Water hammer: Introduction, Transients caused by turbine, Load acceptance and rejection,equation for uniform diameter penstock, use of Allievi's chart.	03		3
Surge tanks: types; functions; locations; hydraulic design & stability of surge tanks, Channel Surges	05		3
	08		
Unit No.4 Intake			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Intakes: Types, locations, losses, trash & other components, control gates, emergency gates, canal forebay, general principles of alignment and balancing tank.	03		4
Turbines : types,general description and layouts, specific speed, Basic flow equations, characteristics of turbines	03		4
	06		

Unit No.5 Power House			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Power houses: types, general layouts and approximate dimensions.	03		5
Electrical Load on Hydro Turbines : Load Curve, load Factor, Capacity Factor, utilization factor, Diversity Factor, load Duration Curve	04		5
	07		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
	Water Power Engineering	Barrows H.K.	Tata McGraw Hill Publishing Company Ltd		√		
	Hydropower Structures	Varshney, R.S.	Nem Chand Brothers		√		
	Water Power Engineering	Sharma, Dandekar M.M.	Vikas Publishing House, Gaziabad,		√		
	Handbook of Hydroelectric Engineering	Nigam P.S.	Nem Chand & Brothers, India				√
	Hydro electric Hand Book	Creager and Justin	John Wiley				√
	Irrigation water power and Water	Arora, K.R.	Standard Publishers Distributors,		√		

	Resources Engineering		Delhi				
	Water Power Engineering	Sharma R.K. & Sharma T.K	S. Chand Publication		√		
	Hydraulic Transient	Streeter V. L. & Wylie E. B	McGraw Hill Book Company, New York		√		
	Water power engineering	Deshmukh M.M	Dhanpat Rai New Delhi		√		

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shrikhande,)
BOS (Civil Engg) Chairman

28. Water & Wastewater Treatment

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	Total Hours Distribution per week		
Total Credit:03	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs	Practical (P): 0 Hrs
Subject Code	BTCVE704T	Name of Subject: Water & Wastewater Treatment (Elective-VI)	

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objective	
1	The course will provide students' knowledge regarding the different sources of water & waste water, characteristics, available treatment technologies and designs
2	The course will make students able to design and implement the different water and wastewater treatment units
3	The course will provide students the knowledge regarding real problems finding and handling strategies of water and wastewater treatments.
4	The course will prepare students to learn recent and advanced treatments of water and wastewater and disposals methods.

Course Outcome	
After completion of syllabus student able to	
1	Understand the process and design components of water treatment such as Aeration, coagulation-flocculation and Sedimentation
2	Understand the process and design the components of water treatment such as Filtration, Disinfection
3	Understand the various sources characteristics and disposal methods of wastewater
4	Understand and design the different preliminary and primary waste-water treatment
5	Understand and design the different Secondary waste-water treatment

SYLLABUS

Unit No.1 Introduction to WTP & Aeration, Coagulation- flocculation & Sedimentation			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction to Water Treatment: Objective of water treatment, unit operation and unit processes, treatment flow sheet, site selection for water treatment plant	01		1
Aeration: objective of aeration, types or aerators,	01		
Design of cascade aerator, gas transfer, two film theory	01		
Coagulation- Flocculation: Theory of coagulation objectives, types & factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids	01		
Design of rapid and slow mixing devices (hydraulic and mechanical),	01		
Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling,	01		
Design of sedimentation tank and clariflocculators	01		
	07		

Unit No.2 Filtration, Disinfection &Minor methods			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Filtration: mechanism of filtration, types of filters	01		2
Design of rapid sand filters, filter media specifications,	01		
Preparation of filter sand from stock sand, problems in filtration.	01		
Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants,	01		

chlorination, method of chlorination (breakpoint chlorination), factors affecting efficiency of chlorination	01		2
Iron and manganese removal, de-fluorination.	01		
Recent development in water treatment	01		
	07		

Unit No.3 Characteristics & Disposal of Waste water

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction to waste water Sources, Physical and chemical characteristics of waste water	02		3
DO, BOD, COD, determination of BOD rate constant, Problems on DO and BOD	03		
Disposal of sewage by dilution and by land disposal, Streater-Phelps's equation. Numerical	02		
	07		

Unit No.4 Preliminary & Primary Waste water Treatment

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Treatment Methods: Waste water treatment flow sheet, preliminary & primary	02		4
secondary methods of treatment,	02		
Design of screen, Girt chamber and primary settling tank.	03		
	07		

Unit No.5 Secondary Treatments

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process, aerated lagoons and stabilization ponds.	03		5
Design of ASP, Sludge treatment, aerobic and anaerobic digestion, reactor types (such as UASB, AFFB, Hybrid reactor) & factors affecting anaerobic digestion and sludge drying beds (excluding design)	03		
	06		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1	"Waste Water Treatment for Pollution Control and Reuse".	Sali J. Arcelvala	Tata Mcgraw Hill	2008			Text Book
2	Water Supply Engineering Environmental Engineering Vol.-I	Dr. P.N. Modi	Standard Publication	2018 6th edition	Text Book		
3	Water Supply Engineering Environmental Engineering Vol.-II	Dr. P.N. Modi	Standard Publication	2018 6th edition	Text Book		
4	Design of Water Treatment Plant	Dr. A.G. Bhole	IWWA, Nagpur centre	2008		Research Article	
5	Environmental Engineering Vol- I & II	Dr. B.C. Punmia	Laxmi Publication	2005			Reference book
6	Water and Waste Water Treatment, Disposal And reuse	Metcalf and Eddy	Tata McGraw Hill. 6	2017 (Third edition)			Reference book

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
I, II	CPHEEO Manual on Water Supply and Treatment	CPHEEO Manual	2009
II, IV, V	Manual on Sewerage and Sewage Treatment Systems - 2013	CPHEEO Manual	2013

Applicable for Unit No.	Website address
I, II	https://jalshakti-ddws.gov.in/cpheeo-manual-water-supply-and-treatment
II, IV, V	http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php

(Dr. A.N. Dabhade)
BoS Member

(Dr. Avinash N Shirkhande,)
BoS (Civil Engg) Chairman

29. Irrigation Management

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	Total Hours Distribution per week		
Total Credit:	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE704T	Name of Subject: Irrigation Management (Elective-VI)	

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objective	
1	To Learn basic principles of irrigation management
2	To impart the knowledge of various irrigation efficient and effective methods
3	To know the efficient irrigation and water management to maximise crop yield
4	To discuss the importance of participation of irrigation stake holders
5	To know various rules and regulations, various water laws

Course Outcome	
After completion of syllabus student able to	
1	Discussion of various principles of irrigation management
2	Study of various methods of canal section design and approaches of optimal canal design
3	Estimation of seepage losses through a canal system and criteria to minimise it
4	Involvement of various stake holders of irrigation system and efficient functioning for the better efficiency of the system
5	Knowing various policies and attempt made by state and central Government for the proper functioning of irrigation system

SYLLABUS

Unit No.1			
Importance of Irrigation	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Goal and importance of irrigation management, various methods of irrigation, water use efficiencies, water charges, measurement of depth of irrigation, cropping pattern, crop rotation, conjunctive use	08		1
	08		
Unit No.2			
Canal Irrigation	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Types of canal, optimal canal design, an efficient canal network, maintenance of canal system, balancing canal section, methods of canal design and concept of command Area development authority	08		2
	08		
Unit No.3			
Water Losses	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Canal losses, measurement of canal losses, minimising the canal losses, canal lining, economic s of canal lining, concept of night irrigation	08		3
Unit No.4			
Involvement of stake holders	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Former participation water uses societies, participatory irrigation	08		4

management, training to the water users, role of engineers in irrigation system			
	08		

Unit No.5			
Irrigation Policies	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Irrigation policies and institution, present state of irrigation policies; water dispute, inter-state river water dispute, concept of inter linking of rivers and discuss their feasibilities	08		5
	08		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
	Water Management	D.K.Mujumdar	Prentic Hall of India Learning Pvt. Ltd, New Delhi	2013	Yes		
	Efficient use of Irrigation Water	G.H.Sankar Reddy and Y. Reddy	Kalyani Publishers, Ludhiana	2006	Yes		
	Irrigation Theory and practice	A.M.Michael	Vikas Publishing House Pvt. Ltd, New Delhi	2006	Yes		
	Hand Book - Irrigation System Operation Practice, Water Resources Management and training project,	CWC Publication Technical Report No.33	CWC, New Delhi	1990	Yes		
	Managing Irrigation . Together Practices and Policy in India	Maloney C. And Raju K.V.	Stage Publication, New Delhi, India	1994	Yes		

(Dr. A.N. Dabhade) BoS Member

(Dr. Avinash N Shrikhande,) BoS (Civil Engg) Chairman