1.3.1. Institution integrates cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Gender, Environment and Sustainability, Human Values and Professional Ethics

SYLLABUS

Department	Course code	Course name
AERO	AE15707	Comprehension and Technical Seminar
	CH15403	Environmental Science and Engineering
	BA15151	Professional Ethics and Human Values
	AE15651	Aviation Maintenance and Management
	BA15451	Entrepreneurship Development
	AE15652	Crisis Management in Aircraft Industry
	BA16E05	Principles of Management
	BA16253	Total Quality Management
	BA16151	Professional Ethics and Human Values
	BA16451	Entrepreneurship Development
	BA16352	Engineering Economics
	AE16902	Wind Power Engineering
	AE16903	Aircraft Safety
AGRICULTURE	AI15402	Soil and Water Conservation Engineering
	AI15403	Hydrology & Water Resources Engineering
	EN15301	Business English Course Laboratory
	AI15504	Environmental Science and Engineering
	EN15501	Career Development Laboratory - I
	AI15153	Professional Ethics in Agriculture Engineering
	AI16504	Environmental Science and Engineering
	AI16604	IT in Agricultural Systems
	AI16903	Professional Ethics in Agriculture Engineering
	AI15701	Solar and Wind Energy Engineering
	AI16405	Soil Science and Engineering
	AI16702	Agricultural Economics and Extension
CIVIL	EN16202	English Communication Skills Laboratory
	BA16151	Professional Ethics and Human Values
	CE16302	Construction Materials
	CE16401	Surveying II
	CE16403	Construction Techniques, Equipments and Practices
	CE16601	Design of Steel Structures
	CH16403	Environmental Science and Engineering
	CE16501	Design of Reinforced Concrete Elements
	CE16502	Highway Engineering

	CE16504	Water Supply Engineering
	CE16505	Soil Mechanics
	CE16151	Hydrology and Water Resources Engineering
	CE16152	Total Station and GPS Surveying
	CE16153	Construction Planning and Scheduling
	CE16154	Air pollution and Control Engineering
	CE16155	Coastal Engineering
	CE16603	Design of Reinforced Concrete and Brick Masonry Structures
	CE16604	Waste Water Engineering
	CE16605	Foundation Engineering
	CE16901	Building Services
	CE16902	Contract Laws and Regulations
	CE16903	Architecture
	CE16904	Smart Structures and Smart Materials
	CE16905	Remote Sensing Techniques and GIS
	CE16606	Computer Aided Design and Drafting Laboratory
	CE16607	Environmental Engineering Laboratory
	CE16701	Estimation, Costing and Valuation Engineering
	CE16702	Structural Dynamics and Earthquake Engineering
	CE16703	Irrigation Engineering
	CE16704	Prestressed Concrete Structures
	CE16251	Industrial Waste Water Engineering
	CE16252	Traffic Engineering and Management
	CE16253	Municipal Solid Waste Management
	CE16254	Railways, Airports and Harbour Engineering
	CE16907	Disaster Management
	CE16910	Environmental Impact Assessment
	CE16705	Environmental and Irrigation Engineering Drawing
	BA16254	Principles of Management
	CE16353	Maintenance, Repair and Rehabilitation of Structures
	CE16952	Advanced Surveying using Total Station
	CE16953	Building Valuation
CSE	CH15301	Environmental Science and Engineering
	BA15151	Professional Ethics and Human Values
	CH16301	Environmental Science and Engineering
	BA16151	Professional Ethics and Human Values
B.E(ECE)	CH15501	Environmental Science and Engineering
	BA15151	Professional Ethics and Human Values
	CH16501	Environmental Science and Engineering
	BA16151	Professional Ethics and Human Values
	BA16253	Total Quality Management
EEE	BA15151	Professional Ethics and Human Values
	EE16152	Electrical Safety
	EE16904	Wind and Solar Energy Systems

	BA16151	Professional Ethics and Human Values
	EE16152	Electrical Safety
	EE16904	Wind and Solar Energy Systems
Mechanical	GE 2025	Professional Ethics In Engineering
	CH15403	Environmental Science and Engineering
	ME6003	Renewable Sources of Energy
	ME6004	Unconventional Machining Processes
MECHATRONICS	CH15501	Environmental Science and Engineering
	BA15151	Professional Ethics and Human Values
	MT15553	Renewable Energy Sources
	CH16501	Environmental Science and Engineering
	BA16151	Professional Ethics and Human Values
	MT16453	Renewable Energy Sources
BIOMEDICAL	CH16401	Environmental Science and Engineering
	BA16151	Professional Ethics and Human Values
	BM16801	Health care and hospital management
	BM16955	Industrial Medical system
MEDICAL ELECTRONICS	CH16401	Environmental Science and Engineering
	BA16151	Professional Ethics and Human Values
	MD16701	Health care and hospital management
	MD16955	Hospital Internship Training
CHEMICAL	CH15301	Environmental Science and Engineering
	CM15611	Industrial Wastewater Treatment
	CH16301	Environmental Science and Engineering
	CM15551	Air Pollution and Control
	CM16902	Industrial Wastewater Treatment
	CM16703	Process Economics and Management
IT	CH15501	Environmental Science and Engineering
	BA15151	Professional Ethics and Human Values
	CH16301	Environmental Science and Engineering
	BA16151	Professional Ethics and Human Values
FOOD TECHNOLOGY	CH16301	Environmental Science and Engineering
	CM16305	Fluid Flow Process
	CM16405	Chemical Engineering Thermodynamics
	FT16605	Process Economics and Management
Pharmaceutical Technology	CM16305	Fluid Flow Process
	CM16406	Process Heat and mass Transfer
	CH16403	Environmental Science and Engineering
	PT16505	Chemical reaction Thermodynamics
	BA16154	Disaster Management
M.E (Communication Systems)	PEN19101	Research Methodology and IPR
ME(PED)	PPE15106	Technical Seminar I
	PPE15206	Technical Seminar II

	PPE16106	Technical Seminar I
	PPE 16206	Technical Seminar II
ME(PSE)	PPS15106	Technical Seminar I
	PPS16106	Technical Seminar I
	PPS1206	Technical Seminar II
	PPS16206	Technical Seminar II
	PPS19154	Wind and Solar Systems
M.E - STRUCTURAL ENGINEERING	PEN19101	Research Methodology and IPR
	PSE19153	Theory of Structural Stability
	PSE19254	Earthquake Resistant Design
	PEN19171	English for Research Paper Writing (Audit Course I)
	PSE16351	Energy Efficient Structures
	PSE16352	Structures in Disaster Prone Areas
	PSE16451	Design of Sub Structures
	PSE19203	Structural Design Laboratory
	PSE19554	Wind and Cyclone Effects on Structures
	PSE19351	Advanced Steel Design
	PSE19352	Design of Formwork
	PSE16454	Design of Bridges
MBA	BA 15G01	Business Ethics and Corporate Governance
	BA 15104	Organizational Behavior
	BA 16G01	Indian Ethos in Modern Management
	BA16104	Organization Behavior
	BA16M06	Rural Marketing
	BA19101	Business Ethics
	BA19G01	Indian Ethos in Modern Management
	BA19103	Organization Behavior
MCA	CA15407	Technical Seminar and Report Writing
	CAE15508	M-Commerce
	CA16407	Technical Seminar and Report Writing
	CA16151	Financial Accounting
	CA16355	Human Resource Management Systems
	CA19103	Financial Accounting
SCIENCE AND HUMANITIES	15GEVC101	Gender Sensitization
	15GEVC201	Introduction to Indian Constitution
	16GEVC101	Introduction of Gender Studies
	16GEVC201	Constitution of India
	17GEVC101	Gender Equality and Law
	17GEVC201	Indian Constitution and Election Commission
	18GEVC101	Gender Equality and Human Rights
	18GEVC201	Indian Constitution and Administration
	19GEVC101	Introduction of Gender Studies
	19GEVC201	Indian Constitution and Human Rights

CH 15301 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources-Use – exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture- fertilizer-pesticide problems - water logging - salinity -case studies. Energy resources-Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource- land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers– energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem – desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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 –field study.

UNIT III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution -thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone- landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people.

Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health– Human rights – value education – HIV/ AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010 .
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, Jaico Publising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAVAI ENGINEERING COLLEGE Approved BOARD OF STUDIES Chemistry 25/10/15 AUTONOMOUS

CM15611 INDUSTRIAL WASTEWATER TREATMENT 3 0 0 3

COURSE OBJECTIVES

To enable students to

- elucidate the latest developments in treatment technologies and their application in diverse pollution sources including industries.
- provide fundamentals of fluid mechanics and understanding of motion of water
- design of treatment plants for various industries
- understand the biological and chemical treatment.
- acquire knowledge of advance treatment and membrane separation processes.

UNIT I WASTEWATER TREATMENT AN OVERVIEW 9

Terminology – Regulations – Health and Environment Concerns in wastewater management– Constituents in wastewater inorganic– Organic and metallic constituents.

UNIT II PROCESS ANALYSIS AND SELECTION 9

Components of wastewater flows – Analysis of Data – Reactors used in wastewater treatment– Mass Balance Analysis – Modeling of ideal and non-ideal flow in Reactors – Process Selection.

UNIT III CHEMICAL UNIT PROCESSES 9

Role of unit processes in wastewater treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation –Neutralization – Chemical Storage.

UNIT IV BIOLOGICAL TREATMENT 9

Overview of biological Treatment – Microbial metabolism – Bacterial growth and energatus – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors. Combined aerobic processes – Activated sludge film packing

UNIT V ADVANCED WASTEWATER TREATMENT 9

Technologies used in advanced treatment – Classification of technologies Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration Absorption – Ion Exchange – Advanced oxidation process.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- define the quality parameters typically used to characterize wastewater and explain the different classes of treated wastewater.
- describe various types of process units used for preliminary, primary and secondary treatment and explain how they achieve the target level of treatment.
- recognize and discuss emerging technologies for advanced wastewater treatment and water recycling.

- discuss water and wastewater treatment solid wastes management
- propose a treatment system for a given wastewater to achieve a specified end use

TEXT BOOKS

1. Wastewater Engineering Treatment and Reuse: Mc Graw Hill, G. Tchobanoglous, FI Biston, 2002.
2. Industrial Wastewater Management Treatment and Disposal by Wastewater McGraw Hill III Edition 2008.

REFERENCES

1. Eckenfelder, W. W, Jr. "Industrial Water Pollution Control" McGraw-Hill: New York, 1966.
2. A. D. Patwardhan "Industrial Wastewater Treatment "PHI, 2009.

CO/PO MAPPING

Mapping of course outcomes with programme outcomes (1/2/3 indicates strength of correlation)3-Strong, 2-Medium, 1- Weak														
COs	**Programme Outcome (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO2	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO3	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO4	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO5	3	-	2	-	3	3	-	3	-	-	2	-	2	2

CH 16301 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected

- To know the constituents of the environment and the precious resources in the environment.
- To conserve all biological resources.
- To understand the role of human being in maintaining a clean environment and useful environment for the future generations
- To maintain the ecological balance and preserve bio-diversity.
- The role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **9**

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources Use – exploitation - environmental effects of extracting and using mineral resources – Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture - fertilizer-pesticide problems - water logging - salinity. Energy resources: Growing energy needs - renewable and non renewable energy sources. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY **9**

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem - desert ecosystem - aquatic ecosystems (lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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.

UNIT III POLLUTION **9**

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution. Disaster management :Floods – earthquake - cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT **9**

Sustainable development : Unsustainable to sustainable development – urban problems related to energy.

Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV/AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Know the relationship between the human population and environment.
- Understand the basic concepts of environment studies and natural resources.
- Gaining the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, EnvironmentalChemistry, VI edition,2015 NewAge International (P) ltd Publication,NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition,NewAge International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering and Sciences, V Edition,2013,Tata M'c Graw Hill pub,Newdelhi110008

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Chemistry
AUTONOMOUS

PROGRAMME ELECTIVE V

CM15551 AIR POLLUTION AND CONTROL 3 0 0 3

COURSE OBJECTIVES

To enable students to

- learn about Air Pollution regulations
- make the students aware of effects of air pollution- Global effects-
- learn the of Sampling of pollutants-
- control pollution with technological achievement and economic viability.
- study the Meteorology and air pollution- Atmospheric stability- and Prediction of air quality.

UNIT I INTRODUCTION 9

Air Pollution Regulatory Framework History - Air Pollution Regulatory - Framework - Regulatory System - Laws and Regulations - Clean air Act - Provisions for Recent Developments.

UNIT II AIR POLLUTION GASES 9

Measurement fundamentals - chemicals and physical properties – Phase - Incinerators - Design and Performance - Operation and Maintenance - Absorbers - Design operation and improving performances

UNIT III PARTICULATE AIR POLLUTION 9

Particle collection mechanism - fluid particle - dynamic - particle size - Distribution - Efficiency - Gravity Settling chambers Cyclones - Electrostatic precipitators

UNIT IV HYBRID SYSTEM 9

Heat electrostatic precipitation - Genizing Heat Scrubbers - Dry Scrubbers - Electrostatically Augmented Fabric Filtration

UNIT V AIR POLLUTION CONTROL EQUIPMENT 9

Introduction - Installation - Cost Model.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course- students will be able to

- understand the evolution of air pollution regulation and different laws related to air pollution and control
- know the effects of air pollution and its adverse impact on Global scenario
- assess the performance of absorbers and understand the different particle collection mechanisms
- understand the concepts involved in hybrid systems and its cost Modelling
- learn to control the pollution with technological equipment and attain economic viability.

TEXT BOOKS

1. Louis Theodore, "Air Pollution Control Equipment", Springer- 2011
2. Cooper C.D. and Alley F.C. "Air Pollution Control-A Design Approach"- 4th Edition- Waveland Pr Inc. 2010.

REFERENCES

1. Noel de Nevers, "Air Pollution Control Engineering"- 2nd Edition- Waveland Pr Inc.- 2010.
2. Rao M.N. and Rao H.V.N. "Air Pollution"- 1st Edition- McGraw Hill India Pvt. Ltd.- 2001.
3. Norman C.Pereira, "Air Pollution control Engineering", Springer science- 2004
4. Paul N. Cheremisinoff, "Air Pollution Control and Design for Industry", Marcel Dekker INC- New york- 1993

CO/PO MAPPING

Mapping of course outcomes with programme outcomes (1/2/3 indicates strength of correlation)3-Strong, 2-Medium, 1- Weak														
	Programme Outcome (POs)													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	-	-	-	2	2	-	-	1	-	1	1	1
CO2	2	2	2	-	-	2	2	-	-	-	-	2	2	2
CO3	3	2	2	-	-	1	2	-	-	-	-	2	2	2
CO4	2	2	2	-	-	1	2	-	-	-	-	1	2	2
CO5	2	1	1	-	-	1	2	-	-	-	-	1	2	2

CM16902 INDUSTRIAL WASTEWATER TREATMENT 3 0 0 3

COURSE OBJECTIVES

To enable students to

- elucidate the latest developments in treatment technologies and their application in diverse pollution sources including industries.
- provide fundamentals of fluid mechanics and understanding of motion of water
- design of treatment plants for various industries
- understand the biological and chemical treatment.
- acquire knowledge of advance treatment and membrane separation processes.

UNIT I WASTEWATER TREATMENT AN OVERVIEW 9

Terminology – Regulations – Health and Environment Concerns in wastewater management– Constituents in wastewater inorganic– Organic and metallic constituents.

UNIT II PROCESS ANALYSIS AND SELECTION 9

Components of wastewater flows – Analysis of Data – Reactors used in wastewater treatment– Mass Balance Analysis – Modeling of ideal and non-ideal flow in Reactors – Process Selection.

UNIT III CHEMICAL UNIT PROCESSES 9

Role of unit processes in wastewater treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation –Neutralization – Chemical Storage.

UNIT IV BIOLOGICAL TREATMENT 9

Overview of biological Treatment – Microbial metabolism – Bacterial growth and energatus – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors. Combined aerobic processes – Activated sludge film packing

UNIT V ADVANCED WASTEWATER TREATMENT 9

Technologies used in advanced treatment – Classification of technologies Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration Absorption – Ion Exchange – Advanced oxidation process.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- define the quality parameters typically used to characterize wastewater and explain the different classes of treated wastewater.
- describe various types of process units used for preliminary, primary and secondary treatment and explain how they achieve the target level of treatment.
- recognize and discuss emerging technologies for advanced wastewater treatment and water recycling.

- discuss water and wastewater treatment solid wastes management
- propose a treatment system for a given wastewater to achieve a specified end use

TEXT BOOKS

1. Wastewater Engineering Treatment and Reuse: Mc Graw Hill, G. Tchobanoglous, FI Biston, 2002.
2. Industrial Wastewater Management Treatment and Disposal by Wastewater McGraw Hill III Edition 2008.

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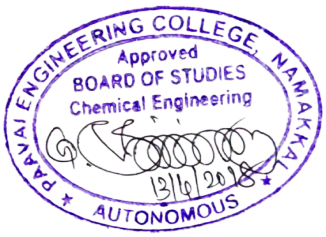
2. A. D. Patwardhan "Industrial Wastewater Treatment "PHI, 2009.

CO/PO MAPPING

Mapping of course outcomes with programme outcomes (1/2/3 indicates strength of correlation)3-Strong, 2-Medium, 1- Weak														
COs	**Programme Outcome (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO2	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO3	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO4	3	-	2	-	3	3	-	3	-	-	2	-	2	2
CO5	3	-	2	-	3	3	-	3	-	-	2	-	2	2



CM16703 PROCESS ECONOMICS AND MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- have the knowledge on planning and techniques of measurement of work.
- attain the importance of cost estimation and projects.
- estimate the project profit and techniques for investment.
- analyze the performance, preparation of annual report.
- sustain the knowledge on economic balance.

UNIT I PRINCIPLES OF MANAGEMENT AND ORGANISATION 9

Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations. Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

UNIT II INVESTMENT COSTS AND COST ESTIMATION 9

Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, capital budgeting and project feasibility.

UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT 9

Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE 9

Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

UNIT V ECONOMIC BALANCE 9

Economic decisions in Chemical Plant - Economics of size - Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat exchanger

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- know the importance of planning and types of organization.
- have knowledge on value of money and how to utilize for the projects.
- impact the investment alternatives and its forecasting.
- gain the knowledge on balance sheet and their performance.
- attain the idea of economic growth and balance.

TEXT BOOKS

1. Peters, M. S. and Timmerhaus, C. D. RE West , “Plant Design and Economics for Chemical Engineers”, III Edn, McGraw Hill, 2003.

2. Holand, F.A., Watson, F.A. and Wilkinson, J.K., "Introduction to Process Economics", 2nd Edn, John Wiley, (1983)

REFERENCES

1. Perry, R. H. and Green, D., “Chemical Engineer’s Handbook “, 7th Edition, McGraw Hill.
2. Allen, L.A., “Management and Organization”, McGraw Hill

CO/PO MAPPING

Mapping of course outcomes with programme outcomes (1/2/3 indicates strength of correlation)3-Strong, 2-Medium, 1- Weak														
COs	**Programme Outcome (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	1	1	1	1	-	-	-	2	1	2	3
CO2	2	2	2	1	1	2	2	-	1	-	-	2	2	3
CO3	3	1	1	2	1	2	2	-	1	1	2	2	2	3
CO4	3	2	2	2	1	1	1	-	-	1	-	2	2	3
CO5	2	2	1	1	1	2	2	-	-	-	1	2	2	3

CH 16301 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected

- To know the constituents of the environment and the precious resources in the environment.
- To conserve all biological resources.
- To understand the role of human being in maintaining a clean environment and useful environment for the future generations
- To maintain the ecological balance and preserve bio-diversity.
- The role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **9**

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources Use – exploitation - environmental effects of extracting and using mineral resources – Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture - fertilizer-pesticide problems - water logging - salinity. Energy resources: Growing energy needs - renewable and non renewable energy sources. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY **9**

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem - desert ecosystem - aquatic ecosystems (lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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.

UNIT III POLLUTION **9**

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution. Disaster management :Floods – earthquake - cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT **9**

Sustainable development : Unsustainable to sustainable development – urban problems related to energy.

Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV/AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Know the relationship between the human population and environment.
- Understand the basic concepts of environment studies and natural resources.
- Gaining the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, EnvironmentalChemistry, VI edition,2015 NewAge International (P) ltd Publication,NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition,NewAge International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering and Sciences, V Edition,2013,Tata M'c Graw Hill pub,Newdelhi110008

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
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BOARD OF STUDIES
Chemistry
AUTONOMOUS

CM16305 FLUID FLOW PROCESS 3 0 0 3

COURSE OBJECTIVES

To enable students to

- have a knowledge on fundamental concepts, fluid properties and fluid statics.
- impart the student knowledge on dynamic characteristics for through pipes and porous medium, flow measurement
- help the students to have knowledge on fluid properties characteristics while static, during flow through ducts, pipes and other channels.
- Knowledge on several machineries used to transport the fluid and their performance are assessed.

UNIT I FLUID PROPERTIES AND STATICS 9

Physical properties of fluids – Classification of fluids – Pressure measurement – Manometers – Simple and Differential – Concept of buoyancy – Fluid statics and its applications. Dimensional homogeneity, Rayleigh and Buckingham-π method – Significance of different dimensionless numbers.

UNIT II FLOW OF COMPRESSIBLE AND INCOMPRESSIBLE FLUIDS 9

Types of fluid flow – Boundary layer concepts – Navier-Stokes' equation – Continuity Equation – Mass balance in a flowing fluid – Bernoulli's equation – Euler's equation of motion – Friction factor chart – Darcy weisbach Equation – Flow of incompressible fluids in pipes – Laminar and turbulent flow through closed conduits – Velocity profile and friction factor for smooth and rough pipes –Hagen-Poiseuille equation

UNIT III FLOW OF FLUIDS THROUGH SOLIDS 9

Form drag – Skin drag – Drag co-efficient – Flow around solids and packed beds – Friction factor for packed beds – Ergun's Equation – Motion of particles through fluids – Terminal settling velocity – Fluidization – Types – Advantages – Applications.

UNIT IV TRANSPORTATION 9

Measurement of fluid flow – construction, working and equation for variable head and variable area meters: Orifice meter – Venturimeter – Pitot tube – Rotameter – determination of discharge and discharge coefficient – Weirs and notches – Major and minor losses.

UNIT V METERING 9

Transportation of fluids – Performance curves and characteristics – Efficiency of Centrifugal pump, working principle of Positive displacement, Rotary and Reciprocating pumps – Introduction to Fans, blowers and Compressors.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- understand the fundamental concepts of physical properties of fluids and its importance in fluid flow operations.
- treat problems in the movement of fluids through all kinds of process equipment and use dimensional analysis for scaling experimental results
- understand the fluid flow through packed and fluidized beds

- deal with the important engineering tasks of moving fluid through process equipment and of measuring and controlling fluids in flow.
- analyze pipe flows as well as fluid machineries used to transport the fluid and their performance

TEXT BOOKS

1. R.K. Bansal, “Fluid Mechanics and Hydraulic Machines”, Revised Ninth Edition, Laxmi Publications (p) limited, (2014).
2. A.P. Kulkarni, “Fluid Mechanics for Chemical Engineers” Nirali Prakshan Publication (2015).

REFERENCES

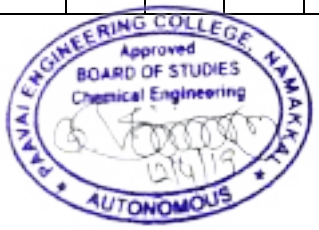
1. McCabe W.L, Smith, J C and Harriot. P “Unit operations in Chemical Engineering”, McGraw Hill, VII Edition, (2005).
2. Noel de Nevers, “Fluid Mechanics for Chemical Engineers “, Second Edition, McGraw-Hill, (1991).
3. White, Frank M. "Fluid mechanics, WCB." Ed McGraw-Hill Boston (1999).
4. Pletcher, Richard H., John C. Tannehill, and Dale Anderson. Computational fluid mechanics and heat transfer. CRC Press, 2012.

WEB LINKS

1. http:// www.nptel.ac.in
2. http:// www.msubbu.in
3. http://www.unitoperation.com

CO/PO MAPPING

Mapping of course outcomes with programme outcomes (1/2/3 indicates strength of correlation)3-Strong, 2-Medium, 1- Weak														
	Programme Outcome (POs)													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3	3	1	1	1	-	-	-	-	1	2	3
CO2	2	1	2	1	1	-	-	-	1	-	-	2	2	3
CO3	3	2	1	3	2	-	-	-	1	1	-	2	2	3
CO4	2	1	2	2	1	-	-	-	-	1	-	2	2	3
CO5	2	2	1	2	1	-	-	-	-	-	1	2	2	3



CM16405 CHEMICAL ENGINEERING THERMODYNAMICS 3 0 0 3

COURSE OBJECTIVES

To enable the students to,

- introduce fundamental thermodynamic principles and their application.
- learn the laws of thermodynamics.
- thermodynamic property relations and their application to fluid flow.
- get the knowledge about power generation and refrigeration processes.
- get the working knowledge of boilers.

UNIT – I BASIC CONCEPTS AND FIRST LAW 9

Fundamental concepts of thermodynamics - Microscopic and macroscopic approach, systems, Properties, Process, Functions, Units, Energy, Heat and work; Zeroth law; First law - statement of first law for flow and non - flow process, Internal energy, Enthalpy, Heat capacities (CV and CP) – Steady state flow processes with reference to various thermal equipment's - Nozzle, Throat, Throttling process

and compressors.

UNIT – II SECOND LAW 9

Second Law of thermodynamics - Kelvin-Plank, Clausius statements and its equivalence, Reversible cycle – Carnot cycle and theorem – Thermodynamic temperature scale. Entropy, Clausius theorem, Clausius inequality, Entropy changes during processes, Available and unavailable energies.

UNIT – III BEHAVIOR OF PURE FLUIDS 9

PVT surfaces - P-V, P-T, T-S and H-S Diagrams; Equation of state and the concept of ideal gas; Process involving ideal gases - Constant volume, Constant pressure, and constant temperature, Adiabatic and polytrophic process; Equation of state for real gases - Vander Waals equation, Redllich Kwong equation, Virial equation of state; Principle of corresponding states – generalized

Compressibility charts.

UNIT – IV STEAM PROPERTIES 9

Properties of steam, Usage of steam tables, Determination of dryness fraction of steam. Calorimeters – Tank or barrel type, Throttling, Separating, Separating and Throttling; Steam distribution systems, Typesof steam traps and their characteristics, Application of steam in food process industries.

UNIT –V BOILERS 9

Types and classification of boilers - Cochran Boiler, Lancashire boiler, Locomotive Boiler, Fluidized Bed Boiler; Boiler mountings and Accessories; Performance and energy efficiency of boilers; Simple calculation of Boiler efficiency; Importance of boiler water treatment and blow down.

TOTAL PERIODS 45

COURSE OUTCOMES

On completion of the course, the students will be able to

- outline the basic concepts and apply the first law of thermodynamics in selected processes.
- understand the principle of second law of thermodynamics and concepts of Carnot cycle.
- interpret the second law of thermodynamics and relate the properties of pure substance.
- estimate the properties of steam and measurement of quality of steam using calorimeters.
- integrate the use of simple calculation in gaining the working knowledge of different boilers.

TEXT BOOKS

1. Narayanan K.V., "A Text Book of Chemical Engineering Thermodynamics", Prentice Hall of India, New Delhi, 2003.
2. Kothandaraman C.P., Khajuria P.R., Arora S.C. and DomkundwarS.A., "Course in Thermodynamics and Heat Engines", 3rd Edition, Dhanpat Rai & Sons, New Delhi, 1990.

REFERENCE BOOKS

1. Ballaney P.L., "Thermal Engineering", 23rdEdition, Khanna Publishers, New Delhi, 2005.
2. Smith J.M., Van Ness H.C, and Abbott M.M., "Introduction to Chemical Engineering Thermodynamics", 7th Edition, McGraw Hill, New York, 2005.
3. Rao Y.V.C., "An Introduction to Thermodynamics", Universities Press, 2004.

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's)

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	Programme Outcomes (PO's)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	3	2	1	3	-	-	1	-	-	3	2
CO2	-	2	2	2	1	1	3	-	-	1	2	-	2	3
CO3	2	2	2	1	-	-	-	-	-	1	2	-	2	3
CO4	2	-	2	-	2	-	3	-	-	2	2	-	3	2
CO5	1	2	2	3	2	-	2	-	-	2	2	-	3	2

FT16605 PROCESS ECONOMICS AND MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- have the knowledge on planning and techniques of measurement of work.
- attain the importance of cost estimation and projects.
- estimate the project profit and techniques for investment.
- analyze the performance, preparation of annual report.
- sustain the knowledge on economic balance.

UNIT I PRINCIPLES OF MANAGEMENT AND ORGANISATION 9

Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations. Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

UNIT II INVESTMENT COSTS AND COST ESTIMATION 9

Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, capital budgeting and project feasibility.

UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT 9

Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE 9

Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

UNIT V ECONOMIC BALANCE 9

Economic decisions in Chemical Plant - Economics of size - Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat exchanger

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- know the importance of planning and types of organization.
- have knowledge on value of money and how to utilize for the projects.
- impact the investment alternatives and its forecasting.
- gain the knowledge on balance sheet and their performance.
- attain the idea of economic growth and balance.

TEXT BOOKS

1. Peters, M. S. and Timmerhaus, C. D. RE West , "Plant Design and Economics for Chemical Engineers", 3rd Edn, McGraw Hill, (2003).
2. Holand, F.A., Watson, F.A. and Wilkinson, J.K., "Introduction to Process Economics", 2nd Edn, John Wiley, (1983)

REFERENCES

1. Perry, R. H. and Green, D., "Chemical Engineer's Handbook ", 8th Edition, McGraw Hill.(2007)
2. Allen, L.A., "Management and Organization", McGraw Hill. (2013)
3. V.Sivasubramanian, "Process Economics And Industrial Management", 1st Edition, Galgotia publishers (2008)
4. Dr. Rajan Mishra, "Industrial Economics and Management Principles", 1st Edition, Laxmi publishers (2008)

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes PSO's

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	PO's												PSO's	
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3	3	3	-	-	-	2	-	3	3	2	3
CO2	3	2	2	2	2	2	-	1	2	-	2	3	2	3
CO3	3	3	-	2	-	3	2	2	2	-	3	3	3	2
CO4	2	2	2	-	1	1	-	1	-	-	2	3	2	3
CO5	3	2	-	2	2	1	1	1	-	-	2	3	3	2

PRAVEEN ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Food Technology
24/08/2020
AUTONOMOUS

CH 15501 **ENVIRONMENTAL SCIENCE AND ENGINEERING** **3 0 0 3**

(Common to ECE, MCT & IT branches)

COURSE OBJECTIVES

To enable students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I **INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES** **9**

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources-Use – exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture- fertilizer-pesticide problems - water logging - salinity -case studies. Energy resources-Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource- land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II **ECOSYSTEMS AND BIODIVERSITY** **9**

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers– energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem – desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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 –field study.

UNIT III **POLLUTION** **9**

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution -thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone- landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV **SOCIAL ISSUES AND ENVIRONMENT** **9**

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people.Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health– Human rights – value education – HIV/ AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010 .
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, Jaico Publising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Chemistry
24/05/17
AUTONOMOUS

BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

- to study the basic issues in Professional Ethics.
- to appreciate the rights of others and to instill moral, social values and loyalty.
- to enable the student in their engineering profession who explore the ethical issues in technological society.
- to get ability to solve Global Issues.
- to understand humans' Safety, Responsibility and Rights.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living- Peacefully – caring – Sharing – Honesty – Courage –Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry –moral dilemmas - moral autonomy -Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories aboutright action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook onlaw - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island andChernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality -conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL HOURS 45

COURSE OUTCOMES

At the end of the course, students will be able to

- propose possible solutions using articulated ethical theories.

- form opinions based on reasoned ethical positions, supported with facts and evidence.
- getawareness of the ethical component of daily engineering decisions.
- solve Global Issues.
- understand the Safety, Responsibility and Rights.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, NewYork 2007.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
1. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, NewDelhi, (2004).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education,New Delhi, 2003.
3. Department of English and Foreign Languages SRM University, "Rhythm of Life", SRM Publications, 2013.
4. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).
5. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientistsand Engineers", Oxford University Press, Oxford.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	2	-	1	-	-	-	-	1	3	1
CO3	3	2	-	2	2	3	-	-	-	-	-	1	2	1
CO4	3	3	-	-	1	3	1	-	-	-	-	2	3	2
CO5	3	3	2	1	1	1	1	-	-	-	-	1	3	1

CH 16301 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected

- To know the constituents of the environment and the precious resources in the environment.
- To conserve all biological resources.
- To understand the role of human being in maintaining a clean environment and useful environment for the future generations
- To maintain the ecological balance and preserve bio-diversity.
- The role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources:Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources Use – exploitation - environmental effects of extracting and using mineral resources – Food resources:World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture fertilizer-pesticide problems - water logging - salinity. Energy resources: Growing energy needs renewable and non renewable energy sources. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem - desert ecosystem - aquatic ecosystems (lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level:Global - national - local levels- India as a mega diversity nation- hotspots 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.

UNIT III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution. Disaster management :Floods – earthquake - cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development : Unsustainable to sustainable development – urban problems related to energy.

Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust -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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV/AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Know the relationship between the human population and environment.
- Understand the basic concepts of environment studies and natural resources.
- Gaining the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

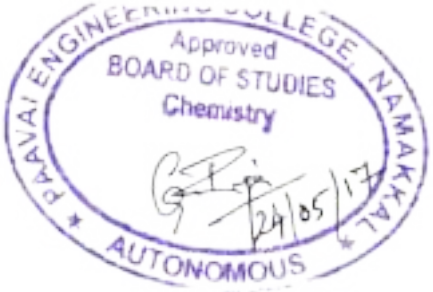
1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, EnvironmentalChemistry, VI edition,2015 NewAge International (P) ltd Publication,NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition,NewAge International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering and Sciences, V Edition,2013,Tata M'c Graw Hill pub,Newdelhi110008

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-



SEMESTER -VIII

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Cooperation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – abalanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, ―Ethics in Engineering‖, McGraw Hill, New York(2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, ―Engineering Ethics –Conceptsand Cases‖, Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, ―Engineering Ethics‖, Prentice Hall, New Mexico, (1999).
2. John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers‖,Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, ―Business Ethics – An IndianPerspective‖,Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, ―Computers, Ethics and Society‖, Oxford UniversityPress, (2003).

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	2	-	1	-	-	-	-	1	3	1
CO3	3	2	-	2	2	3	-	-	-	-	-	1	2	1
CO4	3	3	-	-	1	3	1	-	-	-	-	2	3	2
CO5	3	3	2	1	1	1	1	-	-	-	-	1	3	1

CM16305 FLUID FLOW PROCESS 3 0 0 3

COURSE OBJECTIVES

To enable students to

- have knowledge on fundamental concepts & fluid properties.
- impart the student knowledge on dynamic characteristics for through pipes and porous medium, flow measurement
- have knowledge on fluid properties characteristics on solids such as packed bed
- have knowledge on fluid flow measuring equipments such as rotatmeter
- have knowledge on several machineries used to transport the fluid and their performance are assessed.

UNIT I FLUID PROPERTIES 9

Physical properties of fluids – Classification of fluids – Pressure measurement – Manometers – Simple and Differential – Concept of buoyancy –Dimensional homogeneity, Rayleigh and Buckingham-π method – Significance of different dimensionless numbers.

UNIT II FLOW OF COMPRESSIBLE AND INCOMPRESSIBLE FLUIDS 9

Types of fluid flow – Boundary layer concepts – Navier-Stokes‟ equation – Continuity Equation – Mass balance in a flowing fluid – Bernoulli's equation – Euler‟s equation of motion - Flow of incompressible fluids in pipes – Laminar and turbulent flow through closed conduits -Hagen-Poisuelle equation

UNIT III FLOW OF FLUIDS THROUGH SOLIDS 9

Form drag – Skin drag – Drag co-efficient – Flow around solids and packed beds – Friction factor for packed beds – Ergun's Equation – Motion of particles through fluids – Terminal settling velocity – Fluidization –Types – Advantages – Applications.

UNIT IV TRANSPORTATION 9

Measurement of fluid flow – construction, working and equation for variable head and variable area meters: Orifice meter – Venturimeter – Pitot tube – Rotameter – determination of discharge and discharge coefficient – Weirs and notches – Major and minor losses.

UNIT V METERING 9

Transportation of fluids – Performance curves and characteristics – Efficiency of Centrifugal pump, working principle of Positive displacement, Rotary and Reciprocating pumps – Introduction to Fans, blowers and Compressors

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- fundamental concepts of physical properties of fluids and its importance in fluid flow operations.

- use dimensional analysis for scaling experimental results
- treat problems in the movement of fluids through all kinds of process equipment and
- understand the fluid flow through packed and fluidized beds
- deal with the important engineering tasks of moving fluid through process equipment and of measuring and controlling fluids in flow.

TEXT BOOKS

1. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Revised Ninth Edition, Laxmi Publications (p) limited, (2014).
2. A.P. Kulkarni, "Fluid Mechanics for Chemical Engineers" NiraliPrakshan Publication (2015).

REFERENCES

1. McCabe W.L, Smith, J C and Harriot. P "Unit operations in Chemical Engineering", McGraw Hill, VII Edition, (2005).
2. Noel de Nevers, "Fluid Mechanics for Chemical Engineers ", Second Edition, McGraw-Hill, (1991).
3. James O Wilkes and Stacy G Bike, "Fluid Mechanics for Chemical Engineers' Prentice Hall PTR (International series in Chemical Engineering) (1999).
4. Munson, B. R., Young, D.F., Okiishi, T.H. "Fundamentals of Fluid Mechanics", 5th Edition", John Wiley, 2006

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programmes Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	1	1	-	-	1	-	-	-	-	3	2
CO2	3	3	2	2	1	-	-	1	-	-	-	-	3	2
CO3	3	3	3	2	1	-	-	1	--	-	-	-	2	3
CO4	3	3	3	2	1	-	-	1	-	-	-	-	3	2
CO5	3	2	2	2	1	-	-	1	-	-	-	-	2	2

CM16406 PROCESS HEAT AND MASS TRANSFER 3 0 0 3

COURSE OBJECTIVES

To enable students to

- study various modes of heat transfer and heat transfer by conduction in detail..
- understand the concept of heat transfer by convection
- understand the working of Heat exchangers and to learn design of double pipe, shell and tube heat exchangers.
- understand the phenomenon of radiation, radiation shields and estimation of emissivity.
- understand the principles and applications of mass transfer operations.

UNIT I HEAT TRANSFER – CONDUCTION 9

Basic transfer processes – heat, mass and momentum – heat transfer process - conductors and insulators - conduction – Fourier's fundamental equation – thermal conductivity and thermal resistance - linear heat flow – heat transfer through homogenous wall, composite walls, radial heat flow through cylinders and sphere – extended surfaces (fins) — solving problems in heat transfer by conduction.

UNIT II HEAT TRANSFER - CONVECTION 9

Newton Rikhman's law – film coefficient of heat transfer - convection – free and forced convection dimensional analysis and its application – factors affecting the heat transfer coefficient in free and forced convection heat transfer – overall heat transfer coefficient - solving problems in heat transfer by convection

UNIT III HEAT TRANSFER – HEAT EXCHANGER 9

Heat exchangers – parallel, counter and cross flow – evaporator and condensers - Logarithmic Mean Temperature Difference – overall coefficient of heat transfer – tube in tube heat exchanger, shell and tube heat exchanger, plate heat exchanger – applications of heat exchangers - solving problems in heat exchangers.

UNIT IV HEAT TRANSFER: RADIATION 9

Radiation heat transfer – concept of black and grey body - monochromatic total emissive power – Kirchoff's law – Planck's law - Stefan-Boltzman's law – heat exchange through non-absorbing media - solving problems in heat transfer by radiation.

UNIT V MASS TRANSFER:DIFFUSION 9

Mass transfer – introduction – Fick's law for molecular diffusion - molecular diffusion in gases – equimolar counters diffusion in gases and diffusion of gas A through non diffusing or stagnant B - diffusion through a varying cross sectional area and diffusion coefficients for gases - molecular diffusion in liquids, biological solutions and gels.

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- understand and apply the principles in heat transfer phenomena and solving problems in heat transfer by conduction.
- application for various correlations of convective heat transfer to different problems explains radiation in different type of solids and estimate emissivity.
- Students gain knowledge in various heat transfer methodology in process engineering and to design heat transfer equipments heat exchangers.
- explains radiation in different type of solids and estimate emissivity.
- To understand and apply the principles in mass transfer phenomena.

TEXT BOOKS

1. Bellaney, P.L. "Thermal Engineering". Khanna Publishers, New Delhi, 2001.
2. Geankoplis C.J. "Transport Process and Unit Operations". Prentice-Hall of India Private Limited, New Delhi, 1999.

REFERENCES

1. Jacob and Hawkins. "Elements of Heat Transfer".John Willey and Sons Inc. New York, 1983.
2. EcKert, E.R.G. "Heat and Mass Transfer". McGraw Hill Book Co., New York, 1981
3. Holman, E.P. "Heat Transfer". McGraw-Hill Publishing Co. New Delhi, 2001
4. Coulson, J.M. and etal. "Coulson & Richardson's Chemical Engineering", 6th Edition, Vol. I & II, Butterworth – Heinman (an imprint of Elsevier), 2004.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programmes Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	-	-	-	-	1	-	-	-	-	-	1	1
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	1
CO3	3	2	-	-	-	2	-	-	-	-	-	-	3	-
CO4	3	3	1	-	-	2	1	-	-	-	-	-	3	-
CO5	3	3	2	2	2	2	2	1	-	-	-	-	3	3

CH 16403 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected

- To know the constituents of the environment and the precious resources in the environment.
- To conserve all biological resources.
- To understand the role of human being in maintaining a clean environment and useful environment for the future generations
- To maintain the ecological balance and preserve bio-diversity.
- The role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources Use – exploitation - environmental effects of extracting and using mineral resources – Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture - fertilizer-pesticide problems - water logging - salinity. Energy resources: Growing energy needs - renewable and non renewable energy sources. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem - desert ecosystem - aquatic ecosystems (lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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.

UNIT III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution. Disaster management :Floods – earthquake - cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development : Unsustainable to sustainable development – urban problems related to energy.

Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV/AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Know the relationship between the human population and environment.
- Understand the basic concepts of environment studies and natural resources.
- Gaining the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, EnvironmentalChemistry, VI edition,2015 NewAge International (P) ltd Publication,NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition,NewAge International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering and Sciences, V Edition,2013,Tata M'c Graw Hill pub,Newdelhi110008

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
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Chemistry
AUTONOMOUS

VI SEMESTER

CM16601 CHEMICAL REACTION ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable students to

- provide the basic concepts of types of reactions, variable affecting the rate of reaction, predicting the rate equations for different types of reactions.
- train students how to analyse chemical reactors and reaction systems.
- provide the information about different reactor systems, deriving the performance equations.
- provide experience for students to solve open ended reaction engineering problems.
- predicting the rate equations in chemical reaction engineering system

UNIT I SCOPE OF CHEMICAL KINETICS & CHEMICAL REACTION ENGINEERING 9

Broad outline of chemical reactors; rate equations; concentration and temperature dependence; development of rate equations for different homogeneous reactions. Industrial scale reactors.

UNIT II IDEAL REACTORS 9

Isothermal batch, flow, semi-batch reactors; performance equations for single reactors; multiple reactor systems; multiple reactions.

UNIT III NON IDEAL REACTORS 9

RTD in non-ideal flow; non-ideal flow models; reactor performance with non-ideal flow.

UNIT IV GAS-SOLID, GAS-LIQUID REACTIONS 9

Resistances and rate equations; heterogeneous catalysis; reactions steps; resistances and rate equations.

UNIT V FIXED BED AND FLUID BED REACTORS 9

G/L reactions on solid catalysis; trickle bed, slurry reactors; three phase-fluidized beds; reactors for fluid-fluid reactions; tank reactors

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to,

- writethe rate equation for any type of reaction.
- designreactors for heterogeneous reactions and optimize operating conditions.
- relateand calculate the conversions, concentrations and rates in a reaction and identify, formulate and solve chemical engineering problems.
- analyzemultiple reactions carried out both isothermally and non-isothermal flow.
- determinereaction order and specific reaction rate from experimental data.

TEXT BOOKS

1. Levenspiel O. Chemical Reaction Engineering. IIIrd Edition. John Wiley.2006.
2. Fogler H.S. Elements of Chemical Reaction Engineering. Prentice Hall India.2002

REFERENCES

1. Missen R.W., Mims C.A., Saville B.A. Introduction to Chemical Reaction Engineering and Kinetics. John Wiley.1999
2. Dawande, S.D., "Principles of Reaction Engineering", 1st Edition, Central Techno Publications, 2001.
3. Richardson, J.F. and Peacock, D.G., "Coulson Richardson - Chemical Engineering", Vol.III, IIIrd Edition, Butterworth- Heinemann- Elsevier, 2006.

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	3	2	-	-	-	-	-	1	3	2
CO2	2	3	2	3	2	-	-	-	-	-	-	1	3	2
CO3	3	2	1	3	1	-	2	-	-	-	-	1	3	2
CO4	3	3	2	3	-	-	-	-	-	-	-	1	3	2
CO5	3	3	2	3	2	2	-	-	-	-	-	1	3	2

BA16154 **DISASTER MANAGEMENT** **3 0 0 3**

COURSE OBJECTIVES:

To enable students to

- provide students an exposure to disasters, their significance and types.
- ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- enhance awareness of institutional processes in the country and
- develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS **9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) **9**

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT **9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA **9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS **9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies: Forest Fire: Case Studies, Man Made

disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL PERIODS: 45

COURSE OUTCOMES:

At the end of the course, students will able to,

- differentiate the types of disasters, causes and their impact on environment and society
- assess vulnerability and various methods of risk reduction measures as well as mitigation.
- gain knowledge about Disaster Risk Reduction (DRR)
- draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.
- understand the disaster management through case studies

TEXTBOOKS:

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361
3. Gupta Anil K, Sreeja S. Nair, Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes PSO's

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	PO's												PSO's	
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3	3	2	2	-	-	-	-	-	-	-	3	3
CO2	2	2	3	2	1	-	-	-	-	-	-	-	2	3
CO3	3	2	3	2	2	-	-	-	-	-	-	-	3	2
CO4	2	2	2	1	2	1	-	-	-	-	2	2	2	2
CO5	2	2	2	1	2	1	-	-	-	-	2	2	3	2

PEN19101 RESEARCH METHODOLOGY AND IPR 2 0 0 2

COURSE OBJECTIVES

To enable students to

- understand the formulation of Research problem
- learn about data collection and preparation process
- learn the procedure for literature survey
- learn the concept of Research proposals and Research report writing
- understand about patent rights and its importance

UNIT I RESEARCH PROBLEM FORMULATION 6

Meaning of research, Objectives of Research, Types of research, Significance of Research, Research process, Selecting the problem, Necessity of defining the problem, Meaning of Research design, Need for research design, features of a good design, Different research designs.

UNIT II SCALING AND DATA COLLECTION 6

Quantitative and Qualitative data, Scaling, Scaling Techniques, Experiments and Surveys, Collection of primary and secondary data, Data preparation process.

UNIT III LITERATURE SURVEY 6

Bring clarity and focus to your research problems, Improve your methodology, Procedure for reviewing the literature, search for existing literature, Develop a theoretical and conceptual framework, Writing up the literature reviewed.

UNIT IV RESEARCH PROPOSAL AND RESEARCH REPORT 6

Contents of a research proposal, Writing a research report- Research writing in general, Referencing, Writing a bibliography, Developing an outline, Plagiarism, Research ethics.

UNIT V INTELLECTUAL PROPERTY RIGHTS 6

Intellectual Property- Definition, WTO, Fundamentals of Patent, Copyright- The rights of the owner, Term of copyright, Register of Trademark, Procedure for trade mark, Term of trademark.

TOTAL PERIODS 30

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- identify research problems
- collect and prepare suitable datas for research
- do literature survey in their area of research
- write research proposals and Reports
- apply their research work for patent through IPR

REFERENCES

1. C.R Kothari and Gaurav Garg, "Research Methodology Methods and Techniques", 4th Edition, New Age International Publishers.
2. Ranjit Kumar, " Research Methodology", 2nd Edition, Pearson Education, Australia.
3. M.N. Borse, " Hand Book of Research Methodology, Modern, Methods and New Techniques",Shree Niwas Publications, Jaipur.
4. Neeraj Pandey and Khushdeep Dharni, " Intellectual Property rights", PHI Learning, 2014.
5. Dr.R.Radhakrishnan and Dr.S.Balasubramanian, " Intellectual Property Rights, text and cases",Excel Books, New Delhi.

CO/PO Mapping (1-Low; 2-Medium ; 3-High)														
COs	**Programme Outcomes (Pos)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3	3	3

GENERAL MANAGEMENT ELECTIVES

BA 15G01 BUSINESS ETHICS AND CORPORATE GOVERNANCE 3 0 0 3

COURSE OBJECTIVES

To understand business ethics as part of ethics and its role in human development.

To familiarize oneself with the theory and practice of managing ethics in organizations.

To discuss the various functional areas of ethics in a corporate setup.

To understand the importance of Corporate Social Responsibility in business excellence.

To be familiar with different approaches in Corporate Governance.

UNIT I INTRODUCTION 9

Introduction to ethics – Definition of Ethics, Business Ethics– Nature, Characteristics and Needs, Ethical Practices in Management - Factors affecting business ethics-Theories of ethics.

UNIT II VIRTUE AND ETHICS 9

Virtue, Virtue Ethics - Ethical dilemma, Ethical gap, Ethical leadership – Whistle blowing – Trade Secrets.

UNIT III ETHICS IN FUNCTIONAL AREAS 9

Ethics in Finance, Ethics in Marketing, Ethics in HRD – Ethics and Business Strategy - Culture and Ethics –

Ethical Values in different Cultures, Culture and Individual Ethics- Influence of Organizational Culture in Ethics – Ethics Committee – Ethical Audit

UNIT IV CORPORATE SOCIAL RESPONSIBILITY 9

Corporate Social Responsibility – Social Audit – Ethics and Government – International Business Ethics-

Stakeholder Theory - Social Responsibilities of Business – Environmental Protection, Fair Trade Practices - Safeguarding Health and well being of Customers.

UNIT V CORPORATE GOVERNANCE 9

Corporate Board--Attributes, Duties, Responsibilities, Liabilities- Shaping Directorial Competence and Board Effectiveness-Corporate Disclosure and Investor Protection-Corporate Board Committees- Globalization and Corporate Governance- Emerging Trends in Corporate Governance.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of this course the students will be able to

understand the Long-term benefits of adhering Ethical Codes.

exhibit ethics in trade activities.

apply ethics in various disciplines of an organization.

identify the practical implications of Corporate Social Responsibility.

analyze effectively appropriate mechanism for effective governance on corporate management.

REFERENCES

S.K.Bhatia (2005). Business Ethics and Corporate Governance. Himalaya Publishing House.

Fernando A C (2010). Business Ethics and Corporate Governance. Pearson Education.

Sharma J P (2011). Corporate Governance, Business Ethics and CSR (With Case Studies and Major Corporate Scandals). ANE Books.

D. Murray (1997). Ethics in Organizational, Kogan Page Publishers.

S. K. Chakraborty (1998). Values and Ethics in Organisation, Oxford University Press.

WEB LINKS

www.icmrindia.org

mbanotes.info/?lorem=business-ethics-and-corporate-governance

www.slideshare.net

https://webservices.ignou.ac.in

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2						2					1	
CO2													2	
CO3							1							1
CO4		2					2				1			
CO5				1										

BA 15104 **ORGANIZATIONAL BEHAVIOR** 3 0 0 3

COURSE OBJECTIVES

To provide conceptual inputs to manage behaviour in organisations

To develop an understanding of the environment, organizational context in which behaviour is exhibited

To understand the causes of behaviour

To understand the outcomes of behaviour

To understand the different ways of managing behaviour

UNIT 1 INTRODUCTION TO OB 5

Definition, need and importance of organizational behavior – Nature and scope – Frame work – Organizational behavior models.

UNIT 2 INDIVIDUAL BEHAVIOUR 10

Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behavior modification. Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Changing Attitude – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Theories – Effects on work behavior.

UNIT 3 GROUP BEHAVIOUR 10

Group Formation –Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Developing Effective Team - Interpersonal relations – Communication – Improving verbal and non verbal communication.

UNIT 4 LEADERSHIP AND POWER 10

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Finding and creating effective leaders – Sources of power – Power canters – Power and Politics.

UNIT 5 ISSUES AND CHALLENGES OF OB 10

Organizational culture – Multi cultural organization and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Resistance to change – Managing change – Promoting creativity in an organization – Stress – Work Stressors –

Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives –. Organizational effectiveness.

TOTAL: 45 PERIODS

COURSE OUTCOMES

The student will have the ability to:

Relate the environmental and organizational context in which behaviour occurs.

Identify the causes of behaviour (individual, interpersonal, group and organizational)

To predict the outcomes of specific behaviour

Understand the leadership style, theories and its application in organisational settings.

Manage behaviour in a dynamic environment

REFERENCES

Ivancevich, Konopaske & Maheson, Organisational Behaviour and Management, 10th Edition, Tata McGraw Hill, 2013

Udai Pareek, Understanding Organisational Behaviour 3rd Edition, Oxford Higher Education, 2012

Lionnel Robbins , Judge, Sanghi, Organisational Behaviour, 14th Edition Pearson Publication

Fred Luthans Organisational Behaviour, 12th Edition, McGraw Hill Publications, 2010.

Aswathappa.K, Organisational Behaviour, HPH, New Delhi, 2010

WEB LINKS

www.hrmasia.com

Mapping of Course Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak**														
Course outcome	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	3		3	2					3		1			
CO 2	2		3				1	2				2		
CO 3			2		3				2					
CO 4	2		2		1	2	1	2						3
CO 5	2			3	3			3					3	

GENERAL MANAGEMENT ELECTIVES

BA16G01 BUSINESS ETHICS AND CORPORATE GOVERNANCE 3 0 0 3

COURSE OBJECTIVES

To understand business ethics as part of ethics and its role in human development.

To familiarize oneself with the theory and practice of managing ethics in organizations.

To discuss the various functional areas of ethics in a corporate setup.

To comprehend the importance of Corporate Social Responsibility in business excellence.

To acquire knowledge with different approaches in Corporate Governance.

UNIT I INTRODUCTION 9

Introduction to ethics – Definition of Ethics, Business Ethics– Nature, Characteristics and Needs, Ethical Practices in Management - Factors affecting business ethics-Theories of ethics.

UNIT II VIRTUE AND ETHICS 9

Virtue, Virtue Ethics - Ethical dilemma, Ethical gap, Ethical leadership – Whistle blowing – Trade Secrets.

UNIT III BUSINESS 9

Ethics in Finance, Ethics in Marketing, Ethics in HRD – Ethics and Business Strategy - Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics- Influence of Organizational Culture in and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Ethics – Ethics Committee – Ethical Audit

UNIT IV CORPORATE SOCIAL RESPONSIBILITY 9

Corporate Social Responsibility – Social Audit – Ethics and Government – International Business Ethics- Stakeholder Theory Social Responsibilities of Business – Environmental Protection, Fair Trade Practices -Safeguarding Health and well being of Customers.

UNIT V CORPORATE GOVERNANCE 9

Corporate Board--Attributes, Duties, Responsibilities, Liabilities- Shaping Directorial Competence and Board Effectiveness- Corporate Disclosure and Investor Protection-Corporate Board Committees- Globalization and Corporate Governance- Emerging Trends in Corporate Governance.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

explain the Long-term benefits of adhering ethical codes.

exhibit ethics in trade activities.

apply ethics in various disciplines of an organization.

identify the practical implications of corporate social responsibility.

analyze effectively appropriate mechanism for effective governance on corporate management.

COURSE OBJECTIVES

To discuss the need and importance of organizational behaviour and its scope.

To understand the outcomes of individual behaviour and its impact on work.

To describe the dynamics in group behaviour and means of developing effective team.

To know the leadership styles and sources of power.

To be familiar with factors affecting organizational culture and development.

UNIT I INTRODUCTION TO OB 5

Definition, need and importance of organizational behavior – Nature and scope – Frame work – Organizational behavior models.

UNIT II INDIVIDUAL BEHAVIOUR 12

Personality – types – Factors influencing personality – Theories – Learning – Factors - The learning process – Learning theories – Organizational behavior modification. Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Changing Attitude – Measurement- Values. Perceptions – Factors influencing perception – Interpersonal perception. Motivation – Types – Theories – Effects on work behavior.

UNIT III GROUP BEHAVIOUR 10

Group Formation –Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Developing Effective Team - Interpersonal relations – Communication – Improving verbal and non verbal communication.

UNIT IV LEADERSHIP AND POWER 8

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Finding and creating effective leaders – Sources of power – Power canters – Power and Politics.

UNIT V ORGANISATION CULTURE, CHANGE, CLIMATE & DEVELOPMENT 10

Organizational culture – Multi cultural organization and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Resistance to change – Managing change – Promoting creativity in an organization – Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives –. Organizational effectiveness.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

understand the basics of organizational behaviour

understand the outcomes of individual behaviour and its reflection in workplace

acquire knowledge in group behaviour

reflect leadership styles in different situations

understand organization culture and factors affecting change and development

REFERENCES

Schermerhorn, hunt and Osborn, Organisational Behaviour, John Wiley, 9th Edition, 2012

Udai Pareek, Understanding Organisational Behaviour 3rd Edition, Oxford Higher Education, 2012

Mc Shane & Von Glinov, Organisational Behaviour, 7th Edition, Tata Mc Graw Hill, 2014

Hellrigal, Slocum and Woodman, Organisational Behaviour & Management, 11th Edition, Cengage Learning, 2007

Ivancevich, Konopaske & Maheson, Organisational Behaviour and Management, 10th Edition, Tata McGraw Hill, 2013

Robbins , Judge, Sanghi, Organisational Behaviour, 14th Edition Pearson Publication

Fred Luthan Organisational Behaviour, 12th Edition, McGraw Hill Publications.

Aswathappa.k, Organisational Behaviour, HPH, New Delhi, 2010

WEB LINKS

www.b-u.ac.in/sde

www.en.docsity.com

Mapping of Course Outcomes with the Programme Outcomes

(1/2/3 indicates streangth of correlation) 3-Strong, 2-Medium, 1-Week

Cos	Programme Outcomes (Pos)												Programme Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	POS2
CO1	3		3	2					3		1			
CO2	2		3				1	2				2		
CO3			2		3				2					
CO4	2		2		1	2	1	2						3
CO5	2			3	3			3					3	

COURSE OBJECTIVES

To understand the fundamentals of rural marketing.

To emphasize on rural consumer behavior

To impart knowledge in targeting, segmentation and positioning

To develop skills in product and pricing strategy.

To learn the distribution strategy and financial services

UNIT I INTRODUCTION 9

Rural Marketing – Introduction, concepts and scope – Rural marketing: The new discipline – Nature of rural markets – Attractiveness of rural market – Rural Vs Urban marketing – Rural marketing environment – Rural Marketing in India

UNIT II RURAL CONSUMER BEHAVIOR 9

Introduction – Consumer buying behavior models – Factors affecting consumer behavior – Characteristics of rural consumer – Consumer buying process – Brand loyalty

UNIT III TARGETING, SEGMENTATION AND POSITIONING 9

Introduction – Segmentation – Degrees of Segmentation – Basis of segmentation and approaches to rural– segmentation – Targeting - Evaluation and selection of segments , Coverage of segments. Positioning Identifying,selecting, developing and communicating

UNIT IV PRODUCT and PRICING STRATEGY 9

Introduction – Marketing mix challenges – Product concepts and classification – Rural product categories – New–product development – Consumer adoption process – Product life cycle – Productmix– Rural packaging Pricing objectives, Pricing strategies and Market – Entry strategies

UNIT V DISTRIBUTION STRATEGY AND FINANCIAL SERVICES 9

Introduction – Accessing Rural markets: Coverage status in rural markets – Channels of Distribution –Evolution of Rural Distribution Systems – Prevalent Rural Distribution Models – Emerging Distribution Models – Financialservices – Introduction – Need for Credit, Consumer finance for durables, Sources of credit, Innovation creditdelivery systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

explain the concepts of Rural Marketing.

comprehend the Distribution strategy and Financial Services

analyze the Rural Consumer behavior

exhibit knowledge in Targeting, Segmentation and Positioning

develop their skills in Product and Pricing Strategy

REFERENCES

1. Pradeep Kashya and Siddhartha Raut, " The Rural Marketing Book" Biztantra, 2015
2. C.S.G Krishnamacharyulu and Lalitha Ramakrishnan, "Rural Marketing- Text and Cases" Pearson Education, 2014
3. Rural Marketing: Indian Perspective By Awadhesh Kumar Singh Satyaprakash pandey New age publishers , 2013
4. A Textbook on Rural Consumer Behaviour in India: A Study of FMCGs By Dr. A Sarangapani
5. New Perspectives on Rural Marketing: Includes Agricultural Marketing By Ramkishen Y.

WEB LINKS

1. www.ruralmarketing.org
2. www.ibef.org

www.businessjargons.com/rural

Mapping of Course Outcomes with the Programme Outcomes

(1/2/3 indicates streangth of correlation) 3-Strong, 2-Medium, 1-Week

Cos	Programme Outcomes (Pos)												Programme Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	PO
CO1	1							2		2			2	2
CO2	1			2				3						2
CO3	2			3				3	2	2		3		3
CO4			1	3		2		3						3
CO5			1	2										1

REFERENCES

1. Pradeep Kashya and Siddhartha Raut, " The Rural Marketing Book" Biztantra, 2015
2. C.S.G Krishnamacharyulu and Lalitha Ramakrishnan, "Rural Marketing- Text and Cases" Pearson Education, 2014
3. Rural Marketing: Indian Perspective By Awadhesh Kumar Singh Satyaprakash pandey New age publishers , 2013
4. A Textbook on Rural Consumer Behaviour in India: A Study of FMCGs By Dr. A Sarangapani
5. New Perspectives on Rural Marketing: Includes Agricultural Marketing By Ramkishen Y.

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2. www.ibef.org

www.businessjargons.com/rural

Mapping of Course Outcomes with the Programme Outcomes

(1/2/3 indicates streangth of correlation) 3-Strong, 2-Medium, 1-Week

Cos	Programme Outcomes (Pos)												Programme Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	PO
CO1	1							2		2			2	2
CO2	1			2				3						2
CO3	2			3				3	2	2		3		3
CO4			1	3		2		3						3
CO5			1	2										1

REFERENCES
1. Mike Hodgins, Philip Shrives, Business Ethics and Corporate Governance, Custom Publishing, 2011.
2. Fernando A C, Business Ethics and Corporate Governance. Pearson Education, 2014
3. Sharma J P, Corporate Governance, Business Ethics And CSR (With Case Studies and Major Corporate Scandals). ANE Books, 2016
4. D. Murray, Ethics in Organizational, Kogan Page Publishers, 2013.
5. 3. S. K. Chakraborty, Values and Ethics in Organization, Oxford University Press, 2012.
WEB LINKS
1. www.icmrindia.org
2. mbanotes.info/?lorem=business-ethics-and-corporate-governance
3. www.slideshare.net
4. https://webservices.ignou.ac.in

Mapping of Course Outcomes with the Programme Outcomes

(1/2/3 indicates streangth of correlation) 3-Strong, 2-Medium, 1-Week

Cos	Programme Outcomes (Pos)												Programme Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	POS2
CO1			1		1	2				3				
CO2	1				1	2								
CO3			1							1		2		3
CO4	1						1			3				2
CO5	1					3				2				1

BA19101	BUSINESS ETHICS	3	0	0	3

COURSE OBJECTIVES To enable the students to	
	understand need for Business Ethics.
	impart knowledge on ethics issues in Human Resource Management.
	provide an overview about ethics in Marketing.
	understand ethics in Financial Management and Information Technology.
	learn the role of ethics in Corporate Governance.

UNIT I	INTRODUCTION TO VALUES AND ETHOS	6

Introduction to Business Ethics - Need and Benefit of Business Ethics - Moral Values - Arguments for and against business ethics - Framework for ethical decision making – Individual factors, organizational factors.

UNIT II	ETHICAL ISSUES IN HRM	6

Job Discrimination - Employee Privacy - Gender issues - Employee Rights – Compensation - Whistle blowing - Restructuring and layoffs.

UNIT III	ETHICAL ISSUES IN MARKETING	6

Market Audience - Advertising Ethics - Consumer Privacy - Pricing Ethics - Deceptive Marketing Policies and Ethics - Anti-Competitive Practices - Product Safety.

UNIT IV	ETHICAL ISSUES IN FINANCE AND INFORMATION TECHNOLOGY	6
Accounting standards and accounting disclosures – Deception – Churning - Financial Markets - Insider Trading - Campaign financing. Information system security - Email and Internet security - Software Piracy and Changing Ethical Dilemmas in Technology - Cyber Crime - Ethics and Artificial Intelligence.		
UNIT V	**CORPORATE GOVERNANCE**	**6**
Meaning – Value based Corporate Culture - Roles and responsibilities of the Board – Conflict of Interest – Disclosure, transparency, and accountability - Rights and equitable treatment of Shareholders – Lessons from Corporate Failure - Current Trends and Corporate Governance.		
	TOTAL PERIODS	**30**

COURSE OUTCOMES	
At the end of this course, the students will be able to	
acquire knowledge about scope and significance of Business Ethics.	
understand the ethical dimensions in managing employees at work place.	
execute marketing activities without any dilution in ethical values.	
execute ethical practices in managing financial decisions and information technology.	
understand the issues in Corporate Governance.	

REFERENCES

Sadri (2009), “Business Ethics: Concept and Cases”, Tata McGraw Hill, New Delhi.

Manuel G. Velasquez (2017), "Business Ethics: Concepts and Cases", 8th Edition, Pearson Education.
C.V. Baxi (2008), "Corporate Governance: Critical Issues", Excel Books.
Keho Prasad (2014), "Corporate Governance", 3rd Edition, Prentice Hall Of India.
Andrew C. Wicks, R.Edward Freeman (2010) "Business Ethics – A Managerial Approach", 3rd Edition , Prentice Hall of India

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

Course outcome	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	2		3		2				2		1			
CO 2	3		3	2		2								3
CO 3			1		3	1			1		1		3	
CO 4	3		2		3	3					1			
CO 5	1	2	3		2	3		2			2			

BA19G01	**INDIAN ETHOS IN MODERN MANAGEMENT**	**3**	**1**	**0**
	4			

COURSE OBJECTIVES

To enable students to

recognize the importance of human values, harmony and ethical behavior in real life situation.

appraise the need for ethical issues in workplace and be able to find solution.

compare the relationship between indian ethos and its application in managerial practices.

realise the need for linking ethics in management.

value the ethical principles to be implemented in business.

UNIT I INTRODUCTION 8

Meaning – features – needs – history – relevance – principles – practiced by indian companies – requisities – element – role of Indian ethos in Managerial practices – Management lessons – Vedas – Mahabharatham – bible – kautilyas- Indian heritage in business – Indian/western management.

UNIT II WORK ETHOS 8

Meaning – level- dimensions – steps – factors – responsible for poor work ethos –ethic v/s ethos values – meaning – features – values for Indian manager – relevance of values – impact of values on stakeholder – values of manager – values in management – spiritual values in management– importance in work culture.

UNIT III MANAGEMENT BY INDIAN APPROACH 8

Role of Indian Ethos in Managerial practices – Management in culture bounds – teaching of Buddha and Mahaveer: Leadership and Management the Chanakaya way: Indian thoughts, Guna theory; Karma Theory –Niskama karma – Yoga and Professionalism.

UNIT IV ETHICS IN MANAGEMENT 8

Ethics; Understanding the need for ethics – Ethical values – Ethical Codes – Ethical Principles in business – ethical issues – Advertisement and Marketing – Work ethics – Communication Ethics – channels – trainingprogrammes – evaluation - ethical audit – corporate.

UNIT V INDIAN ETHOS AND VALUES IN MODERN MANAGEMENT 8

India ethos in management – manager mind set – human values insight – value oriented holistic management

total quality management – stress and Indian ethos – the dwandik theory of stress.

TOTAL PERIODS : 40

COURSE OUTCOMES

Upon the completion of the course, students will be able to

appraise the role of Indian ethos in Managerial practices.

adapt the work ethos in business management.

examine the Indian ethos managerial practices in business.

follow the ethical principles in doing business.

assess the prospects of valuing Indian ethos in modern management.

REFERENCES

Indian Ethos in Management, Tushar Agarwal, Niche Chandorkar, First Edition, Himalaya publishing House. Revised 2016-17.

Ramachandran, S., Raja, K.C.R. and Nair, B.K. (2008). Ethics, Indian Ethos and Management, 2/e; Mumbai: Shroff Publishers and Distributors.

Chakra borty, S.K.: Foundations of Managerial Work Contributions from Indian Thought, Himalaya Publishing Hose, Delhi 1998.

Chakra borty, S.K: Ethics in Management: Vedantic Perspectives, Oxford University Press, Delhi 1995.

Corporate Social Responsibility in India, Cases and Developments after the Legal Mandate Editors:Mitra, Nayan, Schmidpeter, Rene, 2017.

CO – PO Mapping :

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1										2			3	
CO2	3													3
CO3									2				2	
CO4					3									2
CO5			3											2

BA19103	ORGANIZATIONAL BEHAVIOR	3	1	0	4

COURSE OBJECTIVES To enable the students to	
discuss the need and importance of organizational behaviour and its scope.	
understand the outcomes of individual behaviour and its impact on work	
describe the dynamics in group behaviour and means of developing effective team	
know the organization conflict, power and politics	
be familiar with factors affecting organizational culture and development.	

UNIT I	INTRODUCTION TO OB	5

Definition, need and importance of Organizational Behavior – Nature and Scope – Frame work – Organizational behavior models, Challenges and Opportunities faced in OB – Models of OB.

UNIT II	INDIVIDUAL BEHAVIOUR	9

Personality – Types – Factors influencing personality – Theories – Learning – Factors - The learning process – Learning theories – Organizational behavior modification - Misbehavior – Types – Management Intervention - Emotions - Emotional Intelligence – Attitudes – Characteristics – Components – Changing Attitude – Measurement- Values - Perceptions – Factors influencing perception – Interpersonal perception.

UNIT III	GROUP BEHAVIOUR	9

Group Formation –Groups in organizations –Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Developing Effective Team - Interpersonal

relations – Communication – Improving verbal and non verbal communication		
UNIT IV	**ORGANISATIONAL CONFLICT POWER AND POLITICS**	**8**
Organizational Conflict Models – Managing Conflicts– Resolution Strategy –Conflict – Transaction in conflicts – Conflicts process - Power – Bases – Power in Action – Sources of power – Power canters – Power and Politics		
UNIT V	**ORGANISATION CULTURE, CHANGE, CLIMATE AND DEVELOPMENT**	**9**
Organizational culture – Factors affecting organizational climate - Job satisfaction – Determinants – Measurements – Influence on behavior - Organizational change – Resistance to change – Managing change – Promoting creativity in an organization - Balancing work and Life - Organizational development – Characteristics – Objectives – Organizational effectiveness.		
	TOTAL PERIODS	**40**

COURSE OUTCOMES	
At the end of this course, the students will be able to	
understand the basics of organizational behavior	
understand the outcomes of individual behaviour and its reflection in workplace	
acquire knowledge in group behavior	
knowledge about the Organization conflict, power and politics	
understand organization culture and factors affecting change and development	

REFERENCES

Shane and Von Glinov (2014), "Organisational Behaviour", 7th Edition, Tata Mc Graw Hill.

rigal, Slocum and Woodman (2007), "Organisational Behaviour and Management", 11th Edition, Cengage Learning.
ıcevich, Konopaske and Maheson (2013), "Organisational Behaviour and Management", 10th Edition, Tata McGraw Hill.
Stephen P. Robbins and Timothy A. Judge (2018), "Organizational Behavior", 18th Edition, Pearson Education.
ven McShane and Mary Ann Von Glinow (2014), "Organizational Behavior", 7th Edition, McGraw-Hill Education.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

Course outcome	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	3		3	2					3		1			
CO 2	2		3				1	2				2		
CO 3			2		3				2					
CO 4	2		2		1	2	1	2						3
CO 5	2			3	3			3					3	

CA15407 TECHNICAL SEMIANR AND REPORT WRITING 0 0 4 2

The goal of this course is to train the students to critically evaluate a well-defined set of research subjects and to summarize the findings concisely in a paper of scientific quality. The paper will be evaluated based on the ability to understand a topic, communicate it and identify the issues. Results from this term paper will be presented to Fellow students and a committee of faculty members.

1. Every student selects a topic related to current trends and the same should be approved by the respective committee. This selection should have at least 5 distinct primary sources.
2. Every student must write a short review of the topic and present it to fellow students and faculty (discuss the topic – expose the flaws – analyze the issues) every week.
3. The faculty should evaluate the short review and award marks with respect to the following.
   a. Has the student analyzed – not merely quoted – the most significant portions of the primary sources
   b. Employed?
   c. Has the student offered original and convincing insights?
   d. Plagiarism to be checked.
4. Every student should re-submit and present the review article including issues/ comments/ conclusions which had arisen during the previous discussion.
5. Every student should submit a final paper as per project specifications along with all short review reports (at least 4 internal reviews) and corresponding evaluation comments.
6. Every student should appear for a final external review exam to defend themselves.

TOTAL PERIODS 60

Mapping of Courses Outcomes with Programme Outcomes:
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Week

COs	**Programme Outcomes (POs)**													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	2	-	-	-	2	-	-	-	-	2	2
CO2	1	2	3	1	-	-	-	1	-	-	-	3	2	3

CAE15508 **M – COMMERCE** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the E – commerce strategies and value chains
- understand the M-commerce services
- understand M – commerce infrastructure and applications
- know the availability of latest technology and applications of M- commerce in various domains
- apply mobile commerce in business-to-business application

UNIT I ELECTRONIC COMMERCE 9

Introduction -The e-commerce environment - The e-commerce marketplace -Focus on portals, Location of trading in the marketplace - Commercial arrangement for transactions - Focus on auctions - Business models for e-commerce - Revenue models - Focus on internet start-up companies - the dot-com - E-commerce versus E-business.

UNIT II MOBILE COMMERCE 9

Introduction – Infrastructure of M–Commerce –Types of Mobile Commerce Services–Technologies of Wireless Business – Benefits and Limitations, Support, Mobile Marketing & Advertisement, non– Internet Applications in M–Commerce – Wireless/Wired Commerce Comparisons

UNIT III MOBILE COMMERCE: TECHNOLOGY 9

A Framework For The Study of Mobile Commerce – NTT Docomo's I– Mode – Wireless Devices For Mobile Commerce– Towards A Classification Framework For Mobile Location Based Services – Wireless Personal and Local Area Networks –The Impact of Technology Advances on Strategy Formulation in Mobile Communication Networks

UNIT IV MOBILE COMMERCE: THEORY AND APPLICATIONS 9

The Ecology of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies and Small Business Adoption and Diffusion – M–Commerce in The Automotive Industry – Location– Based Services: Criteria for Adoption and Solution Deployment – The Role of Mobile Advertising in Building a Brand – M–Commerce Business Models

UNIT V BUSINESS– TO– BUSINESS MOBILE E-COMMERCE 9

Enterprise Enablement – Email And Messaging – Field Force Automation (Insurance,Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking and Maintenance/Management – Remote IT Support –Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course the students would be able to

- apply E – commerce principles in market place
- apply M – commerce principles to various business domains
- understand the theory and applications of M-commerce in business domain
- get an exposure to current technological advancements in M-commerce
- build M – commerce business models

REFERENCES

1. Dave Chaffey, "E-Business and E-Commerce Management", Third Edition, 2009, Pearson Education
2. Brian E. Mennecke, Troy J. Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., IRM press, 2003.
3. P. J. Louis, "M-Commerce Crash Course", McGraw- Hill Companies February 2001.
4. Paul May, "Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business" Cambridge University Press March 2001
5. Michael P. Papazoglou, Peter M.A. Ribbers, 'e-business organizational and Technical foundation ', Wiley India 2009

Mapping of Courses Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Week**														
COs	**Programme Outcomes (POs)**													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3	2	-	-	-	-	-	-	-	1	2	2
CO2	1	2	2	2	3	-	-	-	-	-	-	2	1	2
CO3	2	2	3	2	3	-	-	-	-		2	1	1	3
CO4	2	2	2	2	-	-	-	2	-	-	-	-	2	2
CO5	1	2	3	1	-	-	-	1	-	-	-	3	2	3

ELECTIVE - I

CA16151 FINANCIAL ACCOUNTING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand an overview of accounting concepts
- know the basics ratio analysis
- understand the knowledge in funds flow statement in accounting
- develop budget and budgetary control concept
- understand and practice of costing concept

UNIT I ACCOUNTING 9

Definition, Objectives, Advantages, Accounting Concepts, Accounting- Conventions. Methods of Accounting – Single Entry and Double Entry System. – Journal and Ledger – Preparation of Trial Balance.-Final Accounts: Trading and Profit and Loss Account and Balance Sheet of Sole- Proprietary Concern.

UNIT II RATIO ANALYSIS 9

Meaning – Advantages – Limitations – Classification of Ratio : Profitability, Turnover and Solvency Ratios.

UNIT III FUNDS FLOW STATEMENT 9

Concept of Funds – Funds flow Statement – Uses and Limitations – Preparation of Fund Flow Statement- – Cash Flow Statement

UNIT IV BUDGET AND BUDGETARY CONTROL 9

Meaning and Definition - Objectives of Budgetary - Control, Advantages and Limitations Preparation of Different Types o f Bud gets.

UNIT V COSTING 9

Definition, Nature and Importance Advantages and Limitations of Cost Accounting – Classifications of Cost — Preparation of Cost Sheet- Marginal Costing: Meaning, Advantages Cost – Volume Profit Analysis – Break Even Analysis – Uses and Assumptions – Applications of Marginal Costing.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course the students would be able to

- acquire knowledge about the overview of accounting concepts
- explore the basics ration analysis concept
- learn and understand the funds flow statement
- acquire knowledge in budget and budgetary control
- able to understand the concept of costing

REFERENCES

1. Decenzo and Robbins, financial Accounting, Wilsey, 10th edition, 2012.
2. Mamoria C.B. and Mamoria. S., Personnel Management, Himalaya Publishing Company, 1997.
3. Mirza S. Saiyadain Ration Analysis , Tata McGraw Hill , 4th edition 2009.
4. Eugence Mckenna and Nic Beach Budget and Budgetary Control, Pearson Education Limited, 2002.
5. Dessler, Accounting and Costing, Pearson Education Limited, 2002

Mapping of Courses Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Week**														
COs	**Programme Outcomes (POs)**													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3	2	-	-	-	-	-	-	-	1	2	2
CO2	1	2	2	2	3	-	-	-	-	-	-	2	1	2
CO3	2	2	3	2	3	-	-	-	-		2	1	1	3
CO4	2	2	2	2	-	-	-	2	-	-	-	-	2	2
CO5	1	2	3	1	-	-	-	1	-	-	-	3	2	3

CA16355 HUMAN RESOURCE MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the importance of human resources
- describe the steps involved in the human resource planning process
- understand the stages of employee socialization and training needs
- know about the purposes of performance management systems and appraisal
- know the list of occupational safety and health administration enforcement priorities

UNIT I FUNDAMENTALS OF HRM 9

Introduction- importance of HRM – functions- qualities of HR manager – evolution and growth of HRM – trends and opportunities - HRM in global environment – legal and ethical context – laws for discriminatory practices – equal opportunity employment.

UNIT II STAFFING, RECRUITMENT AND SELECTION 9

HR Polices - need, type and scope - human resource planning - job analysis - recruiting goals – recruiting sources – global perspective – selection process – pre-employment testing – interviews – job offers – hiring mistakes - key element for successful predictors.

UNIT III TRAINING AND DEVELOPMENT 9

Socialization – new employee orientation, training, development – organizational development – methods – evaluating training– international training and development issues – career development - value for organization and individual – mentoring and coaching – traditional career stages

UNIT IV PERFORMANCE EVALUATION, REWARDS AND BENEFITS 9

Appraisal process – methods – factors distort appraisal – team appraisal – international appraisal – rewards – Theories of motivation - compensation administration – job evaluation and pay structure – special cases of compensation – executive compensation programs – employee benefits.

UNIT V SAFE AND HEALTHY WORK ENVIRONMENT 9

Occupational safety and health act - issues – stress – assistance program – labor management - employee unions – labor legislation. Promotion, demotion, transfer and separation – employee grievances – redressal methods.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course the students would be able to

- identify the primary external influences affecting HRM
- outline the components and the goals of staffing, training and development
- understand the selection procedure in various organizations
- understand the practices used to retain the employees and able to evaluate their performance
- able to identify the stress and the cause of burn out

REFERENCES

1. Decenzo and Robbins, Human Resource Management, Wilsey, 10th edition, 2012.
2. Mamoria C.B. and Mamoria. S., Personnel Management, Himalaya Publishing Company, 1997.
3. Mirza S. Saiyadain Human Resource Management , Tata McGraw Hill , 4th edition 2009.
4. EugenceMckenna and Nic Beach Human Resource Management, Pearson Education Limited, 2002.
5. Dessler, Human Resource Management, Pearson Education Limited, 2002.

Mapping of Courses Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Week**														
COs	**Programme Outcomes (POs)**													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3	2	-	-	-	-	-	-	-	1	2	2
CO2	1	2	2	2	3	-	-	-	-	-	-	2	1	2
CO3	2	2	3	2	3	-	-	-	-		2	1	1	3
CO4	2	2	2	2	-	-	-	2	-	-	-	-	2	2
CO5	1	2	3	1	-	-	-	1	-	-	-	3	2	3

CA16407 TECHNICAL SEMIANR AND REPORT WRITING 0 0 4 2

The goal of this course is to train the students to critically evaluate a well-defined set of research subjects and to summarize the findings concisely in a paper of scientific quality. The paper will be evaluated based on the ability to understand a topic, communicate it and identify the issues. Results from this term paper will be presented to Fellow students and a committee of faculty members.

1. Every student selects a topic related to current trends and the same should be approved by the respective committee. This selection should have at least 5 distinct primary sources.
2. Every student must write a short review of the topic and present it to fellow students and faculty (discuss the topic – expose the flaws – analyze the issues) every week.
3. The faculty should evaluate the short review and award marks with respect to the following.
   a. Has the student analyzed – not merely quoted – the most significant portions of the primary sources
   b. Employed?
   c. Has the student offered original and convincing insights?
   d. Plagiarism to be checked.
4. Every student should re-submit and present the review article including issues/ comments/ conclusions which had arisen during the previous discussion.
5. Every student should submit a final paper as per project specifications along with all short review reports (at least 4 internal reviews) and corresponding evaluation comments.
6. Every student should appear for a final external review exam to defend themselves.

TOTAL PERIODS 60

Mapping of Courses Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Week**														
COs	**Programme Outcomes (POs)**													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	2	-	-	-	2	-	-	-	-	2	2
CO2	1	2	3	1	-	-	-	1	-	-	-	3	2	3

CA19103 FINANCIAL ACCOUNTING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand an overview of accounting concepts
- know the basics ratio analysis
- understand the knowledge in funds flow statement in accounting
- develop budget and budgetary control concept
- understand and practice of costing concept

UNIT I ACCOUNTING 9

Definition, Objectives, Advantages, Accounting Concepts, Accounting- Conventions. Methods of Accounting – Single Entry and Double Entry System. – Journal and Ledger – Preparation of Trial Balance.-Final Accounts: Trading and Profit and Loss Account and Balance Sheet of Sole- Proprietary Concern.

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UNIT IV BUDGET AND BUDGETARY CONTROL 9

Meaning and Definition - Objectives of Budgetary - Control, Advantages and Limitations Preparation of Different Types o f Bud gets.

UNIT V COSTING 9

Definition, Nature and Importance Advantages and Limitations of Cost Accounting – Classifications of Cost – Preparation of Cost Sheet- Marginal Costing: Meaning, Advantages Cost – Volume Profit Analysis – Break Even Analysis – Uses and Assumptions – Applications of Marginal Costing.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course the students would be able to

- acquire knowledge about the overview of accounting concepts
- explore the basics ration analysis concept
- learn and understand the funds flow statement
- acquire knowledge in budget and budgetary control
- understand the concept of costing

REFERENCES

1. Decenzo and Robbins, financial Accounting, Wilsey, 10th edition, 2012.
2. Mamoria C.B. and Mamoria. S., Personnel Management, Himalaya Publishing Company, 1997.
3. Mirza S. Saiyadain Ration Analysis , Tata McGraw Hill , 4th edition 2009.
4. Eugence Mckenna and Nic Beach Budget and Budgetary Control, Pearson Education Limited, 2002.
5. Dessler, Accounting and Costing, Pearson Education Limited, 2002

WEB LINKS

1. http://courses.acs.uwinnipeg.ca/3909-050/lectures/Week01.pdf
2. http://handbook.uts.edu.au/subjects/31242.html
3. http://studentsblog100.blogspot.in/2015/05/internet-programming-syllabus-5th-sem-cse-reg-2013.html

Mapping of Courses Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Week**														
COs	**Programme Outcomes**													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3	2	-	-	-	-	-	-	-	1	2	2
CO2	1	2	2	2	3	-	-	-	-	-	-	2	1	2
CO3	2	2	3	2	3	-	-	-	-		2	1	1	3
CO4	2	2	2	2	-	-	-	2	-	-	-	-	2	2
CO5	1	2	3	1	-	-	-	1	-	-	-	3	2	3

15GEVC101/201 GENDER SENSITIZAITON

COURSE OBJECTIVES

To enable the students to

- introduce basic concepts relating to gender and to provide logical understanding of gender roles
- develop gender sensitization and related issues
- enable them to engage in policy decisions to remove gender biases in all fields of life in the process of gender equality for nation building
- trace the evolution of gender studies from women's studies

MODULE 1: Introduction to Women's Studies

Sex and Gender, socialization, Definition, Nature, Scope and various dimensions

MODULE 2: Approaches of Feminism

Feminism and Patriarchy, Feminist ideology, Feminist Movements in brief

MODULE 3: Basic concepts of Gender and Society

Sexual division of Labour, Masculinity & feminity, Man and Woman relationship, Self awareness, consciousness raising

MODULE 4: Women and Law

Constitutional Laws and Fundamental rights, Human Rights, Women related Law, Women in Politics – PRI.

TOTAL PERIODS 30

COURSE OUTCOMES

Students must gain knowledge on

- The concepts relating to gender and gains the logical understanding of gender roles
- Familiarize the evolution of gender studies from women's studies
- the removal of gender biases in all fields of life in the process of gender equality for nation building
- the evolution of gender studies from women's studies

TEXT BOOKS

1.Gill, Rajesh, Contemporary Indian Urban Society- Ethnicity, Gender and Governance, Bookwell Publishers, New Delhi, 2009

2.Jain, Devaki and Rajput, Pam, (eds), Narratives from the Women's Studies Family, Sage, New Delhi, 2003.

REFERENCES

1.Mies, Maria, Indian Women and Patriarchy, Concept Publishing Company, New Delhi, 2004.

2.Chatterjee, Mohini, Feminism and Gender Equality, Aavishkar, Jaipur,2005

15GEVC101/201

INTRODUCTION TO INDIAN CONSTITUTION

COURSE OBJECTIVES

To enable the students to

- assimilate and get familiarized with basic information about Indian constitution
- aware of the functional aspects of the local Administration System.
- understand human rights/ values and its implications in their life.

MODULE- 1 : INTRODUCATION ABOUT INDIAN CONSTITUTION

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working) - Philosophy of the Indian Constitution: Preamble Salient Features.

MODULE 2 - LOCAL ADMINISTRATION

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Village level: Role of Elected and Appointed officials,

MODULE 3 - CONSTITUTIONAL RIGHTS & DUTIES

Contours of Constitutional Rights & Duties: Fundamental Rights , Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

TOTAL PERIODS 30

COURSE OUTCOMES

At the end this course, students will be able to

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics
- Familiarize with the various levels of local administration.
- Gain knowledge on election commission of India

TEXT BOOKS

1. Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th / 20th Edn., (Latest Edition) or 2008.
2. Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" byCengage Learning India Private Limited, Latest Edition – 2018
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015
4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

5. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

REFERENCES

1. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, “Engineering Ethics”, Prentice –Hall of India Pvt. Ltd. New Delhi, 200
2. M.V.Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 2002.
3. Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

16GEVC101/201 CONSTITUTION OF INDIA

COURSE OBJECTIVES

To enable the students to

- assimilate and get familiarized with basic information about Indian constitution
- aware of the functional aspects of the local Administration System.
- understand human rights/ values and its implications in their life.

MODULE- 1 : INTRODUCTION ABOUT INDIAN CONSTITUTION

Definition, historical back ground, features, preamble, territory, citizenship.

MODULE 2 : CONSTITUTIONAL RIGHTS & DUTIES

State, fundamental rights, directive principles, duties.

MODULE 3 : UNION AND STATE PROVISIONS

The machinery of the union government , Government machinery in the states, The federal system, Statutory Institutions, miscellaneous provisions

TOTAL PERIODS 30

COURSE OUTCOMES

At the end this course, students will be able to

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics
- Familiarize with the various levels of local administration.
- Gain knowledge on election commission of India

TEXT BOOKS

1. Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th / 20th Edn., (Latest Edition) or 2008.
2. Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" byCengage Learning India Private Limited, Latest Edition – 2018
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015
4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
5. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

REFERENCES

1. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 200
2. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

3. Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

16GEVC101/201 **INTRODUCTION OF GENDER STUDIES**

COURSE OBJECTIVES

To enable the students to

- introduce basic concepts relating to gender and to provide logical understanding of gender roles
- trace the evolution of gender studies from women's studies
- enable them to engage in policy decisions to remove gender biases in all fields of life in the process of gender equality for nation building

MODULE 1: Introduction

Sex and Gender, Types of Gender, Gender roles and Gender division of Labour, Gender stereotyping and Gender Discrimination

MODULE 2: Social Construction of Feminity

Bio-Social perspective of Gender, Gender as Attribution fact , Essentialism in the construction of feminity, Challenging cultural notions of feminity, images of women in sports, arts , entertainment and fashion industry, media and feminine identities

MODULE 3: Women's studies and Gender studies

Evaluation and scope of women's studies, from women's to gender studies: A Paradigm shift, Women's studies VS Gender studies

TOTAL PERIODS 30

COURSE OUTCOMES

Students must gain knowledge on

- The concepts relating to gender and gains the logical understanding of gender roles
- Familiarize the evolution of gender studies from women's studies
- the removal of gender biases in all fields of life in the process of gender equality for nation building

TEXT BOOKS

1. Cornell R W (1995) Gender. Cambridge, Polity Press.

2. Gatens M (1991) A Critique of the Sex/Gender Distinction in S. Gunew (ed.) A Reader in FeministKnowledge. London: Routledge.

REFERENCES

1. Andrea N (1989) Feminist Theory and Philosophies of Men. New York: Routledge.
2. Arora P (2011) Gender and Power. Delhi: Pacific Publication.

17GEVC101/201 **INDIAN CONSTITUTION AND ELECTION COMMISION**

COURSE OBJECTIVES

To enable the students to

- understand the most diversified legal document of India and philosophy behind it.
- thinking towards basic understanding of the Organs of Governance and its implications for engineers.
- learn about the role and function of election commission

MODULE 1 : INTRODUCTION ABOUT INDIAN CONSTITUTION

Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution,

MODULE 2: ORGANS OF GOVERNANCE

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

MODULE 3 : ELECTION COMMISSION

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL PERIODS 30

COURSE OUTCOMES

At the end this course, students will be able to

- Identify and explore the basic features and modalities about Indian constitution
- Understand the various organs of Indian governance.
- Gain knowledge on election commission of India

TEXT BOOKS

1. Brij Kishore Sharma: Introduction to the Indian Constitution, 8th Edition, PHI LearningPvt. Ltd.
2. Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" byCengage Learning India Private Limited, Latest Edition – 2018
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015
4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

5. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

REFERENCES

1. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, “Engineering Ethics”, Prentice –Hall of India Pvt. Ltd. New Delhi, 200
2. M.V.Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 2002.
3. Subhash C. Kashyap: Our Constitution: An Introduction to India’s Constitution and constitutional Law,NBT,2018.

17GEVC101/201 **GENDER EQUALITY AND LAW**

COURSE OBJECTIVES

To enable the students to

- search, analyse, and work with legally relevant information by using the juridical, comparative and other specific methods
- learn how to work cooperatively in groups.
- achieve gender equality and sustainable development goals

MODULE 1: Gender theory and law

Approaches to gender and law, Gender theory, Conflict, integrationist and hermeneutic approaches, Feminist theory, Human rights of women and legal theory, Feminist jurisprudence, Legal and gender expertise

MODULE 2: Gender equality and human rights

Gender and human rights theory, History of human rights movements, Suffrage movements, International treaties and prohibition of gender-based discrimination, EU human rights law and gender

MODULE 3: Gender equality and labour law

Current challenges for Gender equality, Anti-gender movements, Biopolitics and legal instruments of body control. Sexual violence in conflict. Challenges to human rights of women, mainstreaming and neoliberal jurisprudence, women and austerity. How to achieve gender equality: gender and sustainable development goals 2015-2030.

TOTAL PERIODS 30

COURSE OUTCOMES

Students must gain knowledge on

- To work with information (search, evaluate, use information, necessary for fulfilment of scientific and professional tasks, from various sources, including application of the systematic approach)
- To carry out professional activities in the international environment
- gender equality and sustainable development goals

TEXT BOOKS

1. Cornell R W (1995) Gender. Cambridge, Polity Press.

2. Gatens M (1991) A Critique of the Sex/Gender Distinction in S. Gunew (ed.) A Reader in FeministKnowledge. London: Routledge.

REFERENCES

1. Andrea N (1989) Feminist Theory and Philosophies of Men. New York: Routledge.
2. Arora P (2011) Gender and Power. Delhi: Pacific Publication.

18GEVC101/201 GENDER EQUALITY AND HUMAN RIGHTS

COURSE OBJECTIVES

To enable the students to

- To search, analyse, and work with legally relevant information by using the juridical, comparative and other specific methods
- Learn how to work cooperatively in groups.
- enable them to engage in policy decisions to remove gender biases in all fields of life in the process of gender equality for nation building

MODULE 1: Gender theory and law

Approaches to gender and law, Gender theory, Conflict, integrationist and hermeneutic approaches, Feminist theory, Human rights of women and legal theory, Feminist jurisprudence, Legal and gender expertise

MODULE 2: Gender equality and human rights

Gender and human rights theory, History of human rights movements, Suffrage movements, International treaties and prohibition of gender-based discrimination, EU human rights law and gender

MODULE 3: Gender equality and labour law

Current challenges for Genderequality, Anti-gender movements, Biopolitics and legal instruments of body control. Sexual violence in conflict. Challenges to human rights of women, women and austerity.

TOTAL PERIODS 30

COURSE OUTCOMES

Students must gain knowledge on

- how to work with information (search, evaluate, use information, necessary for fulfilment of scientific and professional tasks, from various sources, including application of the systematic approach)
- professional activities in the international environment
- the removal of gender biases in all fields of life in the process of gender equality for nation building

TEXT BOOKS

1. CornellRW(1995)Gender.Cambridge,PolityPress.

2.GatensM(1991)ACritiqueoftheSex/GenderDistinctioninS.Gunew(ed.)AReaderinFeministKnowledge. London: Routledge.

REFERENCES

1. AndreaN(1989)FeministTheoryandPhilosophiesofMen.NewYork:Routledge.
2. AroraP(2011)GenderandPower. Delhi: Pacific Publication.

18GEVC101/201 INDIAN CONSTITUTION AND ADMINISTRATION

COURSE OBJECTIVES

To enable the students to

- understand themostdiversifiedlegaldocument ofIndiaand philosophy behindit.
- thinking towards basic understanding of the Organs of Governance and its implications for engineers.
- learn about the role and function of election commission

MODULE 1 : INTRODUCTION ABOUTINDIAN CONSTITUTION

Meaning of the constitution law and constitutionalism, Historical Background of the ConstituentAssembly, Government of India Act of 1935 and Indian Independence Act of 1947,EnforcementoftheConstitution,IndianConstitutionanditsSalientFeatures,ThePreambleoftheConstitution.

MODULE 2: LOCAL ADMINISTRATION

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials.

MODULE 3: CONSTITUTIONAL RIGHTS & DUTIES

Contours of Constitutional Rights & Duties: Fundamental Rights , Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

TOTAL 30 PERIODS

COURSE OUTCOMES

At the end this course, students will be able to

- Identifyandexplorethebasicfeaturesandmodalitiesabout Indianconstitution
- Understand the various organs of Indian governance.
- Gain knowledge on election commission of India

TEXT BOOKS

1. BrijKishoreSharma:IntroductiontotheIndianConstitution,8th Edition,PHILearningPvt.Ltd.
2. Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" byCengage Learning India Private Limited, Latest Edition – 2018
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015

4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
5. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

REFERENCES

1. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, “Engineering Ethics”, Prentice –Hall of India Pvt. Ltd. New Delhi, 200
2. M.V.Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 2002.
3. SubhashC.Kashyap:OurConstitution:AnIntroductiontoIndia’s Constitutionand constitutional Law,NBT,2018.

19GEVC101/201

INDIAN CONSTITUTION AND HUMAN RIGHTS

COURSE OBJECTIVES

To enable the students to

- assimilate and get familiarized with basic information about Indian constitution
- understand human rights/ values and its implications in their life..
- thinking towards basic understanding of the Organs of Governance and its implications for engineers.

MODULE 1: INTRODUCTION ABOUT INDIAN CONSTITUTION

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working) - Philosophy of the Indian Constitution: Preamble Salient Features.

MODULE 2 : CONSTITUTIONAL RIGHTS & DUTIES

Contours of Constitutional Rights & Duties: Fundamental Rights , Right to Equality, Right to Freedom, Right against Exploitation, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

MODULE 3 : ORGANS OF GOVERNANCE

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Appointment and Transfer of Judges, Qualifications.

TOTAL PERIODS 30

COURSE OUTCOMES

At the end this course, students will be able to

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics
- Discuss the intellectual origins of the framework of argument that informed the Conceptualization of social reforms leading to revolution in India.
- Understand the various organs of Indian governance.

TEXT BOOKS

1. Durga Das Basu (DD Basu): “Introduction to the Constitution on India”, (Students Edition.)

Prentice –Hall EEE, 19th / 20th Edn., (Latest Edition) or 2008.

2. Shubham Singles, Charles E. Haries, and Et al : “Constitution of India and Professional Ethics” byCengage Learning India Private Limited, Latest Edition – 2018
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015
4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
5. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

REFERENCES

1. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, “Engineering Ethics”, Prentice –Hall of India Pvt. Ltd. New Delhi, 200
2. M.V.Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 2002.
3. Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

19GEVC101/201 INTRODUCTION OF GENDER STUDIES

COURSE OBJECTIVES

To enable the students to

- introduce basic concepts relating to gender and to provide logical understanding of gender roles
- trace the evolution of gender studies from women's studies
- enable them to engage in policy decisions to remove gender biases in all fields of life in the process of gender equality for nation building

MODULE 1: Introduction

Sex and Gender, Types of Gender, Gender roles and Gender division of Labour, Gender stereotyping and Gender Discrimination

MODULE 2: Social Construction of Feminity

Bio-Social perspective of Gender, Gender as Attribution fact , Essentialism in the construction of feminity, Challenging cultural notions of feminity, media and feminine identities

MODULE 3: Women's studies and Gender studies

Evaluation and scope of women's studies, from women's to gender studies: A Paradigm shift, Women's studies VS Gender studies

TOTAL PERIODS 30

COURSE OUTCOMES

Students must gain knowledge on

- The concepts relating to gender and gains the logical understanding of gender roles
- Familiarize the evolution of gender studies from women's studies
- the removal of gender biases in all fields of life in the process of gender equality for nation building

TEXT BOOKS

1. Cornell R W (1995) Gender. Cambridge, Polity Press.

2. Gatens M (1991) A Critique of the Sex/Gender Distinction in S. Gunew (ed.) A Reader in FeministKnowledge. London: Routledge.

REFERENCES

1. Andrea N (1989) Feminist Theory and Philosophies of Men. New York: Routledge.
2. Arora P (2011) Gender and Power. Delhi: Pacific Publication.

CH 15501 **ENVIRONMENTAL SCIENCE AND ENGINEERING** **3 0 0 3**

(Common to ECE, MCT & IT branches)

COURSE OBJECTIVES

To enable students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I **INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES** **9**

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources-Use – exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture- fertilizer-pesticide problems - water logging - salinity -case studies. Energy resources-Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource- land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II **ECOSYSTEMS AND BIODIVERSITY** **9**

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers– energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem – desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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 –field study.

UNIT III **POLLUTION** **9**

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution -thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone- landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV **SOCIAL ISSUES AND ENVIRONMENT** **9**

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people.Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health– Human rights – value education – HIV/ AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010 .
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, Jaico Publising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Chemistry
24/05/17
AUTONOMOUS

BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

- to study the basic issues in Professional Ethics.
- to appreciate the rights of others and to instill moral, social values and loyalty.
- to enable the student in their engineering profession who explore the ethical issues in technological society.
- to get ability to solve Global Issues.
- to understand humans' Safety, Responsibility and Rights.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living- Peacefully – caring – Sharing – Honesty – Courage –Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry –moral dilemmas - moral autonomy -Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories aboutright action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook onlaw - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island andChernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality -conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL HOURS 45

COURSE OUTCOMES

At the end of the course, students will be able to

- propose possible solutions using articulated ethical theories.

- form opinions based on reasoned ethical positions, supported with facts and evidence.
- getawareness of the ethical component of daily engineering decisions.
- solve Global Issues.
- understand the Safety, Responsibility and Rights.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, NewYork 2007.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
1. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, NewDelhi, (2004).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education,New Delhi, 2003.
3. Department of English and Foreign Languages SRM University, "Rhythm of Life", SRM Publications, 2013.
4. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).
5. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientistsand Engineers", Oxford University Press, Oxford.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	2	-	1	-	-	-	-	1	3	1
CO3	3	2	-	2	2	3	-	-	-	-	-	1	2	1
CO4	3	3	-	-	1	3	1	-	-	-	-	2	3	2
CO5	3	3	2	1	1	1	1	-	-	-	-	1	3	1

CH 16301 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected

- To know the constituents of the environment and the precious resources in the environment.
- To conserve all biological resources.
- To understand the role of human being in maintaining a clean environment and useful environment for the future generations
- To maintain the ecological balance and preserve bio-diversity.
- The role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources:Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources Use – exploitation - environmental effects of extracting and using mineral resources – Food resources:World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture fertilizer-pesticide problems - water logging - salinity. Energy resources: Growing energy needs renewable and non renewable energy sources. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem - desert ecosystem - aquatic ecosystems (lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level:Global - national - local levels- India as a mega diversity nation- hotspots 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.

UNIT III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution. Disaster management :Floods – earthquake - cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development : Unsustainable to sustainable development – urban problems related to energy.

Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust -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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV/AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Know the relationship between the human population and environment.
- Understand the basic concepts of environment studies and natural resources.
- Gaining the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

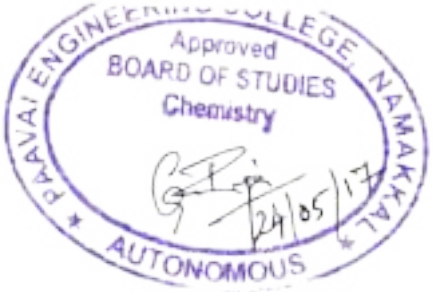
1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, EnvironmentalChemistry, VI edition,2015 NewAge International (P) ltd Publication,NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition,NewAge International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering and Sciences, V Edition,2013,Tata M'c Graw Hill pub,Newdelhi110008

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-



SEMESTER -VIII

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Cooperation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – abalanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, ―Ethics in Engineering‖, McGraw Hill, New York(2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, ―Engineering Ethics –Conceptsand Cases‖, Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, ―Engineering Ethics‖, Prentice Hall, New Mexico, (1999).
2. John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers‖,Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, ―Business Ethics – An IndianPerspective‖,Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, ―Computers, Ethics and Society‖, Oxford UniversityPress, (2003).

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	2	-	1	-	-	-	-	1	3	1
CO3	3	2	-	2	2	3	-	-	-	-	-	1	2	1
CO4	3	3	-	-	1	3	1	-	-	-	-	2	3	2
CO5	3	3	2	1	1	1	1	-	-	-	-	1	3	1

CH 15501 **ENVIRONMENTAL SCIENCE AND ENGINEERING** **3 0 0 3**

(Common to ECE, MCT & IT branches)

COURSE OBJECTIVES

To enable students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I **INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES** **9**

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources-Use – exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture- fertilizer-pesticide problems - water logging - salinity -case studies. Energy resources-Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource- land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II **ECOSYSTEMS AND BIODIVERSITY** **9**

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers– energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem – desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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 –field study.

UNIT III **POLLUTION** **9**

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution -thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone- landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV **SOCIAL ISSUES AND ENVIRONMENT** **9**

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people.Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health– Human rights – value education – HIV/ AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010 .
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, Jaico Publising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Chemistry
24/05/17
AUTONOMOUS

BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

- to study the basic issues in Professional Ethics.
- to appreciate the rights of others and to instill moral, social values and loyalty.
- to enable the student in their engineering profession who explore the ethical issues in technological society.
- to get ability to solve Global Issues.
- to understand humans' Safety, Responsibility and Rights.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living- Peacefully – caring – Sharing – Honesty – Courage –Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry –moral dilemmas - moral autonomy -Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories aboutright action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook onlaw - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island andChernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality -conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL HOURS 45

COURSE OUTCOMES

At the end of the course, students will be able to

- propose possible solutions using articulated ethical theories.

- form opinions based on reasoned ethical positions, supported with facts and evidence.
- getawareness of the ethical component of daily engineering decisions.
- solve Global Issues.
- understand the Safety, Responsibility and Rights.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, NewYork 2007.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
1. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, NewDelhi, (2004).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education,New Delhi, 2003.
3. Department of English and Foreign Languages SRM University, "Rhythm of Life", SRM Publications, 2013.
4. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).
5. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientistsand Engineers", Oxford University Press, Oxford.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	2	-	1	-	-	-	-	1	3	1
CO3	3	2	-	2	2	3	-	-	-	-	-	1	2	1
CO4	3	3	-	-	1	3	1	-	-	-	-	2	3	2
CO5	3	3	2	1	1	1	1	-	-	-	-	1	3	1

CH16501 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3
(Common to ECE & MCT Branches)

COURSE OBJECTIVES

To enable the students to

- know the constituents of the environment and the precious resources in the environment
- conserve all biological resources
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- maintain the ecological balance and preserve bio-diversity.
- the role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance - need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources -Use over utilization of surface and ground water- floods - drought - conflicts over water. Mineral resources Use - exploitation - environmental effects of extracting and using mineral resources - Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture -fertilizer-pesticide problems - water logging - salinity. Energy resources: Growing energy needs - renewable and non-renewable energy sources- Role of an individual in conservation of natural resources

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers -decomposers –energy flow in ecosystem-- ecological succession - food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem aquatic ecosystems (lakes- rivers- oceans- estuaries). Biodiversity: Introduction- definition (genetic – species ecosystem) diversity. Value of biodiversity: Consumptive use - productive use - social values - ethical values aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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

UNIT III POLLUTION 9

Pollution: Définition -air pollution - water pollution - soil pollution - marine pollution - noise pollution – thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution. Disaster management: Floods – earthquake cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development : Unsustainable to sustainable development - urban problems related to energy. Water conservation - rain water harvesting - watershed management- Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions - climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations - population explosion - family welfare programme and family planning - environment and human health - Human rights - value education - HIV/AIDS

Swine flu - women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS **45**

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- know the relationship between the human population and environment.
- understand the basic concepts of environment studies and natural resources
- gain the knowledge about ecosystem and biodiversity.
- have knowledge about causes- effects and control measures of various types of pollution.
- understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar- Introduction to Environmental Science and Engineering- 2nd Edn- Tata McGraw Hill Education Private Limited- New Delhi-(2010).
2. Benny Joseph- "Environmental Science and Engineering"- Tata McGraw Hill- (2010).

REFERENCES

1. S. Divan- Environmental Law and Policy in India- Oxford University Press- New Delhi- 2001.
2. A.K.De- Environmental Chemistry- VI edition-2015 NewAge International (P) ltd publication- NewDelhi.
3. C.S.Rao- Environmental Pollution and Control engineering- Vedition-NewAge International (P) ltd Publication- New Delhi 110002
4. Clair Nathan Sawyer- Perry L. McCarty- Gene F. Parkin- "Chemistry for Environmental Engineering and Sciences- V Edition-2013-Tata M'cGraw Hill pub-Newdelhi110008

Mapping of Course Outcomes with Programme Outcomes:
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	-	-	2	3	3	-	-	-	2	1	2	1
CO2	2	1	-	-	2	3	3	-	-	-	2	1	2	1
CO3	2	1	-	-	2	3	3	-	-	-	2	1	2	1
CO4	2	1	-	-	2	3	3	-	-	-	2	1	2	1
CO5	2	1	-	-	2	3	3	-	-	-	2	1	2	1

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others – Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - Empathy – Self Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining confidentiality - conflicts of interest - occupational crime - professional rights - employee rights Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Describe the basic human values for a professional.

- Understand the significance of ethics in engineering and the theories related to it.
- Be familiar with the role of engineer as responsible experimenters.
- Acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- Discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics -Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics - An Indian Perspective",Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

Mapping of Course Outcomes with Programme Outcomes:
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	2	3	-	2	-	1	1	-
CO2	3	-	-	-	-	-	2	3	-	2	-	1	1	-
CO3	3	-	-	-	-	-	2	3	-	2	-	1	1	-
CO4	3	-	-	-	-	-	2	3	-	2	-	1	1	-
CO5	3	-	-	-	-	-	2	3	-	2	-	1	1	-

BA 16253 TOTAL QUALITY MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable students to

- describe the basic concepts in Quality Management, Customer orientation and retention.
- facilitate the understanding of Quality Management principles and process.
- discuss the techniques in Six Sigma, Bench marking and FMEA.
- understand the basic concepts in Quality Function Development and TPM.
- become familiar with Quality System, Quality Auditing in manufacturing.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing – QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Discuss the basic concepts in Quality Management, Customer orientation and retention.
- Describe the principles and process of Quality Management.
- Implement the quality control techniques in Six Sigma, Bench marking and FMEA.
- Explain the basic concepts in Quality Function Development and TPM.

- Understand the elements in Quality System, Quality Auditing in manufacturing.

TEXT BOOKS

1. Dale H. Besterfiled, et at., "Total quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2006.
2. D.R Kiran, "Total quality Management", Butterworth-Heinemann, 2016.

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4. Dennis AuBuchon, Understanding the Concept of Quality, Pronoun, 2017.
5. Donna C. S. Summers, Quality, Pearson, 5th edition, 2009.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	2	2	1	2	-	1	-	2	-	-	1	-
CO2	3	-	2	2	1	2	-	1	-	2	-	-	1	-
CO3	3	-	2	2	1	2	-	1	-	2	-	-	1	-
CO4	3	-	2	2	1	2	-	1	-	2	-	-	1	-
CO5	3	-	2	2	1	2	-	1	-	2	-	-	1	-

ELECTRICAL AND ELECTRONICS ENGINEERING

EE15152 ELECTRICAL SAFETY **3 0 0 3**

COURSE OBJECTIVES

- To impart knowledge on the basic concepts of electrical safety
- To acquaint to the concepts of electrical safety.
- To understand the protection systems for electrical equipments.
- To learn the installation, operation and maintenance of electrical circuits.
- To gain knowledge on the hazards and issues.

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS 9

Introduction–electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules- statutory requirements from electrical inspectorate-international standards on electrical safety–first aid-cardio pulmonary resuscitation(CPR).

UNIT II ELECTRICAL HAZARDS 9

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage- clearances and insulation-classes of insulation -voltage classifications- excess energy -current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect- static electricity–definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization spark and arc - ignition energy -national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT III PROTECTION SYSTEMS 9

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits ofamperage –voltage – safe distance from lines - capacity and protection of conductor – joints – and connections, Over load and short circuit protection - no load protection - earth fault protection. FRLS insulation -insulation andcontinuity test - system grounding – equipment grounding - earth leakage circuit breaker (ELCB) - cable wires -maintenance of ground - ground fault circuit interrupter - use of low voltage-electrical guards – Personal protectiveequipment – safety in handling hand held electrical appliances tools and medical equipments

UNIT IV SELECTION, INSTALLATION, OPERATION AND MAINTENANCE 9

Role of environment in selection -safety aspects in application-protection and interlock-self diagnostic features andfail safe concepts - lock out and work permit system-discharge rod and earthing devices - safety in the use of portable tools- cabling and cable joints -preventive maintenance.

UNIT V HAZARDOUS ZONES 9

Classification of hazardous zones - intrinsically safe and explosion proof electrical apparatus -increase safe equipment - their selection for different zones - temperature classification - grouping of gases - use of barriers and isolators - equipment certifying agencies.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- apply the basic concepts of electrical safety during practical's
- explain concepts of electrical safety.
- use the appropriate protection systems for electrical equipments.
- enumerate the installation, operation and maintenance of electrical circuits.
- discuss on the hazards and issues.

TEXT BOOKS

1. Fordham Cooper, W., "Electrical Safety Engineering" Butterworth and Company, London, 1994.

REFERENCES

1. N.S.C.,Chicago, "Accident prevention manual for industrial operations", 1982.
2. Indian Electricity Act and Rules, Government of India.
3. Power Engineers–Handbook of TNEB, Chennai, 1989.
4. Martin Glov, Electrostatic Hazards in powder handling, Research Studies Pvt.Ltd.,England, 1988.

WEB LINKS

1. https://www.osha.gov/dte/grant_materials/fy09/sh-18794-09/electrical_safety_manual.pdf
2. https://www.osha.gov/dte/grant_materials/fy07/sh-16615-07/train-the-trainer_manual2.pdf

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	2	-	2	-	-	-	-	2	2	2	2
CO2	3	2	3	-	-	2	2	-	-	-	2	2	2	2
CO3	3	2	3	-	-	2	-	-	-	-	2	2	2	2
CO4	3	2	3	-	-	2	-	-	-	-	2	2	2	2
CO5	3	2	3	-	-	2	-	-	-	-	2	2	2	2

EE15254 WIND AND SOLAR ENERGY SYSTEMS 3 0 0 3

COURSE OBJECTIVES

- To impart knowledge on the energy availability in the field renewable energy.
- To acquire knowledge about the wind generators and about wind hybrid technology
- To understand the developing processes involved in wind energy system
- To impart detailed knowledge On photovoltaic System and role of power electronics in PV system
- To get basic idea of hybrid wind and solar system

UNIT I INTRODUCTION 9

Recent trends in energy consumption - World energy scenario – Energy sources and their availability - Qualitativestudy of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems - need to develop new energy technologies

UNIT II WIND ENERGY CONVERSION SYSTEMS 9

Basic principle of wind energy conversion - nature of wind - Wind survey in India - Power in the wind - components of a wind energy - conversion system - Performance of induction generators for WECS - classification of WECS -Analysis of different wind power generators - IG - PMSG - DFIG – SEIG.

UNIT III GRID CONNECTED WIND ENERGY SYSTEMS 9

Grid Connected WECS: Grid connectors concepts - wind farm and its accessories - Systems for Feeding into the Grid - Induction Generators for Direct Grid Coupling - Asynchronous Generators in Static Cascades - Synchronous. Generators Grid related problems - Generator control - Performance improvements - Different schemes - AC voltage controllers - Harmonics and PF improvement

UNIT IV SOLAR ENERGY CONVERSION SYSTEMS 9

Photovoltaic Energy Conversion: Solar radiation and measurement - solar cells and their characteristics - PV arrays - Electrical storage with batteries - Switching devices for solar energy conversion Grid connection Issues - Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter,battery sizing, array sizing. PV Applications: Stand alone inverters - Charge controllers - Water pumping, audio visual. equipments, street lighting - analysis of PV systems

UNIT V OPERATION OF POWER SYSTEM WITH WIND AND SOLAR ENERGY SYSTEMS 9

Interface requirement – synchronizing with grid – operating limit – energy storage and load scheduling – utility Resource planning – electrical performance – voltage, current and power efficiency – component design for maximum efficiency – static bus impedance and voltage regulation – quality of power – renewable capacity limit – Plant economy

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- understand about the fundamentals of wind & solar energy and the requirements of renewable energy inIndia
- obtain knowledge of various wind turbines and importance of hybrid wind energy system
- know the design procedure of wind energy systems
- gather knowledge about the principle of conversion of solar energy through power electronics converters
- acquire knowledge about the importance of hybrid wind and solar system

TEXT BOOKS

1. Rai ,G.D., "Non- conventional resources of energy" , Khanna publishers ,Fourth edition , 2010.

REFERENCES

1. Rashid. M. H, "Power Electronics Handbook", Academic press, 2001.\
2. Erickson. R., Angkrtitrakul. S, Al – Nasean. O and Lujan. G, "Novel power electronics systems for wind energy applications" – Final report, National Renewable Energy Laboratory, Colorado, US. – Aug 24, 1999 Nov 30, 2002.
3. Rai. G. D, "Non conventional energy sources", Khanna publishers, 4th Edition 2000.
4. B.H.Khan, "Non Conventional Energy Resources", Tata Mc GrawHill, 2nd Edition 2006.
5. J.K.Manwell, J.G.McGowan, A.L.Rogers, "Wind energy explained – Theory Design and applications", John Wiley & Sons, 2nd Edition 2009.

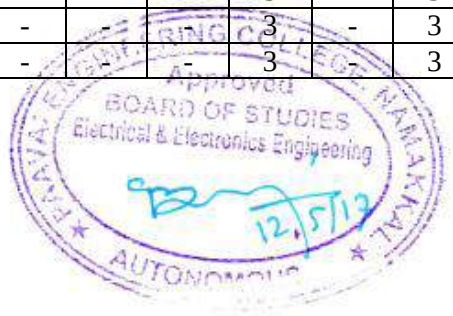
WEB LINKS

1. http://prod.sandia.gov/
2. http://electrical4u.com/
3. http://www.icrepq.com/

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	-	-	2	2	1	-	-	-	-	3	-	3	3
CO2	3	3	3	2	2	1	-	-	-	-	3	-	3	3
CO3	3	3	3	2	2	1	-	-	-	-	3	-	3	3
CO4	3	3	3	2	2	1	-	-	-	-	3	-	3	3
CO5	3	3	3	2	2	1	-	-	-	-	3	-	3	3



BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose their roles and responsibilities in assessing safety and reducing risks.
- illustrate the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage -Valuing Time - Cooperation - Commitment - Empathy - Self - Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership - sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- describe the basic human values for a professional.
- signify of ethics in engineering and the theories related to it.
- familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- converse the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (2005).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO2	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO3	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO4	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO5	2	-	-	-	-	3	3	3	3	2	2	2	1	-

EE16152 ELECTRICAL SAFETY 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on the basic concepts of electrical safety
- acquaint to the concepts of electrical safety.
- understand the protection systems for electrical equipments.
- learn the installation, operation and maintenance of electrical circuits.
- gain knowledge on the hazards and issues.

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS 9

Introduction - electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference - Working principles of electrical equipment-Indian electricity act and rules- statutory requirements from electrical inspectorate-international standards on electrical safety - first aid - cardio pulmonary resuscitation(CPR).

UNIT II ELECTRICAL HAZARDS 9

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage- clearances and insulation- classes of insulation - voltage classifications - excess energy -current surges-Safety in handling of war equipment‟s- over current and short circuit current-heating effects of current-electromagnetic forces-corona effect - static electricity - definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization spark and arc - ignition energy - national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation - earthing, specifications, earth resistance, earth pit maintenance.

UNIT III PROTECTION SYSTEMS 9

Fuse, circuit breakers and overload relays - protection against over voltage and under voltage - safe limits of amperage - voltage - safe distance from lines - capacity and protection of conductor - joints - and connections, Over load and short circuit protection - no load protection - earth fault protection. FRLS insulation -insulation and continuity test - system grounding - equipment grounding - earth leakage circuit breaker (ELCB) - cable wires - maintenance of ground - ground fault circuit interrupter - use of low voltage-electrical guards - Personal protective equipment - safety in handling hand held electrical appliances tools and medical equipments

UNIT IV SELECTION, INSTALLATION, OPERATION AND MAINTENANCE 9

Role of environment in selection -safety aspects in application-protection and interlock-self diagnostic features and fail safe concepts - lock outand work permit system-discharge rod and earthing devices - safety in the use of portable tools- cabling and cable joints -preventive maintenance.

UNIT V HAZARDOUS ZONES **9**

Classification of hazardous zones - intrinsically safe and explosion proof electrical apparatus -increase safe equipment - their selection for different zones - temperature classification - grouping of gases - use of barriers and isolators - equipment certifying agencies.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- apply the basic concepts of electrical safety during practical‟s
- explain concepts of electrical safety.
- use the appropriate protection systems for electrical equipments.
- enumerate the installation, operation and maintenance of electrical circuits.
- discusson the hazards and issues.

TEXT BOOKS

1. Fordham Cooper, W., “Electrical Safety Engineering” Butterworth and Company, London, 2010.

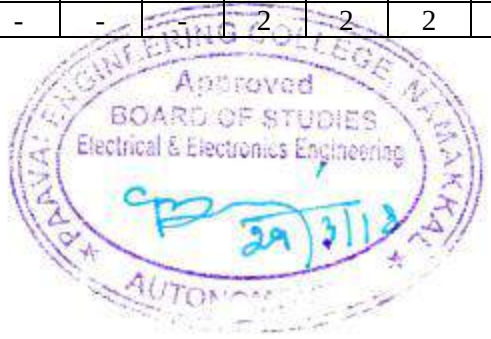
REFERENCES

1. N.S.C.,Chicago, “Accident prevention manual for industrial operations”, 2009.
2. Indian Electricity Act and Rules, Government of India.
3. “Power Engineers–Handbook of TNEB”, Chennai, 2011.
4. Martin Glov, “Electrostatic Hazards in powder handling, Research Studies” Pvt.Ltd., England, 2013.

CO-PO MAPPING:

Mapping of Course Outcome (CO’s) with Programme Outcomes (PO’s) and Programme Specific Outcomes PSO’s (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO’s												PSO’s	
CO’s	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	2	-	2	-	-	-	-	2	2	2	2
CO2	3	2	3	-	-	2	2	-	-	-	2	2	2	2
CO3	3	2	3	-	-	2	-	-	-	-	2	2	2	2
CO4	3	2	3	-	-	2	-	-	-	-	2	2	2	2
CO5	3	2	3	-	-	2	-	-	-	-	2	2	2	2



EE16904 WIND AND SOLAR ENERGY SYSTEMS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on the energy availability in the field renewable energy.
- acquire knowledge about the wind generators and about wind hybrid technology.
- understand the developing processes involved in wind energy system.
- impart detailed knowledge on photovoltaic system and role of power electronics in PV system.
- get basic idea of hybrid wind and solar system.

UNIT I INTRODUCTION 9

Recent trends in energy consumption - World energy scenario - Energy sources and their availability - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems - need to develop new energy technologies

UNIT II WIND ENERGY CONVERSION SYSTEMS 9

Basic principle of wind energy conversion - nature of wind - Wind survey in India - Power in the wind - components of a wind energy - conversion system - Performance of induction generators for WECS - classification of WECS - Analysis of different wind power generators - IG - PMSG - DFIG – SEIG.

UNIT III GRID CONNECTED WIND ENERGY SYSTEMS 9

Grid Connected WECS: Grid connectors concepts - wind farm and its accessories - Systems for Feeding into the Grid - Induction Generators for Direct Grid Coupling - Asynchronous Generators in Static Cascades - Synchronous. Generators Grid related problems - Generator control - Performance improvements - Different schemes - AC voltage controllers - Harmonics and PF improvement

UNIT IV SOLAR ENERGY CONVERSION SYSTEMS 9

Photovoltaic Energy Conversion: Solar radiation and measurement - solar cells and their characteristics - PV arrays - Electrical storage with batteries - Switching devices for solar energy conversion Grid connection Issues - Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing. PV Applications: Standalone inverters - Charge controllers - Water pumping, audio visual. equipments, street lighting - analysis of PV systems

UNIT V OPERATION OF POWER SYSTEM WITH WIND AND SOLAR ENERGY SYSTEMS **9**

Interface requirement - synchronizing with grid - operating limit - energy storage and load scheduling - utility Resource planning - electrical performance - voltage, current and power efficiency - component design for maximum efficiency - static bus impedance and voltage regulation - quality of power - renewable capacity limit - Plant economy

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- describe about the fundamentals of wind and solar energy and the requirements of renewable energy in India
- find various wind turbines and importance of hybrid wind energy system
- design wind energy systems
- enumerate about the principle of conversion of solar energy through power electronics converters
- acquire knowledge about the importance of hybrid wind and solar system

TEXT BOOKS

1. Rai ,G.D., "Non- conventional resources of energy" , Khanna publishers ,Fourth edition , 2010.

REFERENCES

1. Rashid. M. H, "Power Electronics Handbook", Academic press, 2001.
2. Erickson. R., Angkrtitrakul. S, Al – Nasean. O and Lujan. G, "Novel power electronics systems for wind energy applications" – Final report, National Renewable Energy Laboratory, Colorado, US. – Aug 24, 1999 Nov 30, 2002.
3. Rai. G. D, "Non conventional energy sources", Khanna publishers, 4th Edition 2000.
4. B.H.Khan, "Non Conventional Energy Resources", Tata McGrawHill, 2nd Edition 2006.
5. J.K.Manwell, J.G.McGowan, A.L.Rogers, "Wind energy explained – Theory Design and applications", John Wiley& Sons, 2nd Edition 2009.

Approved
BOARD OF STUDIES
Electrical & Electronics Engineering

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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CO4	3	3	3	2	2	1	-	-	-	-	3	-	3	3
CO5	3	3	3	2	2	1	-	-	-	-	3	-	3	3

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose their roles and responsibilities in assessing safety and reducing risks.
- illustrate the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, values and ethics - integrity - work ethic - service learning - civic virtue - respect for others - living peacefully, caring , sharing , honesty , courage, valuing time , cooperation, commitment, empathy , self-confidence, character, spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - models of professional roles - theories about right action - self-interest - customs and religion - uses of ethical theories.

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Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

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Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile Island and Chernobyl case studies. collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - intellectual property rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership - sample code of ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian institute of materials management, institution of electronics and telecommunication engineers(IETE), India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- describe the basic human values for a professional.
- signify of ethics in engineering and the theories related to it.
- familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
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Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO2	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO3	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO4	2	-	-	-	-	3	3	3	3	2	2	2	1	-
CO5	2	-	-	-	-	3	3	3	3	2	2	2	1	-

M.E.POWER ELECTRONICS AND DRIVES

PPE 15106 TECHNICAL SEMINAR - I 0 0 2 1

COURSE OBJECTIVES

- To enhance the communication skills
- To improve presentational skills for betterment of their carrier.
- To enhance leadership quality.
- To Progress Employability.

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- acquire knowledge in communication
- technical presentation skills
- expose leadership quality
- success in employment.

TOTAL: 30 PERIODS

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO2	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO3	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO4	3	-	-	-	-	2	1	2	3	3	1	3	1	-

PPE 15206 **TECHNICAL SEMINAR - II** **0 0 2 1**

COURSE OBJECTIVES

- To enhance the communication skills
- To improve presentational skills for betterment of their carrier.
- To enhance leadership quality.
- To Progress Employability.

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- acquire knowledge in communication
- technical presentation skills
- expose leadership quality
- success in employment.

TOTAL: 30 PERIODS

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO2	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO3	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO4	3	-	-	-	-	2	1	2	3	3	1	3	1	-

PPE16106 **TECHNICAL SEMINAR I** **0 0 2 1**

COURSE OBJECTIVES

- To enhance the communication skills
- To improve presentational skills for betterment of their carrier.
- To enhance leadership quality.
- To Progress Employability.

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

COURSE OUTCOMES

At the end of this course, the students will be able to

- acquire knowledge in communication
- technical presentation skills
- expose leadership quality
- success in employment.

TOTAL: 30 PERIODS

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												**PSO's**	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO2	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO3	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO4	3	-	-	-	-	2	1	2	3	3	1	3	1	-

PPE16206 **TECHNICAL SEMINAR II** **0 0 2 1**

COURSE OBJECTIVES

- To enhance the communication skills
- To improve presentational skills for betterment of their carrier.
- To enhance leadership quality.
- To Progress Employability.

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

COURSE OUTCOMES

At the end of this course, the students will be able to

- acquire knowledge in communication
- technical presentation skills
- expose leadership quality
- success in employment.

TOTAL: 30 PERIODS

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
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M.E. - POWER SYSTEMS ENGINEERING

PPS 15106 **TECHNICAL SEMINAR - I** **0 0 2 1**

COURSE OBJECTIVES

- To help students to acquire wide knowledge in the communication and the presentation skills in theirtechnical papers.
- To strengthen their prospects of success in technical presentation.
- To enhance leadership quality.
- To Progress Employability

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

TOTAL: 30 PERIODS

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- communicate effectively.
- prepare quality and focused presentation.
- be the successful student researchers.
- success in employment

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												PSO's	
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CO2	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO3	3	-	-	-	-	2	1	2	3	3	1	3	1	-

PPS 15206 TECHNICAL SEMINAR - II 0 0 2 1

COURSE OBJECTIVES

- To enhance the communication skills
- To improve presentational skills for betterment of their carrier.
- To enhance leadership quality.
- To Progress Employability.

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

TOTAL: 30 PERIODS

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- acquire knowledge in communication
- technical presentation skills
- expose leadership quality
- success in employment.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												**PSO's**	
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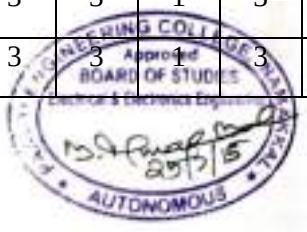


PPS16106 **TECHNICAL SEMINAR I** **0 0 2 1**

COURSE OBJECTIVES

- To help students to acquire wide knowledge in the communication and the presentation skills in their technical papers.
- To strengthen their prospects of success in technical presentation.
- To enhance leadership quality.
- To Progress Employability

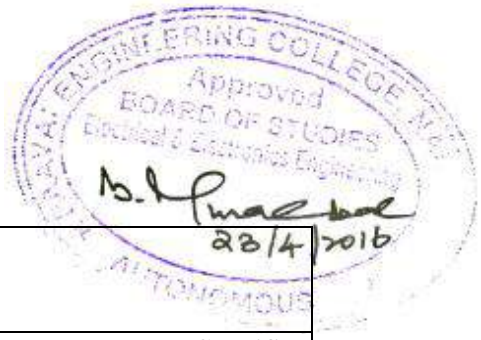
In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- communicate effectively.
- prepare quality and focused presentation.
- be the successful student researchers.
- success in employment



CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO2	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO3	3	-	-	-	-	2	1	2	3	3	1	3	1	-
CO4	3	-	-	-	-	2	1	2	3	3	1	3	1	-

PPS16206 **TECHNICAL SEMINAR II** **0 0 2 1**

COURSE OBJECTIVES

- To enhance the communication skills
- To improve presentational skills for betterment of their carrier.
- To enhance leadership quality.
- To Progress Employability.

In this course, every student has to present at least two technical papers on recent advancements in engineering/technology referring journal papers and will be evaluated by the course instructor. During the seminar session, each student is expected to present a topic, for duration of about 15 to 20 minutes which will be followed by a discussion for 5 minutes. Each student is responsible for selecting a suitable topic that has not been presented previously. Every student is expected to participate actively in the ensuing class discussion by asking questions and providing constructive criticism.

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- acquire knowledge in communication
- technical presentation skills
- expose leadership quality
- success in employment.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO's												**PSO's**	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	-	-	-	-	2	1	2	3	3	1	3	3	3
CO2	3	-	-	-	-	2	1	2	3	3	1	3	3	3
CO3	3	-	-	-	-	2	1	2	3	3	1	3	3	3
CO4	3	-	-	-	-	2	1	2	3	3	1	3	3	3

PPS19154 **WIND AND SOLAR SYSTEMS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- infer knowledge on renewable energy resources.
- get the concepts of wind energy and its application.
- study characteristics of solar and photovoltaic cell.
- know about power electronics converters.
- understand the fundamental concepts of grid connectors in wind and solar.

UNIT I INTRODUCTION **9**

Environmental aspects of electric energy conversion: Renewable energy resources and their importance - qualitative study of solar PV, wind electrical systems - control strategy, operating area, operating principles and characteristics - Trends in energy consumption - World energy scenario – Energy sources and their availability - Conventional and renewable sources - Need to develop new energy technologies.

UNIT II WIND ENERGY **9**

Introduction - Basic principles of wind energy conversion system - Nature of wind -Site selection consideration -Basic components of wind energy conversion system - Types of wind machines - Basic components of wind electric conversion systems - Schemes for electric generations - Generator control, load control, energy storage -Applications of wind energy - Inter connected systems- Power electronics in wind energy utilization.

UNIT III SOLAR ENERGY **9**

Solar radiation, availability, measurement and estimation - Solar thermal conversion devices andstorage, solar cells, solar cell interconnection, solar cell characteristics and photovoltaic conversion -PV systems - Analysis of PV systems- MPPT - Applications of PV Systems - Solar energy collectors and storages - Power electronics in solar energy utilization - DC-DC converters for solar PV systems.

UNIT IV POWER CONVERTERS **9**

Solar: Block diagram of solar photo voltaic system: line commutated converters (inversion mode) - Boost and buck-boost converters- Selection of inverter, battery sizing, array sizing - Wind: three phase AC voltage controllers - AC-DC-AC converters: uncontrolled rectifiers, PWM inverters, grid interactive inverters - Matrix converters.

UNIT V GRID CONNECTED WIND & SOLAR ENERGY CONVERSION SYSTEMS **9**

Grid connectors - Connection issues - Wind farm and its accessories - Grid related problems -

Generator control - Performance improvements - Different schemes - Power converters for Grid connected wind energy conversion system and grid connected solar energy converter systems - Hybrid systems - Types of cogeneration processes.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- elucidate renewable energy resources and their importance.
- describe about the basic components in wind energy system.
- analyse the characteristics of solar cell and photovoltaic system.
- explain the modern power converters for renewable energy power harness.
- evaluate grid connection issues and provide performance improvements of wind and solar.

REFERENCES

1. Mukund R. Patel, "Wind and Solar Power Systems: Design, Analysis, and Operation" , Second Edition, CRC Taylor & Francis, 2006.
2. J.A. Duffie and W.A. Beckman, "Solar Engineering of Thermal Processes", Second Edition, John Wiley, New York, 1991.
3. D.Y. Goswami, F. Kreith and J.F. Kreider, "Principles of Solar Engineering", Taylor and Francis, Second Edition, 1999.
4. D. D. Hall and R.P. Grover, "Bio-Mass Regenerable Energy" , John Wiley, Newyork, 1987.
5. Haitham Abu-Rub, Mariusz Malinowski, Kamal Al-Haddad, "Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications", Wiley Publications,2014.

CO-PO MAPPING:

Mapping of Course Outcome with Programme Outcomes and Programme Specific Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
CO's	**Programme Outcomes PO's**												**PSO's**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	3	-	-	-	-	-	2	3	3	3
CO2	3	3	3	3	3	-	-	-	3	-	3	3	3	3
CO3	3	3	3	1	3	-	-	-	3	-	3	3	3	3
CO4	3	3	3	3	3	-	-	-	3	-	2	1	3	3
CO5	3	3	3	2	3	2	-	-	3	-	3	2	3	3

Approved
BOARD OF STUDIES
Electrical & Electronics Engineering

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it
- familiarize oneself with the role of engineer as responsible experimenters
- expose the students to their roles and responsibilities in assessing safety and reducing risks
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time –Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of „Engineering Ethics" – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg"s theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – a Balanced Outlook on Law- the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - the Three Mile Island and Chernobyl case studies Collegiality and loyalty -Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India,etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon completion of the course, the students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.

- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants

TEXT BOOKS

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, 2000.

REFERENCES

1. Charles B Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 2008.
2. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, 2004.
3. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.
4. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003.
5. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.

CO-PO Mapping

COs	Mapping of Course outcomes with Programme outcomes **(1/2/3 indicates strength of correlation)3-Strong, 2-Medium, 1-Weak**													
	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	1	-	-	-	-	-	-	-	-	2	2	2
CO2	2	-	1	-	-	-	-	-	-	-	-	2	2	2
CO3	2	-	1	-	-	-	-	-	-	-	-	2	2	2
CO4	2	-	1	-	-	-	-	-	-	-	-	2	2	2
CO5	2	-	1	-	-	-	-	-	-	-	-	2	2	2

CH 15403 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources-Use – exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture- fertilizer- pesticide problems - water logging - salinity -case studies. Energy resources-Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource- land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers –decomposers– energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem – desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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 –field study.

UNIT III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution -thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone- landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people.

Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health– Human rights – value education – HIV/ AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010 .
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, Jaico Publising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental

Mapping of course outcome with Programme Outcomes
(S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2 , W-Weak=1.

CO	Programmes Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

PAVAI ENGINEERING COLLEGE Approved BOARD OF STUDIES Chemistry 25/07/15 AUTONOMOUS

ME16151 UNCONVENTIONAL MACHINING PROCESSES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications
- know about working principles of various mechanical processes like Abrasive jet machining, Water jet machining and Ultrasonic Machining
- gain in depth knowledge on electro chemical processes and its applications
- familiarize with thermal metal removal processes like electric discharge machining, grinding and wire cutting processes
- understand the general principle and application of laser beam machining, plasma for machining and metal removal mechanism

UNIT I INTRODUCTION 9

Need for non - traditional machining methods - Classification of modern machining processes – considerations in process selection. Materials, applications. Ultrasonic machining – Elements of the process, mechanics of metalremoval process parameters, economic considerations, applications and limitations, recent development.

UNIT II MECHANICAL PROCESSES 9

Abrasive jet machining, Water jet machining and abrasive water jet machining Basic principles, equipment, Process parameters, mechanics of metal removal, MRR - Variation in techniquesused – applications andlimitations.

UNIT III ELECTRO – CHEMICAL PROCESSES 9

Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, electro chemical reactions-metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Fundamentals of chemical, machining, advantages andapplications.

UNIT IV THERMAL METAL REMOVAL PROCESSES –I 9

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electricdischarge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Processparameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection.

UNIT V THERMAL METAL REMOVAL PROCESSES - II **9**

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes – General Principle, types and application of laser beam machining – thermal features, cutting speed and accuracy of cut. Application of plasma for machining, metal removal mechanism process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining - principle mask-ants etchants - applications. Magnetic abrasive finishing, Abrasive flow finishing.

TOTAL PERIODS **45**

COURSE OUTCOMES

Upon the completion of the course, students will be able to:

- explain about classification, applications and recent updations in modern machining process.,
- understand the working principle, process parameters and equipment used in machining process.
- have a good knowledge on fundamentals of electro chemical process.
- illustrate the principles, applications and selection parameters of thermal metal removal process.
- demonstrate different unconventional machining processes and can know the processes and can know theinfluence of different process parameters on the performance and their applications.

TEXT BOOKS

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi,2002
2. M.K Singh “Unconventional Machining processes”, New age International publishers,2008

REFERENCES

1. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing”. Prentice Hall ofIndia Pvt. Ltd., New Delhi, 2001
2. Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York,1987
3. Pandey P.C. and Shan H.S. “Advanced Machining Processes” Tata McGraw-Hill, New Delhi ,1980
4. “Production Technology” HMT Bengaluru, Tata McGraw Hill Publishing company Limited, New Delhi, 2006
5. Elanchezhian.B, Vijaya Ramnath andVijayan.M, “Unconventional Machining processes”,Anuradha Publications 2005

WEB LINKS

1. www.nptel.ac.in/courses/112105127/pdf/LM-37.pdf
2. www.iitk.ac.in/me/Presentation/Mechanical.pdf
3. http://freevideolectures.com/Course/2369/Manufacturing-Processes-II/37

CO-PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	-	-	-	2	-	1	-	-	-	-	2	3
CO2	3	3	-	-	-	2	-	1	-	-	-	-	2	3
CO3	3	3	-	-	-	2	-	1	-	-	-	-	2	3
CO4	3	3	-	-	-	2	-	1	-	-	-	-	2	3
CO5	3	3	-	-	-	2	-	1	-	-	-	-	2	3

ME16901 **RENEWABLE ENERGY SOURCES** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand primary energy sources and global warming
- understand the principle of solar energy
- learn about wind, tidal and geo-thermal energy
- acquire knowledge about bio energy
- understand the other renewable sources like fuel cells and MHD

UNIT I ENERGY AND ENVIRONMENT **9**

Primary energy sources - world energy resources-Indian energy scenario-energy cycle of the earth-environmental aspects of energy utilisation, CO_2 emissions and Global warming–renewable energyresources and their importance. Potential impacts of harnessing the different renewable energyresources.

UNIT II SOLAR ENERGY **9**

Principles of solar energy collection -solar radiation - measurements - instruments - data andestimation- types of collectors - characteristics and design principles of different type of collectors - performance of collectors - testing of collectors. Solar thermal applications - water heaters and air heaters - performance and applications - simple calculations - solar cooling - solar drying- solar distillation -solar ponds - solar tower concept - solar furnace.

UNIT III WIND, TIDAL AND GEO THERMAL ENERGY **9**

Energy from the wind - general theory of windmills - types of windmills - design aspects of horizontalaxis windmills - Wind Power estimation techniques - Betz criteria - applications. Energy from tides and waves – working principles of tidal plants and ocean thermal energy conversion plants - power from geothermal energy - principle of working of Geo-thermal power plants.

UNIT IV BIO ENERGY **9**

Energy from bio mass and bio gas plants -various types - design principles of biogas plants - applications. Energy from wastes - waste burning power plants - utilization of industrial and municipal wastes – energy from the agricultural wastes – Synthesis biofuel

UNIT V OTHER RENEWABLE ENERGY SOURCES **9**

Direct energy conversion (Description, principle of working and basic design aspects only) – Magneto hydrodynamic systems (MHD) - thermoelectric generators – thermionic generators - fuel cells - solar cells -types, emf generated, power output, losses and efficiency and applications. Hydrogen conversion and storage systems

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- learn about the importance of various energy sources available in the energy cycle.
- know about design and performance calculations of solar energy.
- know about new methodologies of Wind, Tidal and Geo Thermal Energy.
- abouteffective utilization of bio gas and its techniques.
- identify the new methodologies and technologies for effective utilization of renewable energy Sources.

TEXT BOOKS

1. G.D.Rai., "Non-Conventional Sources of Energy", Fifth Edition, Khanna Publishers, Delhi, 2011.
2. Twidell. J.W and Weir. A, "Renewable Energy Sources",Third Edition, EFN Spon Ltd., UK, 2015.

REFERENCES

1. D.P.Kothari, K.C.Singal, RakeshRanjan, "Renewable energy sources and emerging technologies", second edition, PHI learning pvt ltd, Delhi, 2013.
2. David M. Mousdale, "Introduction to Biofuels", CRC Press, Taylor and Francis Group, USA 2010.
3. Chetan Singh Solanki, Solar Photovoltaics, "Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2009.
4. Boyle Godfrey, Renewable Energy (2nd edition). Oxford University Press, 450 pages (ISBN: 0-19- 926178-4), 2004
5. Boyle, Godfrey, Bob Everett, and Janet Ramage (eds.),"Energy Systems and Sustainability: Power for a Sustainable Future", Oxford University Press,619 pages (ISBN: 0-19-926179-2), 2004.

WEB LINKS

1. http://www.nrel.gov/analysis/re_futures
2. http://www.sosmath.com/matrix/matrix.html
3. http://www.sosmath.com/matrix/matrix.html

CO-PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	-	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	2	-	-	-	-	-	-	2	3	3
CO4	3	3	3	-	2	-	-	-	-	-	-	2	3	3
CO5	3	3	3	-	2	-	-	-	-	-	-	2	3	3

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

To the study of nature and the facts about environment.

- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity 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 – India as a mega-diversity nation – hot-spots 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. Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 10

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control

of particulate and gaseous emission, Control of SO_2, NO_X, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – 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 resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins – Biochemical degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods,

earthquake, cyclone and landslides. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare Programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL PERIODS: 45

OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge have led to misconceptions
- Development and improvement in std. of living has led to serious environmental disasters

TEXT BOOKS:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Pearson Education, 2004.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:

1. Trivedi R.K., 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

GE6084 **HUMAN RIGHTS** **L T P C**

3 0 0 3

OBJECTIVES:

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL PERIODS : 45

OUTCOME:

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

CH15501 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

(Common to ECE, MCT & IT branches)

COURSE OBJECTIVES

To enable students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over Exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – Over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources: Use – Exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture- fertilizer-Pesticide problems - water logging - salinity -case studies. Energy resources: Growing energy needs - renewable and non-renewable energy sources. Land resources: Land as resource - land degradation - soil erosion. Role of an Individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers – decomposers– Energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem - desert Ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction– Definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – Social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a Mega diversity nation- hotspots 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 –field study.

UNIT III POLLUTION **9**

Pollution : Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution – thermal pollution – nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone - landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT **9**

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT **9**

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV / AIDS, Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- have knowledge about causes, effects and control measures of various types of pollution.
- understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, TataMcGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw Hill, (2010).

REFERENCES

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, JaicoPublising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental.

Mapping of course outcome with Programme Outcomes (S/M/W indicates strength of correlation) S-Strong-3, M-Medium=2, W-Weak=1.														
CO	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Cooperation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy- Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality

- conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak)														
	Programme Outcomes (POs)													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	3	2	2	3	-	1	3	3	3	3	3
CO2	1	3	3	-	3	3	2	3	2	3	3	1	3	2
CO3	2	3	2	1	-	3	-	1	3	-	-	2	3	3
CO4	2	3	3	3	2	3	2	1	2	3	1	1	3	3
CO5	3	-	3	3	2	3	3	3	3	3	3	3	2	3

MT15553 RENEWABLE ENERGY SOURCES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the utilization of renewable energy sources.
- identify the availability of solar energy and solar cells.
- acquire knowledge of the wind energy resources and wind turbine design.
- understand the bioenergy and biomass process.
- learn other sources of energy such as tidal and geothermal energy.

UNIT I INTRODUCTION 9

World energy use - reserves of energy resources - environmental aspects of energy utilization - renewable energy scenario in Tamil Nadu, India and around the world - potentials - achievements/applications - economics of renewable energy systems.

UNIT II SOLAR ENERGY 9

Solar radiation - measurements of solar radiation - flat plate and concentrating collectors - solar direct thermal applications - solar thermal power generation - fundamentals of solar photovoltaic conversion - solar cells – solar PV power generation - solar PV applications.

UNIT III WIND ENERGY 9

Wind data and energy estimation - types of wind energy systems - performance - site selection - details of wind turbine generator - safety and environmental aspects.

UNIT IV BIOENERGY 9

Biomass direct combustion - biomass gasifiers - biogas plants - digesters - ethanol production - bio diesel - cogeneration - biomass applications.

UNIT V OTHER RENEWABLE ENERGY SOURCES 9

Tidal energy - wave energy - open and closed OTEC cycles - small hydro-geothermal energy - hydrogen and storage - fuel cell systems - hybrid systems.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- describe the availability of renewable energy sources.
- discuss the solar energy and the current solar energy cells.
- gather wind energy resources and techniques to utilize them effectively.
- categorize the availability and the conversion method of bioenergy and biofuels.
- summarize the significance of hydrogen and fuel cells principles, storage and uses.

TEXT BOOKS

1. Rai. G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2011.
2. B.H.Khan, "Non-Convention Energy Resources", 2nd Edition, Tata McGraw Hill, 2009.

REFERENCES

1. Garg.H. P and Prakash. J., "Solar Energy - Fundamentals and applications", 21st revised edition, Tata McGraw Hill, 2000.
2. Freris L.L., "Wind Energy Conversion Systems", Prentice Hall, 1990.
3. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA 2010.
4. Sukhatme, S.P., "Solar Energy, Principles of Thermal Collection and Storage", 3rd Edition, Tata MCGraw Hill, 2008.
5. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.

WEB LINKS

1. https://www.seia.org/initiatives/about-solar-energy
2. https://www.energy.gov/eere/wind/wind-resource-assessment-and-characterization

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak)														
	Programme Outcomes (POs)													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	-	1	-	-	-	3	-	2	-	2	3	-
CO2	3	3	-	-	-	-	3	-	-	2	-	-	3	3
CO3	2	-	-	3	-	-	2	1	-	-	-	3	3	2
CO4	-	3	-	2	-	-	2	3	-	2	-	-	-	1
CO5	2	-	-	2	-	-	-	1	-	2	-	2	3	2

CH16501 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations.
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **9**

Environment: Definition - scope - importance - need for public awareness. Forest resources: Use - over exploitation - deforestation - case studies - mining - effects on forests and tribal people. Water resources: Use - over utilization of surface and ground water - floods - drought - conflicts over water. Mineral resources: Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: world food problems - changes caused by agriculture and overgrazing - effects of modern agriculture- fertilizer -pesticide problems - water logging - salinity - case studies. Energy resources: Growing energy needs - renewable and non - renewable energy sources. Land resources: Land as resource - land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY **9**

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - energy flow in the ecosystem - ecological succession - food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction - definition (genetic - species -ecosystem) diversity. Value of biodiversity: Consumptive use - productive use - social values - ethical values - aesthetic values. Biodiversity level: Global - national - local levels - India as a mega diversity nation - hotspots 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 - field study.

UNIT III POLLUTION **9**

Pollution : Definition - air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods - earthquake - cyclone - landslides. Electronic waste - sources - causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT **9**

Sustainable development: Unsustainable to sustainable development - urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions - climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT **9**

Human population: Population growth - variation among nations - population explosion - family welfare programme and family planning - environment and human health - Human rights - value education - HIV/ AIDS, Swine flu - women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- explain the relationship between the human population and environment.
- elaborate the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- have knowledge about causes, effects and control measures of various types ofpollution.
- understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi, (2010).
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw Hill, (2010).

REFERENCES

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010.
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopaedia, Jaico Publishing House, Mumbai, 2004.

5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, “Chemistry for Environmental Engineering and Science”, McGraw-Hill Education; 5 edition, 2002.

WEB LINKS

1. www.chegg.com
2. www.vidhyarathiplus.com

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes (POs)**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-		3		2	-	-	2		-
CO2	-	-	2	-	-		-		-	2	-	2		2
CO3	2	-	2	-	2		-		-	2	-	2		-
CO4	2		2	-	2		3		-	2	-	2		2
CO5	-		-	-	-		3		2	2	-	2		-

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others -Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment -Empathy - Self-Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy- Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers - engineers as expert witnesses and advisors - moral leadership - sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- describe the basic human values for a professionals.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledgeabout their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics -Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics - An Indian Perspective",Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

Mapping of Course Outcomes with Programme Outcomes:
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3	3	-	2	3	-	-	3	3	-	3	3
CO2	1		3	-	-	3	3	3	-	3	3	-	3	2
CO3	2		3	3	-	3	-	1	-	-	-	-	3	2
CO4	2		3	3	-	3	3	1	-	3	3	-	3	2
CO5	3		3	3	-	3	3	3	-	3	3	-	2	3

MT16453 RENEWABLE ENERGY SOURCES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the utilization of renewable energy sources.
- identify the availability of solar energy and solar cells.
- acquire knowledge of the wind energy resources and wind turbine design.
- understand the bioenergy and biomass process.
- learn other sources of energy such as tidal and geothermal energy.

UNIT I INTRODUCTION 9

World energy use - reserves of energy resources - environmental aspects of energy utilization - renewable energy scenario in Tamil Nadu, India and around the world - potentials - achievements/applications - economics of renewable energy systems.

UNIT II SOLAR ENERGY 9

Solar radiation - measurements of solar radiation - flat plate and concentrating collectors - solar direct thermal applications - solar thermal power generation - fundamentals of solar photovoltaic conversion - solar cells – solar PV power generation - solar PV applications.

UNIT III WIND ENERGY 9

Wind data and energy estimation - types of wind energy systems - performance - site selection - details of wind turbine generator - safety and environmental aspects.

UNIT IV BIOENERGY 9

Biomass direct combustion - biomass gasifiers - biogas plants - digesters - ethanol production - bio diesel - cogeneration - biomass applications.

UNIT V OTHER RENEWABLE ENERGY SOURCES 9

Tidal energy - wave energy - open and closed OTEC cycles - small hydro-geothermal energy - hydrogen and storage - fuel cell systems - hybrid systems.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- describe the availability of renewable energy sources.
- discuss the solar energy and the current solar energy cells.
- gather wind energy resources and techniques to utilize them effectively.
- categorize the availability and the conversion method of bioenergy and biofuels.
- summarize the significance of hydrogen and fuel cells principles, storage and uses.

TEXT BOOKS

1. Rai. G.D., “Non-Conventional Energy Sources”, Khanna Publishers, New Delhi, 2018.
2. N.K. Bansal, “Non-Convention Energy Resources”, Vikas, 2018.

REFERENCES

1. Garg.H. P and Prakash. J., “Solar Energy - Fundamentals and applications”, McGraw Hill Education, 2017.
2. Mohd. Hasan Ali, “Wind Energy Systems: Solutions for Power Quality and Stabilization”, CRC Press, 2017.
3. Vaughn C. Nelson, Kenneth L. Starcher, “Introduction to Bioenergy”, CRC Press, 2017.
4. Sukhatme, S.P., J. K. Nayak, “Solar Energy, Principles of Thermal Collection and Storage”, Tata MCGraw Hill, 2009.
6. John Twidell, Tony Weir, “Renewable Energy Sources”, Routledge, 2015.

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
	Programme Outcomes (POs)													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	-	1	-	-	-	3	-	2	-	2	3	-
CO2	3	3	-	-	-	-	3	-	-	2	-	-	3	3
CO3	2	-	-	3	-	-	2	1	-	-	-	3	3	2
CO4	-	3	-	2	-	-	2	3	-	2	-	-	-	1
CO5	2	-	-	2	-	-	-	1	-	2	-	2	3	2

CH16401 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- maintain the ecological balance and preserve bio - diversity.
- the role of government and non - government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition - scope - importance - need for public awareness. Forest resources: Use - over exploitation - deforestation - case studies - mining - effects on forests and tribal people. Water resources: Use - over utilization of surface and ground water - floods - drought - conflicts over water. Mineral resources Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture - fertilizer - pesticide problems - water logging - salinity - case studies. Energy resources Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource - land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - energy flow in the ecosystem - ecological succession - food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).Biodiversity: Introduction - definition (genetic - species - ecosystem) diversity. Value of biodiversity: Consumptive use - productive use - social values - ethical values - aesthetic values. Biodiversity level: Global - national - local levels - India as a mega diversity nation - hotspots 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 - field study.

UNIT III POLLUTION 9

Pollution: Définition - air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods - earthquake - cyclone - landslides. Electronic waste - Sources - Causes and

its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development: Unsustainable to sustainable development - urban problems related to energy. Water Conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions - climate change - global warming and its effects on flora andfauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations - population explosion - family welfare programme and family planning - environment and human health - Human rights - value education - HIV/ AIDS Swine flu - women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- know the relationship between the human population and environment.
- understand the basic concepts of environment studies and natural resources.
- gaining the knowledge about ecosystem and biodiversity.
- have knowledge about causes, effects and control measures of various types of pollution.
- understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, TataMcGraw Hill

   Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010)

REFERENCES

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010.
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, JaicoPublising House, Mumbai, 2004.

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO 1	2	2	3	2	2	-	-	-	-	-	-	2	2	2
CO 2	3	2	1	2	3	-	-	-	-	-	-	2	-	2
CO 3	2	2	3	2	3	-	-	-	-		2	3	3	2
CO 4	2	2	3	2	2	-	-	2	-	-	-	3	-	2
CO 5	3	1	2	3	2	-	-	1	-	-	-	3	2	1

SEMESTER VI

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional
- discuss the significance of ethics in engineering and the theories related to it
- familiarize oneself with the role of engineer as responsible experimenters
- expose the students to their roles and responsibilities in assessing safety and reducing risks
- describe the global issues in ethics and role of engineers as manager and consultants

UNIT I HUMAN VALUES 9

Morals, values and ethics-Integrity-Work Ethic-Service Learning-Civic virtue-Respect for others-Living peacefully – caring – sharing – Honesty – Courage – Valuingtime-cooperation-Commitment-Empathy-Self-confidence-Character-Spiruality

UNIT II ENGINEERING ETHICS 9

Senses of "Engineering Ethics"-variety of moral issues-types of inquiry-moral dilemmas-moral autonomy-Kohlberg's theory-Gilligan's theory-consensus and controversy-Models of Professional Roles-theories about right action-Self -interest-Customs and religion-uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation-engineers as responsible experimenters-codes of ethics-a balanced outlook on law-the challenger case study

UNIT IV SAFETY, RESPONSIBILTIES AND RIGHTS 9

Safety and risk-assessment of safety and risk-risk benefit analysis and reducing risk-the Three Mile Island and Chernobyl case studies. Collegiality and loyalty-respect for authority-collective bargaining-confidentiality-conflicts of interest-occupational crime-professional rights-employee rights-Intellectual property rights(IPR)-discrimination

UNIT V GLOBAL ISSUES 9

Multinational corporations-Environmental ethics-computer ethics-weapons development-engineers as managers-consulting engineers-engineers as expert witnesses and advisors-moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of materials Management, Institution of electronics and telecommunication engineers(IETE), India,etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- describe the basic human values for a professional
- understandthe significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks
- discuss the global issues in ethics and role of engineers as manager and consultants

TEXT BOOKS

1. Charles E Harris. Michael S Pritchard and Michael J Rabins. "Engineering Ethics -Concepts and Cases". Thompson Learning. (2000).
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

REFERENCES

1. Charles D Fledderman. "Engineering Ethics". Prentice Hall. New Mexico. (1999).
2. John R Boatright. "Ethics and the Conduct of Business". Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers". Oxford University Press. (2001).
4. Prof. (Col) P S Bajaj and Dr Raj Agrawal. "Business Ethics - An Indian Perspective".Biztantra. New Delhi. (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

CO-PO Mapping:

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

Course Outcomes (Cos)	Programme Outcomes(POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3		3		3								3	2
CO2	3		3		3								3	3
CO3	3		3		3								3	3
CO4	3		3		2								3	3
CO5	3		3		2								3	3

MD16703 HEALTHCARE AND HOSPITAL MANAGEMENT **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- expose the students for planning and operation of hospitals in a detailed manner.
- impart the facts of hospital planning activities.
- teach the regulatory requirements and its standards.
- introduce the equipment maintenance management skills.
- expose how to protect equipment from electromagnetic interferences.

UNIT I HEALTH SYSTEM IN A HOSPITAL **9**

Health organization of the country, the State, The Cities and the Region, Health Financing System, Organization of Technical Section. Different Departments of Hospital, Recruitment, Selection, Training Guidelines **–**Methods of Training **–** Evaluation of Training **–** Leadership grooming and Training, Promotion **–** Transfer.

UNIT II HOSPITAL ORGANISATION AND MANAGEMENT **9**

Management of Hospital Organization, Nursing Sector, Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transactional Analysis Human Relation in Hospital, Importance of Teamwork, Legal aspect in Hospital Management.

UNIT III REGULATORY REQUIREMENT AND HEALTH CARE CODES **9**

FDA Regulation, Joint Commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPQ.International Standards- Medical Device Directive 93/42/EEC, Medical Electrical Equipment ISO 60601, Medical Device Inspection ISO17020. Indian Standards **–** Biomedical Equipment Management and Maintenance Program (BMMP), ISO 9001-2008, AERB Compliance **–** Radiation protection AE(RP)R-2004, Safety Code AE/RF-MED/SC-3.

UNIT IV EQUIPMENT AND ASSET MAINTENANCE MANAGEMENT **9**

Organizing Maintenance Operations, Paperwork Control, Maintenance Job Planning, Maintenance Work Measurement and Standards, Preventive Maintenance, Maintenance Budgeting and Forecasting, Maintenance Training, Contract Maintenance. Hospital Planning **–** Equipment Planning- AMC **–** Functional Planning.

UNIT V TRAINED TECHNICAL PERSONNEL **9**

Function of Clinical Engineer, Role to be performed in Hospital, Manpower Market, Professional Registration, Structure in Hospital. Support Service Technical Information Systems **–** Medical Transcription.

TOTAL PERIODS **45**

COURSE OUTCOMES

Upon completion of the course, the students will be able to

- expert in understanding the various health policies.
- planning activities at health care centers.

- equipment installation, service & calibration needs.
- organizing maintenance operations.
- function of a clinical engineer in a hospital.

TEXTBOOKS

1. Jacob Kline, "Handbook of Bio Medical Engineering", Academic Press Inc. SanDeigo 2017 – Fourth Edition.
2. Erickson Thomas, "Human Resource in Hospital Management", Global Vision Publishing House, 2019 Edition.

REFERENCES

1. Edda Weimann, Peter Weimann. "High Performance in Hospital Management - A Guideline for Developing and Developed Countries". Springer Berlin Heidelberg.22 May 2017
2. Almira Badnjevic. Mario Cifrek. Ratko Magjarevic. ZijadDzemic. "Inspection of Medical Devices For Regulatory Purposes". Springer Nature. 2018
3. Cesar A.Caceres, "The Practice of Clinical Engineering", Elsevier Science, 2 December 2012.
4. "Joint Commission Accreditation Standards for Hospitals", 2nd Edition, 2003.

CO-PO Mapping:

Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes (Pos)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PS O 2**
CO1	3	3	2	2	2								3	3
CO2	3	3	2	2	2								3	3
CO3	3	3	3	2	2	3	2						3	3
CO4	3	3	2	2	2	3							3	3
CO5	3	3	2	2	2	3	3						3	3

MD16705 HOSPITAL INTERNSHIP TRAINING 0 0 2 1

COURSE OBJECTIVES

To enable the students to

- improve the skills by visiting the hospitals
- understand the working principle of various biomedical equipments
- able to work on the equipments through internship
- able to design the equipment prototype model

GUIDELINE FOR HOSPITAL INTERNSHIP AND TRAINING

The students may be grouped into 2 to 4 members by internship coordinator. The students will be allowed for hospital internship training for continuous 2 weeks. After the completion of Internship training, they will have to submit certificate and report to the Coordinator and Head of the Department. At the end of the semester examination, the Hospital Training report is evaluated based on oral presentation and is examined by department committee constituted by the Head of the Department.

TOTAL PERIODS 30

COURSE OUTCOMES

At the end of the course, the students will be able to

- formulate the real world problem, identify the requirement and develop the design
- identify the technical ideas, strategies and methodologies.
- use the new tools, algorithms, techniques that contribute to obtain the solution of the
- analyze and validate through conformance of the developed prototype and analysis the
- explain the acquired knowledge through preparation of report and oral presentations.

CO-PO Mapping:

Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes (POs)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PS O 2**
CO1	3	3	2	2	2								3	3
CO2	3	3	2	2	2								3	3
CO3	3	3	3	2	2	3	2						3	3
CO4	3	3	2	2	2	3							3	3

CH15403 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study about the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- maintain the ecological balance and preserve bio-diversity.
- know about the role of government and non-government organizations in environment management.

UNIT-I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources: Use – exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture- fertilizer-pesticide problems - water logging - salinity -case studies. Energy resources: Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource - land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT –II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers -decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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 - field study.

UNIT-III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial

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wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone - landslides. Electronic wastes.

UNIT-IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development: Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT-V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV / AIDS, Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL: 45 PERIODS

COURSEOUTCOMES

At the end of the course, the student will be able to

- know the relationship between the human population and environment.
- understand the basic concepts of environment studies and natural resources.
- gain the knowledge about ecosystem and biodiversity.
- identify causes, effects and control measures of various types of pollution.
- recognize the social issues and various environmental acts.

TEXT BOOKS

1. T.G.Jr. Miller, Environmental Science, 10thEdn, Wadsworth Publishing Co., (2004).
2. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2ndEdn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.

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3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, JaicoPublising House, Mumbai, 2004.
5. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering and Science", McGraw Hill Science, 2010.

WEB LINKS

1. www.chegg.com
2. www.vidhyarathiplus.com

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	3	2	2	3	3	2	3	-	-
CO2	-	-	2	-	-	3	3	3	2	2	3	2	-	-
CO3	-	-	3	-	-	2	3	2	3	3	2	2	-	-
CO4	-	-	3	-	-	3	2	3	3	3	2	3	-	-
CO5	-	-	2	-	-	2	2	3	2	2	3	3	-	-

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COURSE OBJECTIVES

To enable the students to

- clear various competitive exams
- understand the basic concepts in the field of aeronautics.
- learn the basic of flight mechanics and aerodynamics
- regain the basics of structure and propulsion

FLIGHT MECHANICS

Basics: Atmosphere: Properties, standard atmosphere. Classification of aircraft. Airplane (fixed wing aircraft) configuration and various parts

Airplane performance: Pressure altitude; equivalent, calibrated, indicated air speeds; Primary flight instruments: Altimeter, ASI, VSI, Turn-bank indicator. Drag polar; takeoff and landing; steady climb and descent, absolute and service ceiling; cruise, cruise climb, endurance or loiter; load factor, turning flight, V-n diagram; Winds: head, tail and cross winds

Static stability: Angle of attack, sideslip; roll, pitch and yaw controls; longitudinal stick fixed and free stability, horizontal tail position and size; directional stability, vertical tail position and size; dihedral stability. Wing dihedral, sweep and position; hinge moments, stick forces

AERODYNAMICS

Basic Fluid Mechanics: Conservation laws: Mass, momentum (Integral and differential form); Potential flow theory: sources, sinks, doublets, line vortex and their superposition; Viscosity, Reynolds number

Airfoils and wings: Airfoil nomenclature; Aerodynamic coefficients: lift, drag and moment; Kutta-Joukoswki theorem; Thin airfoil theory, Kutta condition, starting vortex; Finite wing theory: Induced drag, Prandtl lifting line theory; Critical and drag divergence Mach number

Compressible Flows: Basic concepts of compressibility, Conservation equations; One dimensional compressible flows, Fanno flow, Rayleigh flow; Isentropic flows, normal and oblique shocks, Prandtl-Meyer flow; Flow through nozzles and diffusers

STRUCTURES

Strength of Materials: States of stress and strain. Stress and strain transformation. Mohr's Circle. Principal stresses. Three-dimensional Hooke's law. Plane stress and strain; Failure theories: Maximum stress, Tresca and von Mises; Strain energy. Castigliano's principles. Analysis of statically determinate and indeterminate trusses and beams. Elastic flexural buckling of columns.

Flight vehicle structures: Characteristics of aircraft structures and materials. Torsion, bending and flexural shear of thin-walled sections. Loads on aircraft

Structural Dynamics: Free and forced vibrations of undamped and damped SDOF systems. Free vibrations of undamped 2-DOF systems

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PROPULSION

Basics: Thermodynamics, boundary layers and heat transfer and combustion thermochemistry. Thermodynamics of aircraft engines: Thrust, efficiency and engine performance of turbojet, turboprop, turbo shaft, turbofan and ramjet engines, thrust augmentation of turbojets and turbofan engines. Aerothermodynamics of non-rotating propulsion components such as intakes, combustor and nozzle.

Axial compressors: Angular momentum, work and compression, characteristic performance of a single axial compressor stage, efficiency of the compressor and degree of reaction. Axial turbines: Axial turbine stage efficiency

Centrifugal compressor: Centrifugal compressor stage dynamics, inducer, impeller and diffuser.

Rocket propulsion: Thrust equation and specific impulse, vehicle acceleration, drag, gravity losses, multi-staging of rockets. Classification of chemical rockets, performance of solid and liquid propellant rockets

TOTAL PERIODS 30

COURSE OUTCOMES

At the end of the course, the students will be able to

- explore the basic concepts of flight dynamics, aerodynamics, structures and propulsion.
- plan missions to prepare for their successful professional careers.
- excel in professional career and higher education by acquiring knowledge.
- clear the competitive exams

TEXT BOOKS

1. John D. Anderson "Introduction to Flight", McGraw-HiX Higher Education, 7th edition, 2011.
2. Courtland D. Perkins, Robert E. Hage, "Airplane Performance stability and Control", Wiley India Pvt Ltd, 2011.

REFERENCES

1. Robert Nelson, "Flight Stability and Automatic Control", 2nd Edition, McGraw Hill Education (India) Private Limited, 2007.
2. AndersonJ.D, "Fundamentals of Aerodynamics", 5th Edition, McGraw Hill Education India Private Limited, 2010.
3. Radhakrishnan E, "Gas Dynamics", Fifth Edition, PHI Learning Private Limited – New Delhi, 2014.
4. MegsonT M G, "Aircraft Structures for Engineering Students", Butterworth Heinemann, 2012.
5. Thammaiah Gowda, D.V.Girish, T.Jagadeesha "Mechanical vibrations", McGraw Hill Education, 2012.
6. P.G. Hill and C.R. Peterson, "Mechanics and Thermodynamics of Propulsion", Addison – Wesley Longman INC, 2009.
7. G. P. Sutton, "Rocket Propulsion Elements", John Wiley and Sons Inc., New York, 8th Edition, 2010.

WEB LINKS

1. https://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/amt_handbook/

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Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	-	2	-	-	-	2	2	3	3
CO2	3	3	2	3	2	-	2	-	-	-	3	2	3	2
CO3	2	2	3	2	3	-	3	-	-	-	3	2	2	3
CO4	3	2	3	2	3	-	3	-	-	-	3	2	2	2

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PROGRAMME ELECTIVE VI

BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - Empathy - Self-Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy- Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

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TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	3	2	2	3	3	2	3	-	-
CO2	-	-	2	-	-	3	3	3	2	2	3	2	-	-
CO3	-	-	3	-	-	2	3	2	3	3	2	2	-	-
CO4	-	-	3	-	-	3	2	3	3	3	2	3	-	-
CO5	-	-	2	-	-	2	2	3	2	2	3	3	-	-

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AE15651 AVIATION MAINTENANCE AND MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the aviation maintenance, characteristics of maintenance programs
- know the various technical services and product planning
- differentiate on time maintenance and hanger maintenance
- learn the various oversight functions and audit programs
- study about various human factors

UNIT I FUNDAMENTAL OF MAINTENANCE 9

Development of maintenance program – Maintenance Program Documents – Aviation Certification – Delivery Inspection – Types of Documentation – ATA documents standards – FAA requirements – Organization of maintenance and engineering – Manager level functions – Technical Services, Aircraft Maintenance, Overhaul shops, Maintenance Programs.

UNIT II TECHNICAL SERVICES 9

Production planning and control – Forecasting, Production planning, production control, Feedback for planning, Organization of PPandC – Technical Publications – Training for aviation maintenance – Maintenance Resource Management.

UNIT III MAINTENANCE AND MATERIAL SUPPORT 9

Line Maintenance – Functions, Maintenance control, Aircraft logbook, Ramp and terminal operations, Maintenance crew skill requirements – Hanger Maintenance – organization of hanger maintenance, Maintenance Support shops, Ground support equipments.

UNIT IV OVERSIGHT FUNCTIONS 9

Requirements for quality assurance – Quality Audits – ISO 9000 Quality standards – Technical Records, Reliability – Types, Elements of reliability probability, Administration and management of the reliability program -Maintenance safety – Industrial safety, safety regulations, maintenance safety program.

UNIT V HUMAN FACTORS IN MAINTENANCE 9

Human factors in maintenance – Basic definitions, System engineering, goals, Human factors in maintenance - Human factors responsibilities – Eight basic concepts of trouble shooting – ETOPS.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- compare various production planning techniques.
- analyze the different technical publications and aviation maintenance
- apply knowledge of various on time maintenance and hanger maintenance.
- perform the various quality audits and technical records
- calibrate ETOPS operations.

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TEXT BOOKS

1. Harry A. Kinnison, "Aviation Maintenance Management: Tata McGraw Hill, New Delhi", 2010.
2. Cushing, S. "Fatal Words: Communication clashes and aircraft crashes", University of Chicago Press,2004.

REFERENCES

1. Heppenheimer, "T. A. Turbulent Skies: The history of commercial aviation", New York, John Wiley and Sons.
2. Fink S., "Maintenance Management: Planning for the inevitable, New York", 2009.
3. Pauchant, T., Mitro, I., "Transforming the crisis prone organization: Preventing individual, organizational and environmental tragedies", San Fransisco: Jossey-Bass

WEB LINKS

1. http://nptel.ac.in/courses/101104071/
2. http://www.nptel.ac.in/courses/112102107/

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	3	2	2	3	3	2	3	-	-
CO2	-	-	2	-	-	3	3	3	2	2	3	2	-	-
CO3	-	-	3	-	-	2	3	2	3	3	2	2	-	-
CO4	-	-	3	-	-	3	2	3	3	3	2	3	-	-
CO5	-	-	2	-	-	2	2	3	2	2	3	3	-	-

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BA15451 **ENTREPRENEURSHIP DEVELOPMENT** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- acquire the knowledge about competencies required for an entrepreneur.
- impart knowledge in motivation techniques in entrepreneurship.
- discuss the various factors that has to be considered while preparing a business plan.
- understand the various sources of finance and accounting for business.
- describe the role of government and other agencies in promoting entrepreneurship.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 9

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- acquire skills necessary to become an entrepreneur
- exhibit the skills required to manage small business
- analyze and develop a business plan.
- identify the various factors to be considered for launching a small business.
- comprehend the support rendered by government and other agencies in entrepreneurship development

TEXT BOOKS

1. Khanka. S.S., "Entrepreneurial Development" S.Chand and Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko,"Entreprenuership -Theory, Process and Practice", 9th Edition,Cengage Learning, 2014.

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REFERENCES

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala,"Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.
3. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	1	-	2	2	2	-	2	3	2	3
CO2	-	2	2	-	2	-	-	-	-	-	1	1	1	3
CO3	-	1	1	-	1	1	-	-	-	1	1	3	-	3
CO4	1	1	-	-	-	-	1	-	3	1	1	3	1	2
CO5	1	1	-	-	-	-	2	-	2	1	-	3	-	1

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AE15652 CRISIS MANAGEMENT IN AIRCRAFT INDUSTRY 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the case studies of various causes, characteristics of crisis
- understand the management techniques already in vogue and apply them to the solutions of crisis problems.
- understand the psychology of crisis management
- learn the safety procedures given by ICAO
- study about the various air crash investigations

UNIT I INTRODUCTION TO CRISIS MANAGEMENT 9

Crisis management; Crisis management basics; Establishing a crisis management team; The role of the crisis manager; Organizational crisis and communication; Crisis Checklist Needs.

UNIT II TYPOLOGIES AND STAGES OF CRISIS MANAGEMENT 9

Crisis typologies - Coomb's typology - Characteristics of the crises - Consequences - Modeling crises - Crisis communication - Strategic communication Pre-crisis - Existing in pre-crisis phase, preparing for the worst - Post-Crisis.

UNIT III CRISIS MANAGEMENT AT AIRPORTS 9

Psychology of crisis management decisions; Emergency response scenarios; Contingency plans; Damage control; Various Crisis at Airport -SOP for Bomb Threat -Mitigating Hijack Crisis Situation Response to Acts of Unlawful Interference: Developing Plans.

UNIT IV WORLD AIRLINES AND AIRPORTS , WORLD AVIATION BODIES 9

Airports - Civil , Military Training-Domestic/International - Passenger/Cargo Terminals -World Airlines -World's Major Airports IATA / ICAO-National Aviation Authorities and Role of State and Central Governments Airports Authority of India - The National Transportation Board, Director General of Civil Aviation

UNIT V CRISIS IN AIRCRAFT INDUSTRY -CASE STUDIES 9

Northwest airlines flight 255; American airlines flight 191; Delta airlines flight 191; Trans world airlines flight 800; Pan American World Airways flight 103; US Air flight 427; Value jet flight 592; Malasian Airlines MH370.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- compare various crisis management techniques.
- analyze the different typology procedures in crisis management
- apply knowledge of crisis management at airports to solve aeronautical engineering problems.
- perform the various national air transportation procedures
- acquire knowledge about the various air crash investigations.

TEXT BOOKS

1. Sally J. Ray, "Strategic communication in crisis management: Lessons from the Airline Industry", 2009.
2. Heppenheimer, "T. A. Turbulent Skies: The history of commercial aviation", New York, John Wiley and Sons,2005

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REFERENCES

1. Cushing, S. "Fatal Words: Communication clashes and aircraft crashes", University of Chicago Press,2004.
2. Fink S., "Crisis Management: Planning for the inevitable, New York", 2003.
3. Pauchant, T., Mitro, I., "Transforming the crisis prone organization: Preventing individual, organizational and environmental tragedies", San Fransisco: Jossey-Bass

WEB LINKS

1. http://nptel.ac.in/courses/122102006/9
2. http://nptel.ac.in/courses/110105052/
3. http://nptel.ac.in/courses/122102006/mod2/6.htm

Mapping of Course Outcomes with Program Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs	
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CO3	-	1	1	-	1	1	-	-	-	1	1	3	-	3
CO4	1	1	-	-	-	-	1	-	3	1	1	3	1	2
CO5	1	1	-	-	-	-	2	-	2	1	-	3	-	1

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SEMESTER VI

BA16254 PRINCIPLES OF MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand history and development of management thought.
- know the planning activities in management.
- understand organizing, dimensions of organization structure, and choosing the right structural form.
- know how to manage human resources.
- understand various methods and techniques of control

UNIT I INTRODUCTION TO MANAGEMENT 9

Management: Meaning, Scope, Managerial Roles. Management: Science, Art or Profession; Universality of Management, Ancient roots of management theory; Classical schools of management thought; Behavioral School, Quantitative School; Systems Approach, Contingency Approach; Contemporary Management thinkers and their contribution.

UNIT II PLANNING 9

Characteristics of planning, Planning Process; Types of plans; Decision making, Decision making tools, Group decision making, Forecasting and MBO.

UNIT III ORGANIZING 9

Organizational structure and design; types of organizational structures; authority, delegation, decentralization and reengineering; Organization Size, Technology, Environment, Power-control; choosing the right structural form

UNIT IV MANAGING HUMAN RESOURCES 9

Human resource planning, Recruitment, selection, training and development, performance appraisal, managing change, compensation and employee welfare, leadership theory, motivation theory, communication

UNIT V CONTROLLING 9

Nature of organizational control; control process; Methods and techniques of control; Designing control systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able

- To demonstrate history and development of management thought.
- To exhibit the planning activities in management.
- To know organizing, dimensions of organization structure, and choosing the right structural form.
- To gain knowledge how to manage human resources.
- To develop various methods and techniques of control.

TEXT BOOKS

1. Management a Global and Entrepreneurial Perspective, Heinz Weihrich, Mark V. Cannice, Tata McGraw-Hill Education, 2010.
2. Management, James A.F. Stoner and R. Edward Freeman, Prentice-Hall of India Private Limited, New Delhi, 5/e, 2010.

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REFERENCES

1. Management, John R. Schermerhorn, Jr., Daniel G. Bachrach, Wiley India, 13/e, 2015.
2. Essentials of Management, Joseph L Massie, Prentice-Hall India, New York, 4/e, 2013.
3. Management, S.A.Sherlekar, Himalaya Publications, Mumbai, 1/e, 2012.
4. Principles of Management, L.M. Prasad, Sultan Chand and Sons, New Delhi, 9/e, 2015.

WEB LINKS

1. https://www.slideshare.net/ersmbalu/principles-of-management-lecture-notes
2. mbaexamnotes.com/principles-of-management.html
3. https://www.cliffsnotes.com/study-guides/principles-of-management

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	3	2	2	3	3	2	3	-	-
CO2	-	-	2	-	-	3	3	3	2	2	3	2	-	-
CO3	-	-	3	-	-	2	3	2	3	3	2	2	-	-
CO4	-	-	3	-	-	3	2	3	3	3	2	3	-	-
CO5	-	-	2	-	-	2	2	3	2	2	3	3	-	-

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AE16902 **WIND POWER ENGINEERING** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- learn how wind is generated and possible ways of extracting the same.
- estimate the resource potential.
- learn the aerodynamic forces and basics theories of wind turbine.
- make the students to understand the aerodynamic design aspects and controlling methods of wind turbines.
- introduce the environmental aspects of wind energy production.

UNIT I INTRODUCTION TO WINDENERGY **8**

Background, Wind speed variation, Motivations, and Constraints, Historical perspective, Modern wind turbines, Components and geometry.

UNIT II WIND RESOURCES AND CHARACTERISTICS **8**

General characteristics of the wind resource, Atmospheric boundary layer characteristics, Wind data analysis and resource estimation, Wind turbine energy production .

UNIT III WIND TURBINE AERODYNAMICS **11**

Overview , Forces from wind, Lift and Drag forces, Airfoils and aerodynamic concepts ,1-D Momentum theory, Ideal horizontal axis wind turbine with wake rotation, blade element theory, General rotor blade shape performance prediction

UNIT IV WIND TURBINE DESIGN AND CONTROL **9**

Brief design overview, Wind turbine control systems, Typical grid, connected turbine operation, Basic concepts of electric power, Electrical machines.

UNIT V ENVIRONMENTAL SITE AND ASPECTS **9**

Wind turbine siting, Installation and operation, Wind farms, Overview of wind energy Economics, Electromagnetic interference, noise, Safety-Concepts in wind turbine development.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- operate a wind farm and economics of power generation.
- prepare and evaluate detailed project reports for establishing a wind farm.
- elaborate the aerodynamic forces and fundamental theories of wind turbine.
- design and analyze the aerodynamics performance of wind turbines.
- compare the environmental sites and aspects of wind farms.

TEXT BOOKS

1. Emil Simiu and Robert H Scanlan, "Wind effects on structures - Fundamentals and Applications to Design",
   John Wiley and Sons Inc New York, 2016.
2. Ahmad Hemami, "Wind Turbine Technology", Cengage learning, Cananda, 2012.

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REFERENCES

1. Tom Lawson, "Building Aerodynamics", Imperial College Press London, 2001
2. G P Russo, "Aerodynamic Measurements: From Physical Principles to Turnkey Instrumentation", Woodhead publishing, 2003.
3. N J Cook, "Design Guides to wind loading of buildings structures- Part I and II", Butterworths London, 2014
4. IS: 875 (1987) Part III Wind loads, Indian Standards for Building codes",2009.

WEB LINKS

1. http://nptel.ac.in/courses/101105059/
2. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-100-aerodynamics-fall-2005/lecture-notes/

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	-	2	-	2	-	-	2	3	3
CO2	2	3	2	3	2	-	2	-	-	-	-	3	3	2
CO3	-	2	3	2	3	-	3	-	3	-	-	2	2	3
CO4	3	2	3	2	3	-	2	-	3	-	-	2	2	2
CO5	2	1	3	3	2	-	3	-	2	-	-	2	3	2

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AE16903 **AIRCRAFT SAFETY** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- impart the knowledge of human factors and spatial disorientation.
- study the cause of runway incursion.
- gain knowledge of weather related problems in low and high altitudes.
- learn about the various mid air collision issues and rectification procedures.
- know about various air crash investigation reports by NTSB.

UNIT I HUMAN FACTORS 9

Judgment and Decision Making – Accurate Situation Assessment Leads to good Situational Awareness – Crew Resource Management – Crew effectiveness – Spatial Disorientation – Types of Spatial Disorientation.

UNIT II RUNWAY INCURSIONS 9

Runway Incursion severity categories – Reported Runway Incursions by Severity – Distribution by Aircraft type and Combination

UNIT III WEATHER 9

Air Masses and Fronts – Types of Fronts – Cloud Formations – Low, Medium, High clouds – Thunderstorms – Aircraft performance in Heavy rains – Icing conditions – Types of Clouds – Turbulence

UNIT IV MID AIR COLLISIONS 9

Mid air collision avoidance – Eye brain connection – Eye movement – Distant visual Acuity – Cockpit creates monocular visual areas – Effective scanning based on sectors – Enhancing visual skills.

UNIT V AIR CRSH INVESTIGATION - CASE STUDIES 9

American Airlines Flight 1420 – USA flight 1493 - Sky west flight 5569 - Delta Airlines flight 191 – Air France flight 4590 - TWA flight 800.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- compare the features of various human factors.
- describe the principle and avoidance of runway incursion.
- analyze the various weather problems during VFR and IFR flight.
- acquire and interpret data of various mid air collisions.
- acquire knowledge of old air crash and investigation procedures.

TEXT BOOKS

1. Krause, Shari Stamford, Air Safety/ Accident Investigation, analysis and applications, Tata McGraw Hill, New Delhi, 2009 .

REFERENCES

1. Seth B. Young, Alexander T. Wells, "Airport Planning and Management" McGraw- Hill Education, New Delhi, 2011.
2. M.S Nolan, "Fundamentals Air Traffic Control", Latest Edition, YESDEE Publishers, 2010

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WEB LINKS

1. http://nptel.ac.in/courses/101106035/001_Chapter%201_L1_(01-10-2013).pdf
2. http://www.nptel.ac.in/courses/112102107/16
3. http://nptel.ac.in/courses/112107143/40

Mapping of Course Outcomes with Program Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	-	2	-	2	-	-	2	3	3
CO2	2	3	2	3	2	-	2	-	-	-	-	3	3	2
CO3	-	2	3	2	3	-	3	-	3	-	-	2	2	3
CO4	3	2	3	2	3	-	2	-	3	-	-	2	2	2
CO5	2	1	3	3	2	-	3	-	2	-	-	2	3	2

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PROGRAMME ELECTIVE IV

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES **9**

Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - Empathy - Self-Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy- Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES **9**

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

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COURSE OUTCOMES

At the end of the course, the students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, 2000.

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.

Mapping of Course Outcomes with Program Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs	
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CO4	-	-	3	-	-	3	2	3	3	3	2	3	-	-
CO5	-	-	2	-	-	2	2	3	2	2	3	3	-	-

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BA16253 **TOTAL QUALITY MANAGEMENT** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- describe the basic concepts in Quality Management, Customer orientation and retention.
- facilitate the understanding of Quality Management principles and process.
- discuss the techniques in Six Sigma, Bench marking and FMEA.
- understand the basic concepts in Quality Function Development and TPM.
- become familiar with Quality System, Quality Auditing in manufacturing.

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT II TQM PRINCIPLES **9**

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I **9**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II **9**

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) – Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS **9**

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TOTAL PERIODS **45**

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COURSE OUTCOMES

At the end of the course, the students will be able to

- discuss the basic concepts in quality management, customer orientation and retention.
- describe the principles and process of quality management.
- implement the quality control techniques in six sigma, bench marking and FMEA.
- explain the basic concepts in quality function development and TPM.
- understand the elements in quality system, quality auditing in manufacturing.

TEXT BOOKS

1. Dale H. Besterfiled, et at., "Total quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2006.
2. D.R Kiran, "Total quality Management", Butterworth-Heinemann, 2016.

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4. Dennis AuBuchon, Understanding the Concept of Quality, Pronoun, 2017.
5. Donna C. S. Summers, Quality, Pearson, 5th edition, 2009.

Mapping of Course Outcomes with Program Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs	
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CO3	-	-	3	-	-	2	3	2	3	3	2	2	-	-
CO4	-	-	3	-	-	3	2	3	3	3	2	3	-	-
CO5	-	-	2	-	-	2	2	3	2	2	3	3	-	-

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BA16352 **ENGINEERING ECONOMICS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the fundamental economic concepts applicable to engineering and to learn the techniques of economics.
- learn the applications on time value of money in Value Engineering.
- impart Knowledge on Cash Flow Analysis.
- acquire knowledge on maintenance and replacement analysis.
- inculcate knowledge on depreciation and its methods.

UNIT I INTRODUCTION TO ECONOMICS **9**

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis - V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING **9**

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor-equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW **9**

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS **9**

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with Return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION **9**

Depreciation- Introduction, Straight line method of depreciation, declining balance method of Depreciation -Sum of the years digits method of depreciation, sinking fund method of depreciation/Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL PERIODS 45

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COURSE OUTCOMES

At the end of the course, the students will be able to

- apply the fundamental economic concepts applicable to engineering and to learn the techniques of economics.
- understand the applications on time value of money in value Engineering.
- familiar on Cash flow analysis.
- understand the maintenance and replacement analysis.
- apply the depreciation methods.

TEXT BOOKS

1. Ronald A Chadderton,"Purposeful Engineering Economics" Springer,2015.
2. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES

1. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2011.
2. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, 2011.
4. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012.
5. Chan S.Park, "Advances Engineering Economcs" John Wiley & Sons,1990.

Mapping of Course Outcomes with Program Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	1	-	2	2	2	-	2	3	2	3
CO2	-	2	2	-	2	-	-	-	-	-	1	1	1	3
CO3	-	1	1	-	1	1	-	-	-	1	1	3	-	3
CO4	1	1	-	-	-	-	1	-	3	1	1	3	1	2
CO5	1	1	-	-	-	-	2	-	2	1	-	3	-	1

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BA16451 **ENTREPRENEURSHIP DEVELOPMENT** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- acquire the knowledge about competencies required for anentrepreneur
- impart knowledge in motivation techniques inentrepreneurship.
- discuss the various factors that has to be considered while preparing a business plan.
- understand the various sources of finance and accounting for business
- acquire the knowledge about supporting Entrepreneurs through entrepreneurship development

UNIT I ENTREPRENEURSHIP **9**

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION **9**

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS **9**

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING **9**

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS **9**

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- acquire skills necessary to become anentrepreneur
- exhibit the skills required to manage smallbusiness
- analyze and develop a business plan..
- identify the various factors to be considered for launching a smallbusiness.
- comprehend the support rendered by government and other agencies in entrepreneurship development

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TEXT BOOKS

1. Khanka. S.S., "Entrepreneurial Development" S.Chand and Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko,"Entreprenuership -Theory, Process and Practice", 9th Edition, Cengage Learning, 2014.

REFERENCES

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala,"Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.
3. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.
5. Dr.Vasant Desai, "The Dynamicsof Entrepreneurial Development and Management", Himalaya Publishing House, 6th edition, 2011.

Mapping of Course Outcomes with Program Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	1	-	2	2	2	-	2	3	2	3
CO2	-	2	2	-	2	-	-	-	-	-	1	1	1	3
CO3	-	1	1	-	1	1	-	-	-	1	1	3	-	3
CO4	1	1	-	-	-	-	1	-	3	1	1	3	1	2
CO5	1	1	-	-	-	-	2	-	2	1	-	3	-	1

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AI15153 PROFESSIONAL ETHICS IN AGRICULTURE ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To create an exposure on Human Values.
- To equip with Engineering Ethics and its related theories.
- To instill Moral and social responsibility of engineers.
- To give awareness about safety, responsibilities and rights.
- To know the global issues related to ethical values.

UNIT I HUMAN VALUES 10

Morals, values and Ethics - Integrity - Work ethic - Service learning - Civic virtue - Respect for others - Living peacefully - Caring - Sharing - Honesty - Courage - Valuing time - Cooperation - Commitment - Empathy - Self confidence - Character - Spirituality - Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 9

Senses of Engineering Ethics - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy – Kohlberg's theory – Gilligan's theory - Consensus and Controversy - Models of professional roles - Theories about right action - Self-interest - Customs and Religion - Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics - A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis and Reducing Risk - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 8

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Moral Leadership - Code of Conduct - Corporate Social Responsibility

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- Gain exposure on Human Values.
- Apply Ethics theories in the agriculture profession.
- Understand the social responsibility and Loyalty of engineers.
- Realize the need of safety, responsibilities and rights in the society.
- Familiar with global issues related to ethical values.

TEXTBOOKS

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics -Concepts and Cases”, Cengage Learning, 2009
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi,2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists andEngineers”, Oxford University Press, Oxford, 2001
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for PersonalIntegrity and Social Responsibility” McGraw Hill education, India Pvt. Ltd., New Delhi 2013
6. World Community Service Centre, „ Value Education‟, Vethathiri publications, Erode, 2011

CO/PO Mapping

*CO-PO & PSO Matrix Correlation :: Put if, Strong :3, Moderate : 2, Weak : 1, Nil : -														
COs	**Programmes Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	3	-	-	-	-	-	3
CO2	-	2	-	-	-	3	-	3	-	-	-	-	-	3
CO3	3	-	-	-	-	3	3	-	-	-	-	-	-	3
CO4	-	-	1	-	-	3	3	3	-	-	-	-	-	3
CO5	-	-	-	-	-	3	3	3	-	-	-	-	-	3

AI15402 SOIL AND WATER CONSERVATION ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To present the concepts of erosion so that students get a sound knowledge in the problems associated with it.
- To introduce the Classification of eroded soils and Runoff computation for soil conservation
- To impart knowledge in various practices to control erosion
- To study the water harvesting principles and techniques
- To enable the students to make use of the principles and concepts to solve issues related to soil and water management.

UNIT I SOIL EROSION PRINCIPLES 9

Approaches to soil conservation – Soil conservation in India - Erosion – Agents - Causes - Mechanics of water erosion – Soil erosion problems - Types of water erosion: Raindrop erosion, Sheet erosion, Rill erosion, Gully erosion, Stream bank erosion – Classification of Gully – Gully Control Structures: Drop Spillway, Drop Inlet, Chute Spillways - Prerequisites for soil and water conservation measures.

UNIT II ESTIMATION OF SOIL EROSION 9

Runoff computation for soil conservation: SCS-CN method – Evolution of Universal Soil Loss Equation: Applications and Limitations – Modified Universal Soil Loss Equation – Revised Universal Soil Loss Equation-2 - Permissible erosion – Land use capability classification - Classification of eroded soils.

UNIT III EROSION CONTROL MEASURES 10

Agronomic practices: contour cultivation - strip cropping – tillage practices – Soil management practices – Bunding: Types and design specifications - Mechanical measures for hill slopes – Terracing: Classification and design specification of bench terrace – Grassed waterways: Location, construction and maintenance – Types of temporary and permanent gully control structures.

UNIT IV WATER CONSERVATION MEASURES 9

In-situ soil moisture conservation – Water harvesting principles and techniques: Micro catchments, catchment yield using morphometric analysis - Farm ponds: Components, Design, Construction and Protection – Check dams - Earthen dam – Retaining wall.

UNIT V SEDIMENTATION 8

Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- gain knowledge in the concepts of erosion and sedimentation.
- design specification of terracing
- implement water harvesting principles and techniques
- know the construction and protection of dams
- understand the factors affecting sediment distribution pattern.

TEXTBOOKS

1. Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 2007.
2. Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.
3. "Sedimentation Engineering", 2006, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing.

REFERENCES

1. Murthy, V.V.N., "Land and Water Management Engineering", Kalyani Publishers, Ludhiana, 1998.
2. Gurmail Singh, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.
3. Mal, B.C., "Introduction to Soil and Water Conservation Engineering", Kalyani Publishers, New Delhi, 2002

CO/POMapping:

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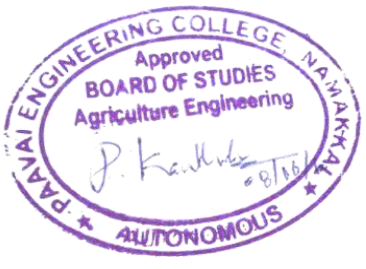
CO1	3	1	-	-	-	2	-	1	-	-	-	-	-	2
CO2	3	1	-	-	-	-	1	-	-	2	1	-	3	2
CO3	2	-	-	-	-	-	-	-	-	-	-	-	3	2
CO4	3	-	-	-	-	-	-	-	-	-	3	2	-	3
CO5	3	2	-	-	-	-	-	-	1	-	-	-	3	-



AI15403 HYDROLOGY AND WATER RESOURCES ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To introduce the student the concept of hydrological aspects of water availability and requirements
- To give idea in the factors affecting runoff
- To study the properties of aquifers
- To impart knowledge to quantify, control and regulate the water resources
- To develop skill to conduct Spatial analysis of rainfall data and design of water storage reservoirs

UNIT I PRECIPITATION AND ABSTRACTIONS 10

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges- Spatial analysis of rainfall data using Thiessen and Isohyetal methods- Interception - Evaporation. Horton‟s equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton‟s equation - double ring infiltrometer, infiltration indices.

UNIT II RUNOFF 8

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange‟s table and SCS methods – Stage discharge relationships- flow measurements- Hydrograph – Unit Hydrograph – IUH

UNIT III FLOOD AND DROUGHT 9

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)

UNIT IV RESERVOIRS 8

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

UNIT V GROUNDWATER AND MANAGEMENT 10

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- understand the key drivers on water resources, hydrological processes and their integrated behaviour in catchments
- gain knowledge in properties of aquifers
- to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge
- to conduct Spatial analysis of rainfall data
- to design water storage reservoirs

TEXTBOOKS

1. Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008
3. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.

REFERENCES

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
3. Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 1998.

Co/Po Mapping:

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COs	**ProgrammesOutcomes(POs)**													
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CO1	2	3	1	3	2	-	2	-	2	2	1	-	3	2
CO2	2	3	3	2	2	1	2	1	2	3	2	2	2	3
CO3	2	2	3	2	3	1	3	1	3	3	2	2	2	3
CO4	3	2	3	3	2	2	3	1	2	2	3	1	2	2
CO5	2	2	2	3	3	2	2	-	2	2	3	1	2	3

AI15504 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To impart scientific knowledge on environment and its impact on associated biological systems.
- To study about the different types of pollution ,its causes and effects on environment.
- To understand the use of natural resources and exploitation of these resources by socio economic activities of human.
- To impart knowledge on social issues related to environment.
- To know the role of human population in environment.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Environment - definition, scope and importance - Chemical, Physical, Biological hazards in the environment - ecosystem - concept, structure and functions - producers, consumers and decomposers. Oxygen and Nitrogen cycle - energy flow in the ecosystem. Ecological succession processes - types, characteristic features. Structure and function of ecosystem - forest, grassland, desert, aquatic ecosystems. Biodiversity - definition, genetic, species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity: consumptive and productive use - social, ethical, aesthetic and option values. Biodiversity at global, national and local levels - hot-spots of biodiversity in India. Threats to biodiversity - habitat loss, poaching, man-wildlife conflicts - endangered and endemic species of India - In-situ and ex-situ conservation of biodiversity

UNIT II ENVIRONMENTAL POLLUTION 10

Definition - causes, effects and control measures of: (a) Air pollution (Chemical composition of the atmosphere; Chemical and photochemical reactions in atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry; Control of particulate and gaseous emission) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters - physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes - (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards-role of an individual in prevention of pollution - pollution case studies.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people; Water resources - Use and overutilization of surface and ground water, dams-benefits and problems; Mineral resources - Use and exploitation, environmental effects of extracting and using mineral resources, case studies; Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies; Energy resources - Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Energy Conversion processes - Biogas - production and uses.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development - urban problems related to energy - water Conservation, rain water harvesting, watershed management - resettlement and rehabilitation of people; its problems and concerns,

case studies - role of non-governmental organization environmental ethics: Issues and possible solutions - Principles of green chemistry- nuclear accidents and holocaust, case studies. - wasteland reclamation - consumerism and waste products - environment production act - Air act - Water act - Wildlife protection act - Forest conservation act - The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labelling of environmentally friendly products (Eco mark). Enforcement machinery involved in environmental legislation- central and state pollution control boards disaster management: floods, earthquake, cyclone and landslides. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations - population explosion - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare -Environmental impact analysis (EIA) - GIS-remote sensing-role of information technology in environment and human health - Case studies.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- Acquire scientific knowledge on environment and its impact on Eco systems.
- Learn about pollution of natural resources by socio economic activities of human.
- Understand the natural resources and its exploitation.
- Gain awareness about environmental organisation, conservation laws and enforcements.
- Know the role of human population, information technology on environment protection.

TEXTBOOKS

1. AnubhaKaushik and C.P. Kaushik. 2014. “Environmental Science and Engineering”, Fourth Edition, New Age International Publishers, New Delhi.
2. Gilbert M.Masters, “Introduction to Environmental Engineering and Science“, 2nd Edition, Pearson Education, 2004
3. Benny Joseph, “Environmental Science and Engineering“, Tata McGraw Hill, New Delhi,2006.

REFERENCES

1. Trivedi R.K. “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards“, Vol. I and II, Enviro Media.
2. Dharmendra S. Sengar, “Environmental law“, Prentice Hall of India PVT LTD, New Delhi,2007.
3. Rajagopalan R, “Environmental Studies - From Crisis to Cure“, Oxford University Press,2005

CO/PO Mapping

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CO2	3	-	-	3	-	-	-	-	-	1	2	-	-	3
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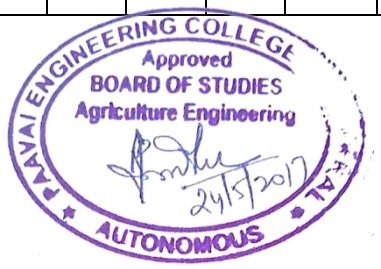
CO4	-	-	-	-	-	-	-	-	-	3	2	-	-	3
CO5	3	-	-	-	-	-	-	-	-	-	3	-	2	3



AI15701 SOLAR AND WIND ENERGY ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To expose principles and applications of various renewable energy resources.
- To impart knowledge on applications of solar energy in agriculture.
- To get an idea about the photovoltaic technology.
- To understand the wind mapping analysis.
- To know about design and applications of windmill.

UNIT I INTRODUCTION OF RENEWABLE ENERGY 9

World energy scenario –Energy sources and their availability; Qualitative study of different renewable energy resources – Solar – wind – ocean – Biomass - Fuel cell - Hydrogen energy systems and hybrid renewable energy systems.

UNIT II SOLAR COLLECTORS AND APPLICATION 9

Solar radiation availability – Radiation measurement – collectors – Types - Flat-plate collector - Liquid collector- Air collectors (Solar air heaters) - concentrating collectors - Types – parabolic trough collector – Mirror strip reflector- Fresnel lens collector; Application of solar energy - solar thermal power station - solar furnace - solar greenhouses - Solar stills - solar pond – solar pump – solar drier.

UNIT III PHOTOVOLTAIC TECHNOLOGY 9

Photovoltaic Energy Conversion - solar cells and their characteristics - PV arrays -Electrical storage with batteries - inverter -selection of inverter - battery sizing - array sizing; PV Applications - Standalone inverters - Charge controllers - street lighting; Hybrid system - solar technology in green buildings.

UNIT IV WIND MAPPING ANALYSIS AND CHARACTERISTICS OF WIND 9

Nature of wind - wind structure and measurement - wind power laws - velocity and power duration curves - aerofoil – tip-speed ratio - torque and power characteristics - power coefficients - Betz coefficient.

UNIT V WINDMILL DESIGN AND APPLICATIONS 9

Turbines - Windmill - classification - power curve; Upwind and downwind systems - transmission rotors - pumps - generators - standalone system - grid system – batteries; Wind energy storage - wind farms - wheeling and banking - testing and certification procedures.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- Understand the applications of different alternate energy resources.
- Know about the applications of solar energy in agriculture.
- Get an idea about the photovoltaic technology.
- Analyse the wind mapping.
- Gain sufficient knowledge on design of windmills.

TEXT BOOKS

1. Rai., G.D. "Solar Energy Utilization*"* Khanna publishers, New Delhi, 2002.
2. More, H.S & R.C. Maheshwari, " Wind Energy Utilization in India" CIAE Publication - Bhopal, 1982.
3. Rao. S and B.B. Parulekar, "Energy Technology - Non conventional, Renewable and Conventional",Khanna Publishers, Delhi, 2000.

REFERENCES

1. Mathew Buresch, "Photovoltaics Energy Systems",McGraw-Hill Book Company, London, 1986.
2. JuiSheng Hsieh. "Solar Energy Engineering", Prentice Hall, London, 1986.
3. TanyBurtar, "Hand book of wind energy.",John Wiley and Sons, 2001,
4. J.G.McGowan, Manwell, J.F. and A.L.Rogers ,"Wind Energy Explained - Theory Design and Application", John Wiley and Sons Ltd, 2004.
5. John Twidell, "A guide to small wind energy conversion system", Cambridge University press. UK, 1987.
6. Rai. G.D. "Non Conventional Sources of Energy", Khanna Publishers, New Delhi, 2002.

CO/PO Mapping

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CO1	3	3	-	1	2	-	2	-	-	-	3	2	2	3
CO2	3	1	-	1	3	-	2	-	1	1	3	1	2	3
CO3	3	2	3	-	-	1	1	-	-	-	1	2	3	1
CO4	2	3	2	-	-	-	1	-	-	-	-	1	-	2
CO5	3	2	3	-	1	-	-	-	-	-	-	1	1	2

AI16405 SOIL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To introduce the fundamental knowledge in soil physical parameters
- To impart knowledge in types and methods of soil survey and interpretative groupings
- To understand the phase relationship and laboratory soil compaction methods
- To gain fundamental knowledge in engineering properties of different types of soil
- To study bearing capacity of different types of soil

UNIT I INTRODUCTION AND SOIL PHYSICS 9

Soil - definition - major components – Soil forming minerals and processes - soil profile –Physical properties - texture – density – porosity – consistence - colour- - specific gravity - capillary and non - capillary - plasticity. Soil air - soil temperature - soil water - classification of soil water - Movement soil water. Soil colloids – organic and inorganic matter - Ion exchange - pH – Plant nutrient availability

UNIT II SOIL CLASSIFICATION AND SURVEY 9

Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps -preparation of survey reports - concepts and uses - land capability classes and subclasses - soil suitability -Problem soils – Reclamation.

UNIT III PHASE RELATIONSHIP AND SOIL COMPACTION 9

Phase relations- Gradation analysis- Atterberg Limits and Indices- Engineering Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.

UNIT IV ENGINEERING PROPERTIES OF SOIL 9

Shear strength of cohesive and cohesion-less - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Tri-axial and vane shear test- -Permeability- Coefficient of Permeability-Darcy's law-field and lab methods - Assessment of seepage - Compressibility.

UNIT V BEARING CAPACITY AND SLOPE STABILITY 9

Bearing capacity of soils - Factors affecting Bearing Capacity- Shallow foundations-Terzaghi's formula-BIS standards - Slope stability - Analysis of infinite and finite slopes- friction circle method slope protection measures.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- gain ideas in fundamentals of soil physical parameters and classification of soils.
- acquire knowledge in the procedures involved in soil survey, field soil mapping and suitability of soil.
- understand the soil compaction and engineering classification of soil.

- analyse engineering properties of soil and darcy law.
- apply the concepts of bearing capacity, slope stability and BIS standard for soil.

TEXTBOOKS

1. Nyle C. Brady, "The Nature and Properties of Soil", Macmillan Publishing Company, 10th Edition, New York, 2008.
2. Punmia, B.C., "Soil Mechanics and Foundation "Laxmi Publishers, New Delhi, 2007.

REFERENCES

1. Edward J. Plaster., "Soil Science", Cengage Learning India Ltd, New Delhi, 2009.
2. Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2007.
3. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2007.
4. Sehgal, S.B., "Text Book of Soil Mechanics", CBS Publishers and Distributors New Delhi, 2007.

CO/POMapping

*CO-PO&PSOMatrixCorrelation::Putif,Strong:3,Moderate:2,Weak:1,Nil:-														
COs	**ProgrammesOutcomes(POs)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	-	2	-	-	1	-	-	-	1	1	3	3
CO2	2	1	-	3	-	-	1	-	-	-	1	1	3	3
CO3	2	1	-	3	-	-	1	-	-	-	1	1	3	3
CO4	3	2	-	2	1	-	-	-	-	-	1	1	3	3
CO5	3	2	-	2	1	-	-	-	-	-	1	1	3	3

COURSE OBJECTIVES

- To impart scientific knowledge on environment and its impact on associated biological systems.
- To study about the different types of pollution, its causes and effects on environment.
- To understand the use of natural resources and exploitation of these resources by socio economic activities of human.
- To impart knowledge on social issues related to environment.
- To know the role of human population in environment.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 11

Environment - definition - scope and importance - Chemical - Physical - Biological hazards in the environment; Ecosystem - concept - structure and functions - producers - consumers and decomposers; Oxygen and Nitrogen cycle - energy flow in the ecosystem; Ecological succession processes - types - characteristic features; Structure and function of ecosystem - forest - grassland - desert - aquatic ecosystems; Biodiversity - definition - genetic - species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity - consumptive and productive use - social - ethical - aesthetic and option values; Biodiversity at global - national and local levels; Hot-spots of biodiversity in India; Threats to biodiversity - habitat loss - poaching - man-wildlife conflicts; Endangered and endemic species of India; In-situ and ex-situ conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 10

Definition - causes - effects and control measures – (a) Air pollution (Chemical composition of the atmosphere; Chemical and photochemical reactions in atmosphere - formation of smog - PAN - acid rain - oxygen and ozone chemistry; Control of particulate and gaseous emission); (b) Water pollution - Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters - physical - chemical and biological; Water treatment processes; (c) Soil pollution - soil waste management - causes - effects and control measures of municipal solid wastes; (d) Marine pollution; (e) Noise pollution; (f) Thermal pollution; (g) Nuclear hazards - role of an individual in prevention of pollution - pollution case studies.

UNIT III NATURAL RESOURCES 10

Forest resources - Use and over-exploitation - deforestation - case studies - timber extraction - mining - dams and their effects on forests and tribal people; Water resources - Use and overutilization of surface and ground water - dams-benefits and problems; Mineral resources - Use and exploitation - environmental effects of extracting and using mineral resources - case studies; Food resources - World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture - fertilizer-pesticide problems - water logging - salinity - case studies; Energy resources - Growing energy needs - renewable and non-renewable energy sources - use of alternate energy sources; Energy Conversion processes - Biogas - production and uses.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

From unsustainable to sustainable development - urban problems related to energy - water Conservation - rain water harvesting - watershed management; Resettlement and rehabilitation of people - its problems and concerns - case studies; Role of non-governmental organization in environmental ethics - issues and possible solutions; Principles of green chemistry - nuclear accidents and holocaust, case studies; Wasteland reclamation - consumerism and waste products; Environment production act - Air act - Water act - Wildlife protection act - Forest conservation act; The Biomedical Waste (Management and Handling) Rules; 1998 and amendments -

scheme of labelling of environmentally friendly products (Eco mark); Enforcement machinery involved in environmental legislation - central and state pollution control boards disaster management - floods - earthquake - cyclone and landslide; Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth - variation among nations - population explosion - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare; Environmental impact analysis (EIA) - GIS - remote sensing; Role of information technology in environment and human health - Case studies.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- Acquire scientific knowledge on environment and its impact on Eco systems.
- Learn about pollution of natural resources by socio economic activities of human.
- Understand the natural resources and its exploitation.
- Gain awareness about environmental organisation, conservation laws and enforcements.
- Know the role of information technology on human population and environment protection.

TEXT BOOKS

1. AnubhaKaushik and C.P. Kaushik. "Environmental Science and Engineering", Fourth Edition, New Age International Publishers, New Delhi,2014.
2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, New Delhi,2006.

REFERENCES

1. Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Dharmendra S. Sengar, "Environmental law", Prentice Hall of India PVT LTD, New Delhi,2007.
3. Rajagopalan R, "Environmental Studies - From Crisis to Cure", Oxford University Press,2005

CO/PO Mapping

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COs	**Programmes Outcomes(POs)**													
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	-	-	3	-	-	-	-	2	-	1	-	3	-
CO2	3	-	-	3	-	-	-	-	-	1	2	-	-	3
CO3	2	-	-	-	-	-	-	3	-	2	-	-	3	-
CO4	-	-	-	-	-	-	-	-	-	3	2	-	-	3
CO5	3	-	-	-	-	-	-	-	-	-	3	-	2	3

AI16604 IT IN AGRICULTURAL SYSTEMS 3 0 0 3

COURSE OBJECTIVES

- To acquire acquaintance of IT in precision agriculture.
- To furnish knowledge about environmental control systems in agriculture.
- To expose agricultural system management for optimizing the use of resources.
- To know the weather prediction models and their application in seasonal climate forecasts.
- To introduce E-governance in agriculture systems for the benefits of farming society.

UNIT I IT IN PRECISION AGRICULTURE 9

IT - Scope & importance in agriculture; Precision agriculture - use of IT - Remote sensing & sensors - use of GPS & GIS - mapping software - crop area estimation - yield estimation - biotic and abiotic stress mapping.

UNIT II ENVIRONMENT CONTROL SYSTEMS 9

IT in controlled environment cultivation - Artificial light systems for cropping; Greenhouse management - for irrigation management - for cooling & heating - for simulation of CO_2 consumption - for on-line measurement of plant growth; Models of plant production - expert systems and crop doctors.

UNIT III AGRICULTURAL SYSTEMS MANAGEMENT 9

Agricultural systems - managerial overview - reliability of agricultural systems; Simulation of crop growth - crop simulation models - prioritizing field operations - Optimizing the use of resources - Linear programming, Project scheduling - Artificial intelligence and Decision Support Systems (DSS).

UNIT IV WEATHER PREDICTION MODELS 9

Weather & Climate - Climate variability & climate change - Importance of climate variability; Forecasting - importance in agriculture - medium term & long term (seasonal) forecasting - Forecasting - statistical - dynamical; Climate prediction - understanding world's climate system - Global climatic models - Regional climate models - seasonal climate forecasting - climate projection.

UNIT V E-GOVERNANCE IN AGRICULTURAL SYSTEMS 9

Agricultural and biological databases - e-commerce - e-business systems & applications; Technology enhanced learning systems and solutions - e-learning; On-line and Off- line information for the society.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- Possess sufficient knowledge of IT application like Remote sensing, GPS and GIS.
- Have acquaintance on Environmental control systems in agriculture.
- Identify agricultural system management for optimizing the use of resources.
- Familiar with weather prediction models and their application in seasonal climate forecasts.
- Implement E-governance in agriculture systems for the benefits of farming society.

TEXT BOOKS

1. National Research Council, "Precision Agriculture in the 21st Century", National Academies Press, Canada, 1997.
2. H. Krug, Liebig, H.P. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", 1989.

REFERENCES

1. Peart, R.M., and Shoup, W. D., "Agricultural Systems Management", Marcel Dekker, New York, 2004.
2. Hammer, G.L., Nicholls, N., and Mitchell, C., "Applications of Seasonal Climate", Springer, Germany, 2000.

CO/PO Mapping

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CO1	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	2	-	-	-	-	-	-	-	2	2	2	1
CO3	3	-	-	-	-	-	-	-	-	-	1	2	2	1
CO4	2	-	-	-	2	1	-	-	1	-	2	3	2	3
CO5	3	2	2	-	1	-	-	-	1	-	-	2	2	1

AI16702 AGRICULTURAL ECONOMICS AND EXTENSION 3 0 0 3

COURSE OBJECTIVES

- To impart the fundamental knowledge of Economics, types of resources and Investment analysis.
- To analyse cost requirements
- To get an idea about management of resources
- To expose the different extension methods for communication to take the work from lab to field.
- To introduce the capacity building techniques.

UNIT I LAWS OF ECONOMICS 9

Agricultural Economics - definition and scope; Basic laws of economics - demand and supply concepts - law of increasing, diminishing and constant returns - Equi-marginal returns; Factor-Product relationship - Production function - definition and types - Optimum level of input and optimum level of output; Scale of Economies - external and internal economies and diseconomies; Cost concepts - types - opportunity cost - comparison of costs - cost curves

UNIT II PRODUCT RELATIONSHIP 9

Factor-factor relationship & concepts - principle of substitution - isoquant, isocline, expansion path, ridge line and least cost combination of inputs; Product-product relationship - Production possibility curve, Iso-revenue line and optimum combination of outputs; Estimation of cost of cultivation and production of crops - annual and perennial crops; Preparation of interview schedule and farm visit for data collection.

UNIT III MANAGEMENT OF RESOURCES AND FINANCIAL ANALYSIS 9

Risk and uncertainty – concept - causes for uncertainty - managerial decisions to reduce risks in production process; Management of resources - types of resources - land, labour, capital and measurement of their efficiencies; Mobilization of farm resources - Cost of machinery and maintenance - Break even analysis - Farm Investment analysis – Time comparison principles - Compounding &Discounting techniques; Farm financial analysis - Balance sheet - Income statement - Cash flow analysis; Farm planning - Elements of farm planning - Farm level management system; Farm budgeting - whole farm budgeting and partial budgeting - examples of farm planning and budgeting.

UNIT IV EXTENSION CONCEPT AND TEACHING METHODS 9

Extension – definition and meaning – Education - Types of Education – Difference between Formal and Extension Education - Function and scope of Extension - Principles of Extension - Steps in Extension Teaching; Communication - Basic functions of Communication - Models of Communication - Barriers of Communication; Extension teaching methods - Audio-Visual aids - definition - classification - purpose, planning and selection, combination and use - individual, group and mass contact methods - merits and demerits; Modern communication methods - internet, video and teleconferencing - Interactive Multimedia Compact Disk (IMCD) - Village kiosks - Kisan Call Centre (KCC) - mobile phone applications.

UNIT V
DIFFUSION, ADOPTION AND CAPACITY BUILDING 9

Diffusion - meaning and elements; Adoption - meaning - adopter categories and factors influencing adoption - stages of adoption - Innovation - decision process - Innovation decision period - Rate of adoption - Over adoption - attributes of innovation - consequences of Innovation; Capacity building of extension personnel and

farmers - meaning - definition - types of training - training to farmers - farm women and rural youth - FTC & KVK.

TOTAL 4
PERIODS 5

COURSE
OUTCOMES

At the end of this course, the students will be able to

- Understand basics of agricultural economics.
- Plan the financial aspects in a cost effective manner.
- Know the different farm management techniques.
- Familiar with various extension methods, communication gadgets
- Get trained in capacity building techniques.

TEXT BOOKS

1. Johl, S.S., and Kapur, T.R., “Fundamentals of Farm Business Management”, Kalyani publishers, Ludhiana, 2007.
2. Subba Reddy, S., Raghu Ram, P., NeelakantaSastry T.V and Bhavani Devi, I., “Agricultural

Economics" Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2006.

3. Ray, G.L., "Extension Communication and Management", NayaProkash, 206, BidhanSarani, Calcutta, 1999.
4. Sandhu, A.S., "Extension Programme Planning", Oxford & IBH Publishing Co. pvt. Ltd, New Delhi,1996.

REFERENCE

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1. Subba Reddy, S., and Raghu Ram, P. "Agricultural Finance and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
2. Muniraj, R., "Farm Finance for Development", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2000.
3. Rogers, E.M,"Diffusion of Innovations", The Free Press, New York,1995.
4. Sandhu, A.S., "Agricultural Communication: Process and Methods", Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi,1996.

CO/PO Mapping

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CO1	3	3	-	1	2	-	2	-	-	-	3	2	2	3
CO2	3	1	-	1	3	-	2	-	1	1	3	1	2	3
CO3	3	2	3	-	-	1	1	-	-	-	1	2	3	1
CO4	2	3	2	-	-	-	1	-	-	-	-	1	-	2
CO5	3	2	3	-	1	-	-	-	-	-	-	1	1	2

AI16903 PROFESSIONAL ETHICS IN AGRICULTURE ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To create an exposure on Human Values.
- To equip with Engineering Ethics and its related theories.
- To instil Moral and social responsibility of engineer.
- To give awareness about safety, responsibilities and rights.
- To know the global issues related to ethical values.

UNIT I HUMAN VALUES 10

Morals, values and Ethics - Integrity - Work ethic - Service learning - Civic virtue - Respect for others - Living peacefully - Caring - Sharing - Honesty - Courage - Valuing time - Cooperation - Commitment - Empathy - Self-confidence - Character - Spirituality - Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 9

Senses of Engineering Ethics - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of professional roles - Theories about right action - Self-interest - Customs and Religion - Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics - A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis and Reducing Risk - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) - Discrimination.

UNIT V GLOBAL ISSUES 8

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Moral Leadership - Code of Conduct - Corporate Social Responsibility.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- Gain exposure on Human Values.
- Apply Ethics theories in the agriculture profession.
- Understand the social responsibility and Loyalty of engineers.
- Realize the need of safety, responsibilities and rights in the society.
- Familiar with global issues related to ethical values.

TEXT BOOKS

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics -Concepts and Cases", Cengage Learning, 2009.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi,2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists andEngineers", Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for PersonalIntegrity and Social Responsibility", McGraw Hill education, India Pvt. Ltd., New Delhi 2013.
6. World Community Service Centre, "Value Education", Vethathiri publications, Erode, 2011.

CO/PO Mapping

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	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	3	-	-	-	-	-	3
CO2	-	2	-	-	-	3	-	3	-	-	-	-	-	3
CO3	3	-	-	-	-	3	3	-	-	-	-	-	-	3
CO4	-	-	1	-	-	3	3	3	-	-	-	-	-	3
CO5	-	-	-	-	-	3	3	3	-	-	-	-	-	3

EN15301 BUSINESS ENGLISH COURSE LABORATORY 0 0 2 1

COURSE OBJECTIVES

- To develop the reading skills of the students and make them familiarize in skimming and scanning.
- To instill the communication concepts to enhance the students' conversational skills through various practice sessions
- to familiarize them with a variety of business correspondence.
- To inculcate the receptive skills i.e. Listening and Reading and to make the students well versed in the Productive skills and to assist them in improving their vocabulary and comprehension of grammar.

UNIT I READING AND VOCABULARY

Understanding short, real notices, messages - detailed comprehension of factual material- skimming & scanning skills - interpreting visual information - reading for detailed factual information - reading for gist and specific information - reading for grammatical accuracy and understanding of text structure - reading and information transfer.

UNIT II WRITING

Re-arranging appointments - asking for permission - giving instructions - apologizing and offering compensation - making or altering reservations - dealing with requests - giving information about a product.

UNIT III LISTENING

Listening to short telephonic conversation - Listening to short conversation or monologue - Listening to specific information - Listening to conversation- interview, discussion.

UNIT IV SPEAKING

Conversation between the interlocutor and the candidate - general interaction and social language - A mini presentation by each candidate on a business theme - organising a larger unit of discourse - giving information and expressing opinions - two way conversation between candidates followed by further prompting from the interlocutor- Expressing opinions- agreeing and disagreeing

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of the course, students will be able to

- enrich the vocabulary through reading and to develop their pronunciation skills.
- prepare flawless reports and proposals.
- listen to speeches and conversations and answer the questions.
- communicate fluently and effectively on any given topic and appear with confidence for on-line tests.

o

TEXT BOOKS

1. Cambridge BEC Preliminary, Self-Study Edition, Cambridge University Press, New York, 2012.
2. Whitby, Norman. Business Benchmark, Pre-intermediate to intermediate, Business Preliminary, Shree Maitrey Printech Pvt. Ltd., Noida, 2014.

CO/PO Mapping

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CO1	-	-	-	3	1	-	-	1	-	3	1	-	-	-
CO2	-	-	-	1	-	-	1	-	-	3	-	-	-	-
CO3	-	-	-	-	2	-	-	-	-	2	2	-	-	-
CO4	-	-	-	-	-	1	2	2	3	3	3	-	-	-

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
English
10/5/2016
AUTONOMOUS

EN15501 CAREER DEVELOPMENT LABORATORY - I 0 0 2 1

COURSE OBJECTIVES

To enable students to

- enhance their own potential strength and reduce weakness to survive in corporate world
- evaluate their own personality skills to face the interviews in a successful way
- solve the quantitative aptitude problems and improve their problem-solving skills
- solve the quantitative aptitude in advance level tests to get placed in Tier 1 companies
- improve their reasoning skills to get placed in reputed companies

UNIT I PERSONALITY DEVELOPMENT 1 6

Introduction - self explorations - character building - self-esteem- self-confidence- positive thinking - leadership qualities- time management.

UNIT II PERSONALITY DEVELOPMENT 2 6

Grooming- role play - good etiquettes - extempore - writing skills: email, paragraph - team building- body language - non-verbal communication

UNIT III QUANTITATIVE APTITUDE (QA) 1 6

Time , speed & distance -- simple interest & compound interest - percentage - height & distance - time & work - number systems - L.C.M & HCF - ratio proportion- area - directions.

UNIT IV LOGICAL REASONING (LR) 1 6

Analogies - letter & symbol series - number series - cause & effect - essential part - verbal reasoning.

UNIT V VERBAL REASONING (VR) 1 6

Blood relation - Venn diagrams - analogy - character puzzles - logical sequence - classification - verification of truth - seating arrangement.

TOTAL 30

PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- demonstrate the interpersonal skills in Group Discussions
- enhance their verbal and written ability
- practice soft skills to excel in their jobs
- compute problems based on quantitative aptitude
- reveal their logical and verbal reasoning by scoring the expected percentage to get placed in reputed companies

REFERENCE BOOKS

1. Agarwal, R.S." A modern approach to verbal &Non verbal reasoning", S.Chand& Co Ltd, New Delhi.
2. AbhijitGuha, "Quantitative aptitude", Tata-Mcgraw Hill.
3. Word Power Made Easy by Norman Lewis, WR.Goyal Publications.
4. Johnson, D.W. (1997) Reaching out - Interpersonal effectiveness and Self Actualization, Boston: Allyn and Bacon.
5. Agarwal, R.S. " Objective general English", S.Chand& Co
6. Infosys campus connect program - Students' Guide for Soft Skills.

CO/PO Mapping :

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CO2	-	2	3	-	2	-	2	-	-	-	-	-	3	2
CO3	3	2	2	2	-	-	1	-	-	-	-	-	2	3
CO4	3	2	2	-	-	3	-	-	-	-	2	-	2	3
CO5	2	3	3	2	1	1	3	1	-	1	2	-	2	3

CH16401 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- maintain the ecological balance and preserve bio - diversity.
- the role of government and non - government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition - scope - importance - need for public awareness. Forest resources: Use - over exploitation - deforestation - case studies - mining - effects on forests and tribal people. Water resources: Use - over utilization of surface and ground water - floods - drought - conflicts over water. Mineral resources Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture - fertilizer - pesticide problems - water logging - salinity - case studies. Energy resources Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource - land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - energy flow in the ecosystem - ecological succession - food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).Biodiversity: Introduction - definition (genetic - species - ecosystem) diversity. Value of biodiversity: Consumptive use - productive use - social values - ethical values - aesthetic values. Biodiversity level: Global - national - local levels - India as a mega diversity nation - hotspots 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 - field study.

UNIT III POLLUTION 9

Pollution: Définition - air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods - earthquake - cyclone - landslides. Electronic waste - Sources - Causes and

its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development: Unsustainable to sustainable development - urban problems related to energy. Water Conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions - climate change - global warming and its effects on flora andfauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population: Population growth - variation among nations - population explosion - family welfare programme and family planning - environment and human health - Human rights - value education - HIV/ AIDS Swine flu - women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- know the relationship between the human population and environment.
- understand the basic concepts of environment studies and natural resources.
- gaining the knowledge about ecosystem and biodiversity.
- have knowledge about causes, effects and control measures of various types of pollution.
- understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, TataMcGraw Hill

   Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010)

REFERENCES

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010.
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, JaicoPublising House, Mumbai, 2004.

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO 1	2	2	3	2	2	-	-	-	-	-	-	2	2	2
CO 2	3	2	1	2	3	-	-	-	-	-	-	2	-	2
CO 3	2	2	3	2	3	-	-	-	-		2	3	3	2
CO 4	2	2	3	2	2	-	-	2	-	-	-	3	-	2
CO 5	3	1	2	3	2	-	-	1	-	-	-	3	2	1

SEMESTER VI

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic human values for a professional
- discuss the significance of ethics in engineering and the theories related to it
- familiarize oneself with the role of engineer as responsible experimenters
- expose the students to their roles and responsibilities in assessing safety and reducing risks
- describe the global issues in ethics and role of engineers as manager and consultants

UNIT I HUMAN VALUES 9

Morals, values and ethics-Integrity-Work Ethic-Service Learning-Civic virtue-Respect for others-Living peacefully – caring – sharing – Honesty – Courage – Valuingtime-cooperation-Commitment-Empathy-Self-confidence-Character-Spiruality

UNIT II ENGINEERING ETHICS 9

Senses of "Engineering Ethics"-variety of moral issues-types of inquiry-moral dilemmas-moral autonomy-Kohlberg's theory-Gilligan's theory-consensus and controversy-Models of Professional Roles-theories about right action-Self -interest-Customs and religion-uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation-engineers as responsible experimenters-codes of ethics-a balanced outlook on law-the challenger case study

UNIT IV SAFETY, RESPONSIBILTIES AND RIGHTS 9

Safety and risk-assessment of safety and risk-risk benefit analysis and reducing risk-the Three Mile Island and Chernobyl case studies. Collegiality and loyalty-respect for authority-collective bargaining-confidentiality-conflicts of interest-occupational crime-professional rights-employee rights-Intellectual property rights(IPR)-discrimination

UNIT V GLOBAL ISSUES 9

Multinational corporations-Environmental ethics-computer ethics-weapons development-engineers as managers-consulting engineers-engineers as expert witnesses and advisors-moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of materials Management, Institution of electronics and telecommunication engineers(IETE), India,etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- describe the basic human values for a professional
- understandthe significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks
- discuss the global issues in ethics and role of engineers as manager and consultants

TEXT BOOKS

1. Charles E Harris. Michael S Pritchard and Michael J Rabins. "Engineering Ethics -Concepts and Cases". Thompson Learning. (2000).
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

REFERENCES

1. Charles D Fledderman. "Engineering Ethics". Prentice Hall. New Mexico. (1999).
2. John R Boatright. "Ethics and the Conduct of Business". Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers". Oxford University Press. (2001).
4. Prof. (Col) P S Bajaj and Dr Raj Agrawal. "Business Ethics - An Indian Perspective".Biztantra. New Delhi. (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

CO-PO Mapping:

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

Course Outcomes (Cos)	Programme Outcomes(POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3		3		3								3	2
CO2	3		3		3								3	3
CO3	3		3		3								3	3
CO4	3		3		2								3	3
CO5	3		3		2								3	3

SEMESTER VIII

BM16801 HEALTHCARE AND HOSPITAL MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- expose the students for planning and operation of hospitals in a detailed manner.
- impart the facts of hospital planning activities.
- teach the regulatory requirements and its standards.
- introduce the equipment maintenance management skills.
- expose how to protect equipment from electromagnetic interferences.

UNIT I HEALTH SYSTEM IN A HOSPITAL 9

Health organization of the country - The State, The Cities and the Region, Health Financing System, Organization of Technical Section; Different Departments of Hospital, Recruitment, Selection; Training Guidelines – Methods of Training, Evaluation of Training, Leadership grooming and Training, Promotion, Transfer.

UNIT II HOSPITAL ORGANISATION AND MANAGEMENT 9

Management of Hospital Organization - Nursing Sector, Medical Sector, Central Services, Technical Department; Definition and Practice of Management by Objective, Transactional Analysis Human Relation in Hospital, Importance of Teamwork, Legal aspect in Hospital Management.

UNIT III REGULATORY REQUIREMENT AND HEALTH CARE CODES 9

FDA Regulation, Joint Commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPQ; International Standards- Medical Device Directive 93/42/EEC, Medical Electrical Equipment ISO 60601, Medical Device Inspection ISO17020; Indian Standards – Biomedical Equipment Management and Maintenance Program (BMMP), ISO 9001-2008, AERB Compliance, Radiation protection AE(RP)R-2004, Safety Code AE/RF-MED/SC-3.

UNIT IV EQUIPMENT AND ASSET MAINTENANCE MANAGEMENT 9

Organizing Maintenance Operations, Paperwork Control, Maintenance Job Planning, Maintenance Work Measurement and Standards; Preventive Maintenance, Maintenance Budgeting and Forecasting, Maintenance Training, Contract Maintenance; Hospital Planning, Equipment Planning, AMC, Functional Planning.

UNIT V TRAINED TECHNICAL PERSONNEL 9

Function of Clinical Engineer - Role to be performed in Hospital, Manpower Market, Professional Registration, Structure in Hospital; Support Service Technical Information Systems – Medical Transcription.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon completion of the course, the students will be able to

- expert in understanding the various health policies.
- planning activities at health care centers.
- equipment installation, service & calibration needs.
- organizing maintenance operations.
- function of a clinical engineer in a hospital.

TEXTBOOKS

1. Jacob Kline, Handbook of Bio Medical Engineering, Academic Press Inc. San Deigo 2017 – Fourth Edition.
2. Human Resource in Hospital Management, Erickson Thomas, Global Vision Publishing House, 2019 Edition.

REFERENCES

1. Edda Weimann, Peter Weimann, "High Performance in Hospital Management - A Guideline for Developing and Developed Countries", Springer Berlin Heidelberg, 22 May 2017.
2. Almira Badnjevic, Mario Cifrek, Ratko Magjarevic, Zijad Dzemic, "Inspection of Medical Devices For Regulatory Purposes". Springer Nature. 2018
3. Cesar A.Caceres, The Practice of Clinical Engineering, Elsevier Science,2 December 2012.
4. Joint Commission Accreditation Standards for Hospitals ,2nd Edition, 2003.

CO-PO Mapping:

Course Outcomes (COs)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1			3	3	3	3	3	3	3				3	
CO 2			2	2	2	2	2	2	2				3	
CO 3			3	3	3	3	3	3	3				3	
CO 4			2	2	2	2	2	2	2				3	
CO 5			3	3	3	3	3	3	3				3	

BM16705 HOSPITAL INTERNSHIP TRAINING 0 0 2 1

COURSE OBJECTIVES

To enable the students to

- improve the skills by visiting the hospitals.
- understand the working principle of various biomedical equipments.
- able to work on the equipments through internship.
- able to design the equipment prototype model.

GUIDELINE FOR HOSPITAL INTERNSHIP AND TRAINING

The students may be grouped into 2 to 4 members by internship coordinator. The students will be allowed for hospital internship training for 2 weeks. After the completion of Internship training, they will have to submit the report to the Coordinator and Head of the Department. At the end of the semester examination, the Hospital Training report is evaluated based on oral presentation and is examined jointly by the committee constituted by the Head of the Department.

TOTAL PERIODS 30

COURSE OUTCOMES

At the end of the course, the students will be able to

- advocate a patient-centered approach in healthcare.
- communicate with other health professionals under various departments in a respectful and responsible manner.
- propose a patient-centered inter-professional health improvement record plan based upon the patient's perceived needs.
- use the knowledge of one's own role in a hospital and those of other professions to address the healthcare needs of populations and patients served.

CO-PO Mapping:

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	3	3	3					3	3	3		2	3	3
CO 2	3	3	3	3	3	2	2		2	3		3	3	2
CO 3	3	3	3	3	3	3	2		2	3		3	2	3
CO 4	3	3	3				2	3	3	3	2	3	2	2

EN16202 ENGLISH COMMUNICATION SKILLS LABORATORY 0 0 2 1

COURSE OBJECTIVES:

To enable the students to

- Instill the basic communication concepts to enhance students' communication skills through various lab sessions.
- Help students develop the ability to communicate effectively in spoken English.
- Help students develop their soft skills and interpersonal skills.
- Increase employability by developing students' communication skills in English.

UNIT I FORMAL & INFORMAL CONVERSATION PRACTICE 9

Role Play conversations - with family members, neighbors, friends, relatives etc. Simple expressions - agreeing/disagreeing, persuading, wishing,consoling,advising,arguing,expressingopinionsetc.-Professional dialogues with superiors - Conversation with different professionals in - Government and Corporate Offices, Official Meetings, Educational Institutions, (At the railway junction, malls, post office,bank) etc-every day usage of English

UNIT II ORAL REVIEW, RADIO SHOW & NARRATIVE TECHNIQUES 9

Oral review of books - Presentation of various radio programs like news, announcements, advertisements, entertainment programs etc. as a team activity. Understanding the basic narrative techniques – Narrating short stories, Narrating real life experiences, Oral interpretation of charts, tables, graphs.

UNIT III RESUME / LETTER WRITING 9

Preparation of resume- structure – Types of resume – writing the vision statement – Objectives – Types ofLetter –Job Application–accepting/declining a Job offer.

UNIT IV PRESENTATION SKILLS & GROUP DISCUSSION 9

Elements of effective presentation – Structure of a presentation – Speech acts - effective use to presentation tools - Audience analysis – Preparing the PPT slides - Video samples- Importance ofGD –in the selection process - Structure of a GD – Moderator – led and other GDs - Strategies in GD – Team work – Body Language-Mock GD-Video samples

UNIT VI NTERVIEW SKILLS

Kinds of interviews–one to one, group interview, telephone interview, online interview, stress interview-Required Skills– Corporate culture–Mock interviews-Video samples.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- listen and comprehend classroom lectures, short talks and conversations.
- read, interpret and analyze a given text effectively, and use cohesive devices in spoken and written English.
- understand English and converse effectively.
- write flawless sentences, Job application.

TEXT BOOKS:

- Kalpana.V&Co.,"Communication Skills Laboratory Manual", Vijay Nicole Imprints Pvt. Limited, Chennai.2013
- Rizvi,Ashraf. M.Effective Technical Communication.TataMcGraw-Hill, NewDelhi.2005.

REFERENCE BOOKS:

- Anderson,P.V."Technical Communication",Thomson Edition,NewDelhi,2007.
- Kumar Sanjay, PushpLata,"Communication Skills (With CD)",Oxford University Press, NewDelhi.2011

	Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
COs	**Programmes Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	2	2	3	3	1	-	-
CO2	-	-	-	2	3	-	1	2	-	3	3	1	-	-
CO3	-	-	-	-	-	-	-	-	-	3	1	1	-	-
CO4	-	-	-	-	3	1	1	-	2	3	3	1	-	-

BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

Prerequisite :Nil

UNIT I HUMAN VALUES 9

Morals - Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - Empathy - Self-Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories - about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk, risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality- conflicts of interest - occupational crime - professional rights, employee rights, Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers - consulting engineers - engineers as expert witnesses and advisors - moral leadership - sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York(2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists andEngineers",
4. Oxford University Press, (2001).
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, (2004).
6. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO2	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO3	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO4	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO5	-	-	-	-	-	2	2	2	2	2	2	1	-	-

CE16302 CONSTRUCTION MATERIALS 3 0 0 3

COURSE OBJECTIVES

- To identify the characteristics of various building materials.
- To analyse various materials commonly used in civil engineering construction and their properties
- To gain knowledge about various processes involved in the manufacturing of concrete
- To study the importance and benefits of timber and other products
- To gain knowledge of various modern materials used in construction.

UNIT I STONES – BRICKS – CONCRETE BLOCKS 9

Stones as building material – Criteria for selection - Test on stones – Deterioration and preservation of stone work; Bricks – Classification – Manufacturing of clay bricks – Test on bricks – Compressive strength – Water Adsorption – Efflorescence – Bricks for special use – Refractory bricks ; Cement Concrete blocks –Light weight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR 9

Lime – Preparation of lime mortar; Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and cement mortar – Hydration – Compressive strength – Tensile strength – Fineness – Soundness and consistency – Setting time – Industrial by products – Fly ash; Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance - Grading – Sand Bulking.

UNIT III CONCRETE 9

Concrete – Ingredients – Manufacturing process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction factor – Properties of hardened concrete – Compressive, Tensile and shear strength - Modulus of rupture - Tests - High strength concrete and HPC – Self compacting concrete – Other types of concrete – Durability of Concrete.

UNIT IV TIMBER AND OTHER MATERIALS 9

Timber - Market forms – Industrial timber – Plywood –Veneer – Thermacole – Panels of laminates; Steel - Aluminum and Other metallic materials – Composition – Aluminum composite panel – Uses – Market forms - Mechanical treatment; Paints – Vanishes – Distempers; Bitumen's.

UNIT V MODERN MATERIALS 9

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- identify the various construction materials
- familiarize themselves with the characteristics of basic building materials
- understand the behavior and manufacture of cement and concrete.
- identify the timber materials.
- understand and conserve the modern materials.

TEXT BOOKS

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.

REFERENCES

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., &NehaJamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
3. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008.
4. Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
5. Duggal.S.K., "Building Materials", 4th Edition, New Age International, 2008.

WEB LINKS

1. http://ceae.colorado.edu/~saouma/Lecture-Notes/s4a.pdf
2. http://pareto.uab.es/xmg/Docencia/IO-en/IO-Introduction.pdf

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	-	2	-	3	-	2	-	-	-	-	3	-
CO2	3	-	3	-	1	-	1	-	-	-	-	-	3	-
CO3	3	-	-	-	-	-	-	-	2	1	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	2	-	3	-
CO5	2	-	-	2	-	-	-	2	-	-	-	1	3	2

CE16401 SURVEYING II 3 0 0 3

COURSE OBJECTIVES

- To understand the trignometrical levelling.
- To adjust the errors encountered during surveying
- To work with total station
- To understand the concept of GPS
- To know the various types of advanced surveying methods.

UNITI CONTROL SURVEYING 9

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre – Trignometrical leveling-Single and reciprocal observations - Modern trends – Bench marking

UNIT II SURVEY ADJUSTMENT 9

Errors Sources- precautions and corrections – classification of errors – true and most probable values - weighed observations – method of equal shifts – principle of least squares - normalequation – correlates - level nets- adjustment of simple triangulation networks.

UNIT III TOTAL STATION SURVEYING 9

Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principles, Sources of Error, Infrared and Laser Total Station instruments. Microwave system:Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Trilateration.

UNIT IV GPS SURVEYING 9

Basic Concepts - Different segments - space, control and user segments - satellite configuration -signal structure - Orbit determination and representation - anti spoofing and selective availability- Task of control segment – Hand Held and Geodetic receivers –data processing - Traversing and triangulation.

UNIT V ADVANCED TOPICS IN SURVEYING 9

Route Surveying-Reconnaissance- Route surveys for highways, railways and waterways- Curve ranging - Horizontal and vertical curves - Simple curves - Setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements. Hydrographic surveying- Tides-MSL- Sounding methods- Three-point problem- Strength of fix-Sextants and station pointer- Astronomical Surveying-field observations and determination of Azimuth by altitude and hour angle methods- fundamentals of Photogrammetry and Remote sensing.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- distinguish between the stations calculated by single and reciprocal levelling.
- identify the errors and adjust them in the real time applications.
- gain knowledge about principles and methods of measurement using total station.

- understand the working principle of GPS, its components, signal structure, processing techniques used in GPS observations and error sources.
- demonstrate methods of survey in water bodies by hydrographic surveying, basic concepts adopted in photogrammetry.

TEXT BOOKS

1. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 2010.
2. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2013.

REFERENCES

1. Chandra A.M., "Plane Surveying", New Age International Publishers, 2015.
2. Arora, K. R. Surveying Vol. I and II, Standard Book House, 2008.
3. Alak De, "Plane Surveying", S. Chand & Company Ltd., 2014.
4. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice",7thEdition,McGraw Hill, 2001.
5. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
6. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2011.
7. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 2004.

WEB LINKS

1. nptel.ac.in/courses/105107122/
2. http://nptel.ac.in/courses/105107122/20

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	1	2	-	-	-	2	-	-	1	2	1
CO2	1	2	1	1	2	-	-	-	2	-	-	1	2	1
CO3	1	2	1	1	2	-	-	-	1	-	-	2	2	1
CO4	1	2	1	1	2	-	-	-	2	-	-	2	2	1
CO5	1	2	1	1	2	-	-	-	2	-	-	2	2	1

CE16403 CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES 3 0 0 3

COURSE OBJECTIVES

- To study the properties, testing and handling of concrete for the construction projects.
- To know the appropriate techniques and practices used in the construction according to the current scenario.
- To gain knowledge about various constructions methodology adopted for substructure construction.
- To acquire emerging ideas in the field of Super structure construction.
- To create awareness about the new construction equipment and its usage in the project.

UNIT I CONCRETE TECHNOLOGY 9

Cements – Grade of cements - concrete chemicals and Applications – Grade of concrete manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete –curing and finishing - Testing of fresh and hardened concrete – quality of concrete – Extreme Weather Concreting - Ready Mix Concrete - Non-destructive testing.

UNIT II CONSTRUCTION PRACTICES 9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance –Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints –pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes –acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION 9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam – cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points-Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION 9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work - earth moving operations – types of earthwork equipment tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- understand the material properties, strength and durability of concrete.
- use suitable construction techniques and practices for the particular project.
- gain exposure in the modern construction techniques adopted in the construction projects.
- use advanced techniques towards speedy and guaranteed projects.
- acquire knowledge about the usage & suitability of new construction equipment in large projects.

TEXT BOOKS

1. Varghese, P.C. "Building construction", Eastern Economy Edition, Second Edition, 2016
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and CompanyLtd, New Delhi, 2008.
3. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", DhanpatRai and Sons, 1997

REFERENCES

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers,1999.
2. Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi,2002
3. Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi,2012.
4. Dr. Mahesh Varma, “Construction Equipment and its Planning and Application”,Metropolitan Book Company, New Delhi, 1983.
5. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd,New Delhi, 2004

WEB LINKS

1. https://www.youtube.com/watch?v=bA3OsOsrRgc
2. http://www.youtube.com/watch?v=-srRW8Gfvnk

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
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CO1	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO2	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO3	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO4	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO5	2	-	-	-	1	-	-	-	1	-	-	1	1	1

CE16601 DESIGN OF STEEL STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- describe limit state design concepts and the design of bolted and riveted joints.
- gain knowledge on design of tension members.
- acquire knowledge about design of compression member.
- gain knowledge about design of beams.
- acquire knowledge on designing the components of roof trusses

Prerequisite: Nil

UNIT I INTRODUCTION 9

Properties of steel – Structural steel sections – Limit state design concepts – Loads on Structures; Connections using bolting and welding – Design of bolted and welded joints – Eccentric Connections – Efficiency of joints.

UNIT II TENSION MEMBER 9

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag.

UNIT III COMPRESSION MEMBER 9

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base.

UNIT IV BEAMS 9

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to Uniaxial and biaxial Bending – Design of plate girders – Intermediate and bearing stiffeners – Flange and web splices.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 9

Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss – Design of gantry girder.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- apply knowledge of limit state design concepts and joints.
- design tension members.
- design compression members.
- apply knowledge on design of beams.
- design components of steel trusses such as Purlins and gantry girders.

TEXT BOOKS

1. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, International Publishing House Pvt. Ltd., 2009
2. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013

REFERENCES

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2010
2. Dayaratnam, P., "Design of Steel Structures", Second edition, S. Chand & Company, 2004.
3. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 StructuresPublications, 2009.
4. Ramachandra, S. and Virendra Gehlot, "Design of Steel Structures – Vol. I & II", Standard Publication, NewDelhi, 2007
5. IS800 :2007, General Construction in Steel – Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
6. IS 875: (Part 2 and 3) 1987 (Reaffirmed 1997), Code of practice for design loads (Other thanEarthquake) For Buildings and Structures.
7. Steel Tables

WEB LINKS

1. https://engineering.purdue.edu/~ahvarma/CE%20470/
2. http://www.learnerstv.com/Free–engineering–Video–lectures–ltv323–Page1.html
3. http://peer.berkeley.edu/~yang/courses/ce248/CE248_LN_Floor_vibrations.pdf

CO PO Mapping

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CO1	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO2	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO3	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO4	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO5	2	2	2	1	1	-	-	-	-	-	-	1	1	2

CH16403 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

(COMMON TO AERO,CIVIL & MECH)

COURSE OBJECTIVES

At the end of this course the student is expected

- To know the constituents of the environment and the precious resources in the environment.
- To conserve all biological resources.
- To understand the role of human being in maintaining a clean environment and usefulenvironment for the future generations.
- To maintain the ecological balance and preserve bio-diversity.
- The role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment - Definition- scope - importance – need for public awareness; Forest resources - Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people; Water resources- Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources:-Use – exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources- World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture-fertilizer-pesticide problems - water logging - salinity -case studies; Energy resources- Growing energy needs - renewable and non-renewable energy sources; Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem- Structure and function of an ecosystem – producers - consumers -decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem- Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (lakes, rivers, oceans, estuaries); Biodiversity- Introduction– definition (genetic - species –ecosystem) diversity- Value of biodiversity- Consumptive use productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots 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.

UNIT III POLLUTION 9

Pollution: Definition –air pollution; water pollution; soil pollution; marine pollution; noise pollution; thermal pollution; nuclear hazards; Solid waste management- Causes - effects - control measures of urban and industrial wastes; Role of an individual in prevention of pollution ; Disaster management- Floods – earthquake - cyclone – landslides; Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development- Unsustainable to sustainable development – urban problems related to energy; Water conservation - rain water harvesting - watershed management; Resettlement and rehabilitation of people. Environmental ethics- Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust. 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.

UNIT V HUMAN POPULATION AND ENVIRONMENT **9**

Human population- Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV / AIDS, Swine flu – women and child welfare; Role of information technology in environment and human health.

TOTAL PERIODS **45**

COURSE OUTCOMES

At the end of this course, the student will be able to

- Know the relationship between the human population and environment.
- Understand the basic concepts of environment studies and natural resources.
- Gaining the knowledge about ecosystem and biodiversity.
- Have knowledge about causes, effects and control measures of various types of pollution.
- Understand the social issues and various environmental acts.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi, (2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2002.
2. A.K.De, EnvironmentalChemistry, VI edition,2015 NewAge International (P) ltd Publication,NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition,NewAge International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering", McGraw Hills

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
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CO1	-	-	-	-	-	1	3	3	2	-	-	3	1	-
CO2	-	-	2	-	-	1	-	3	-	2	-	3	1	-
CO3	2	-	2	-	2	1	-	3	-	2	-	3	1	-
CO4	2	2	2	-	2	1	3	3	-	2	-	3	1	-
CO5	-	2	-	-	-	1	3	3	2	2	-	2	1	-

Approved BOARD OF STUDIES Chemistry

CE16501 DESIGN OF REINFORCED CONCRETE ELEMENTS 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- develop an understanding on the basic concepts in the behaviour and design of reinforced concrete systems and elements using limit state method.
- present the design principles of RC members for shear, bond, and torsion.
- announce the concepts in the design of RC column design
- get the knowledge in the concept of RC footings.
- develop an understanding on the basic concepts in the behaviour and design of staircase.

Prerequisite: Nil

UNIT I INTRODUCTION AND DESIGN OF FLEXURAL MEMBERS 9

Stages in Structural Design – Design philosophies – Introduction to working stress method, ultimate load Design (Principles only) – Limit state method – Comparison – General principles of design – Design of beams and slabs – Procedure for the analysis of section by strain compatibility method.

UNIT II DESIGN FOR BOND, ANCHORAGE, SHEAR & TORSION 9

Design of flanged beams – Behaviour of RC members in bond and Anchorage – Curtailment of reinforcement – Behavior of RC beams in shear and torsion – Design of RC members for combined bending, shear and torsion.

UNIT III DESIGN OF COLUMNS 9

Columns – Assumptions – Effective length – Classification – Design guidelines – Axially loaded short columns with lateral ties and helical reinforcement – Columns – Uniaxial bending – Biaxial bending.

UNIT IV DESIGN OF FOOTING 9

Foundations – Classification – Design guidelines – Codal provisions – Design of wall footing – Design of axially and eccentrically loaded square, rectangular and circular footing – Design of combined footing – Standard method of detailing the RC footing.

UNIT V DESIGN OF STAIRCASE 9

Types of stairs – Design of ordinary stairs, dog–legged stairs, Open newel stairs and stairs with stringer beams – Standard method of detailing of staircase.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- design flexural members using limit state method under different loading and end conditions.
- enterprise flexural members of any cross–sectional shape for shear, bond and torsion
- plan RC columns of any cross section with different end conditions
- select and design RC footing of different cross section under various site conditions.
- choose and design various types of staircase as per the site/building requirements

TEXT BOOKS

1. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw–Hill Publishing Company Ltd., New Delhi 2009.
2. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi,2003.

REFERENCES

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi 2010
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw–Hill Publishing Company Ltd., New Delhi 2014.
3. Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
4. IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000.
5. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999.

WEB LINKS

1. http://nptel.ac.in/video.php?subjectId=105105105

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	2	2	-	-	-	-	-	-	-	2	1	2
CO2	2	2	2	2	-	-	-	-	-	-	-	2	1	2
CO3	2	3	2	2	-	-	-	-	-	-	-	2	1	2
CO4	2	2	2	2	-	-	-	-	-	-	-	2	1	2
CO5	2	3	2	2	-	-	-	-	-	-	-	2	1	2

CE16502 HIGHWAY ENGINEERING 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- gain knowledge on planning of roadways.
- illustrate proficiency in the geometric design of various highway elements.
- gain knowledge on planning and design of flexible and rigid pavements.
- illustrate exposure of materials used for highways and construction procedures.
- gain knowledge on highway projects under public–private sector participation.

Prerequisite: Nil

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

History of road development in India – Classification of highways – Institutions for Highway planning, design and construction at different levels – Factors influencing in highway alignment; Road ecology; Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9

Typical cross sections of Urban and Rural roads — Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients, hairpin bends – Lateral and vertical clearance at underpasses – IRC standards – Road sign and safety.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Design principles – Pavement components and their role – Design practice for flexible and rigid pavements (IRC methods only).

UNIT IV HIGHWAY CONSTRUCTION AND MAINTENANCE 9

Highway construction materials, properties, testing methods – Construction practice including modern materials and methods of concrete and flexible pavements, Highway drainage – Special considerations for hilly roads; Evaluation and Maintenance of pavements.

UNIT V HIGHWAY ECONOMICS AND FINANCE 9

Introduction, Highway User Benefits, Highway Costs, Vehicle Operation Costs, Economic analysis, Highway projects under public – Private sector participation, Bidding process, Highway finance.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- plan and align the highway components.
- execute geometric design of various highway components.
- prepare the design of flexible and rigid pavements.
- apply knowledge of construction procedure of various roads.
- perceive the economic analysis of highways.

TEXT BOOKS

1. Veeraragavan.A, Khanna.K and Justo.C.E.G. "Highway Engineering", Nem Chand & Bros Publishers, 2014.
2. Subramanian.K.P., "Highways, Railways, Airport and Harbour Engineering", Sci tech Publications(India), Chennai, 2010.

REFERENCES

1. Kadiyali.L.R., "Principles and Practice of Highway Engineering", Khanna Technical Publications,Delhi, 1997.
2. Subhash C Saxena, "Textbook of Highway and Traffic Engineering", CBS Publishers, 2014.
3. Partha Chakroborty and Animesh Das, "Principles of Transportation Engineering", PHI Learning Pvt. Ltd., 2005
4. Indian Road Congress(IRC), Guidelines and Special Publications on Planning and design of Highways
5. IRC Standards (IRC 37 – 2001 & IRC 58 –1998)

WEB LINKS

1. http://nptel.ac.in/downloads/105101087/
2. http://transportationengineering2012onwards.blogspot.in/2014/04/highway–economics–and–finance–part–1.html
3. https://www.dot.state.mn.us/planning/program/benefitcost.html

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	1	-	-	-	-	-	1	2
CO2	2	2	3	-	-	-	1	-	-	-	-	2	1	3
CO3	2	2	3	-	-	-	1	1	1	-	2	3	1	3
CO4	2	-	-	-	2	2	1	1	-	-	2	3	1	3
CO5	1	-	-	-	2	2	1	1	1	-	2	3	1	2

CE16504 WATER SUPPLY ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart the knowledge on sources, effect and control of water pollution.
- know the principles of dispersion characteristics of pollution in water.
- impose the knowledge in the control of water pollution.
- know the concepts behind the water pollution management.
- deliver the sources, effect and control of water pollution.

Prerequisite: Nil

UNITI PLANNING FOR WATER SUPPLY SYSTEM 9

Public water supply system – Planning – Objectives – Design period; Population forecasting-Water demand; Sources of water and their characteristics – Surface and Groundwater – Impounding Reservoir Well hydraulics – Development and selection of source – Water quality – Characterization and standards – Impact of climate change.

UNIT II CONVEYANCE SYSTEM 9

Water supply – Intake structures – Functions and drawings ; Pipes and conduits for water – Pipe materials; Hydraulics of flow in pipes –Transmission main design; Laying, jointing and testing of pipes – Drawings Appurtenances ;Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III WATER TREATMENT 9

Objectives – Unit operations and processes – Principles, functions, design and drawing of Chemical feeding, Flash mixers, flocculator, sedimentation tanks and sand filters – Disinfection ; Residue management; Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT IV ADVANCED WATER TREATMENT 9

Principles and functions of Aeration – Iron and manganese removal; De–fluoridation and demineralization ; Water softening ; Desalination – Membrane Systems ; Recent advances.

UNIT V WATER DISTRIBUTION AND SUPPLY TO BUILDINGS 9

Requirements of water distribution – Components – Service reservoirs ;Functions and drawings Network design – Economics – Computer applications – Analysis of distribution networks Appurtenances – Operation and maintenance; Leak detection, Methods. Principles of design of water supply in buildings; House service connection – Fixtures and fittings; Systems of plumbing and drawings of types of plumbing.

TOTAL PERIODS 45

COARSE OUTCOMES

Upon the completion of the course, students will be able to

- analyze the structure of drinking water supply systems, including water transport, treatment and distribution.
- understand the water quality criteria and standards, and their relation to public health.
- design and evaluate water supply project alternatives on basis of chosen selection criteria.
- aware on the water pollution management ideas.
- aware with the sources, effects and control of water pollution.

TEXT BOOKS

1. Garg, S.K., "Environmental Engineering", Vol. 1 Khanna Publishers, New Delhi, 2009.
2. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2010.

REFERENCES

1. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
2. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning, Design and Operation", Prentice Hall of India Private Limited, New Delhi, 2006.
3. Garg, S.K., "Environmental Engineering Vol. I", Khanna Publishers, New Delhi,2009.
4. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.

WEB LINKS

1. http://nptel.ac.in/courses/103107084/
2. http://nptel.ac.in/courses/105106119/

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
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CO1	2	-	-	-	-	2	3	1	-	-	-	1	1	-
CO2	2	1	1	1	-	2	3	1	-	-	-	1	1	1
CO3	2	1	1	1	-	2	3	1	-	-	-	1	1	1
CO4	2	-	-	-	-	2	3	1	-	-	-	1	1	-
CO5	2	1	1	1	1	2	3	1	-	-	-	1	1	1

CE16505 SOIL MECHANICS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- describe the soil properties.
- discuss about the seepage analysis and flow nets.
- know about the components of settlement and behaviour of soils.
- define the shear strength and pore pressure parameters.
- understand the stress analysis and failure mechanisms.

Prerequisite: Nil

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Nature of soil – Phase relationships – Soil description and classification for engineering purposes, their significance – Index properties of soils – BIS Classification system – Soil compaction – Theory, comparison of laboratory and field compaction methods – Factors influencing compaction behaviour of soils.

UNIT II SOIL WATER AND WATER FLOW 9

Soil water – Static pressure in water – Effective stress concepts in soils – Capillary stress – Permeability measurement in the laboratory – Factors influencing permeability of soils – Seepage – Introduction to flow nets – Simple problems.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution – Soil media – Boussinesq theory – Use of New marks influence chart – Components of settlement – Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – $\sqrt{t}$ and log t methods – E–log p relationship – Factors influencing compression behaviour of soils.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesionless soils – Mohr – Coulomb failure theory – Measurement of shear strength, direct shear – Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Cyclic mobility – Liquefaction.

UNIT V SLOPE STABILITY 9

Slope failure mechanisms – Types – Infinite slopes – Finite slopes – Total stress analysis for saturated clay – Swedish Circle method – Friction circle method – Use of stability number – Slope protection measures.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- list the soil properties.
- confess about the seepage analysis and static pressure in water.
- determine the components of settlements and behavior of soils.
- perceive the concept of shear strength and its measurements.
- analyze the total stress for slope failure mechanism.

TEXT BOOKS

1. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2018
2. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2006

REFERENCES

1. Craig. R.F., "Soil Mechanics". E & FN Spon, London and New York, 2007
2. Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", Wiley Eastern Ltd, New Delhi (India), 2000.
3. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education,2013

WEBLINKS

1. nptel.ac.in/courses/105103097/
2. https://www.slideshare.net/vlmvv2/soil–mechanicsfullcoursenotesandlectures

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO2	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO3	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO4	2	2	2	1	1	-	-	-	-	-	-	1	1	2
CO5	2	2	2	1	1	-	-	-	-	-	-	1	1	2

CE16151 HYDROLOGY AND WATER RESOURCES ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- have good understanding of all the components of the hydrological cycle
- gain knowledge about the estimation of runoff
- realize the importance of flood control and mitigation measures
- study reservoir and its classification
- understand the dynamics of ground water flow and their implication

Prerequisite: Nil

UNIT I PRECIPITATION AND ABSTRACTIONS 10

Hydrological cycle – Meteorological measurements – Requirements, types and forms of precipitation – Rain Gauges – Spatial analysis of rainfall data using Thiessen and Isohyetal methods Interception ; Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression ; Infiltration – Horton's equation – Double ring infiltrometer, infiltration indices.

UNIT II RUNOFF 8

Watershed- catchment and basin – Catchment characteristics ; Factors affecting runoff – Runoff estimation using empirical ; Strange's table and SCS methods ; Stage discharge relationships flow measurements ; Hydrograph – Unit Hydrograph – IUH.

UNIT III FLOOD AND DROUGHT 9

Natural Disasters – Flood Estimation – Frequency analysis – Flood control ; Definitions of droughts – Meteorological, hydrological and agricultural droughts – IMD method – NDVI analysis – Drought Prone Area Programme (DPAP).

UNIT IV RESERVOIRS 8

Classification of reservoirs- General principles of design, site selection, spillways, elevation – Area – Capacity – storage estimation, sedimentation – Life of reservoirs – Rule curve.

UNIT V GROUNDWATER AND MANAGEMENT 10

Origin – Classification and types – Properties of aquifers – Governing equations – Steady and unsteady flow – Artificial recharge – RWH in rural and urban areas – Seawater intrusion.

TOTAL PERIODS 45

COURSE OUTCOMES:

Upon the completion of course, the students will be able to

- estimate the mean areal precipitation and their significance in design of various hydraulic structures.
- calculate the runoff and measurements of flow
- estimate the flood by various methods and concept of flood routing.
- confess about the various classification of reservoirs
- perceive the dynamics of ground water flow and their estimation

TEXT BOOKS

1. Subramanya .K. "Engineering Hydrology" – Tata McGraw Hill, 4th Edition, 2017
2. Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 3rd Edition, 2016.

REFERENCES

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
2. VenTe Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 2010.
3. Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 2004

WEB LINKS

1. http://nptel.ac.in/downloads/105101002/.
2. http://nptel.ac.in/courses/105101002/8
3. http://nptel.ac.in/courses/105107129/.
4. https://www.ipcc.ch/ipccreports/tar/wg2/pdf/wg2TARchap4.pdf.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1	1	-	2	3	-	-	-	-	1	1	1
CO2	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO3	2	-	-	-	2	2	3	-	-	-	-	1	1	-
CO4	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO5	2	-	-	-	-	2	3	-	-	-	-	1	1	-

CE16152 TOTAL STATION AND GPS SURVEYING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the working of total station equipment and solve the surveying problems
- understand the concepts of electromagnetic waves and impact of RI
- impart the knowledge on the total station principles and its applications
- impart the knowledge of GPS and its applications.
- impart the knowledge of the advantages of electronic surveying over conventional surveying methods

Prerequisite: Surveying II

UNIT I FUNDAMENTALS OF TOTAL STATION AND GPS 9

Methods of Measuring Distance – Basic Principles of Total Station – Historical Development – Classifications – Applications and comparison with conventional surveying ; Basic concepts of GPS – Historical perspective and development – Applications – Geoid and Ellipsoid – Satellite orbital motion – Keplerian motion – Kepler's Law – Perturbing forces – Geodetic satellite – Doppler effect – Positioning concept – GNSS

UNIT II ELECTROMAGNETIC WAVES 9

Classification – Applications of Electromagnetic waves – Propagation properties – Wave propagation at lower and higher frequencies – Refractive index (RI) – Factors affecting RI – Computation of group for light and near infrared waves at standard and ambient conditions – Computation of RI for microwaves at ambient condition – Reference refractive index – Real time application of first velocity correction. Measurement of atmospheric parameters – Mean refractive index – Second velocity correction – Total atmospheric correction – Use of temperature – Pressure transducers.

UNIT III ELECTRO OPTICAL AND MICRO WAVE SYSTEM 9

Electro-optical system – Measuring principle – Working principle – Sources of Error – Infrared and Laser Total Station instruments – Microwave system – Measuring principle – Working principle – Sources of Error – Microwave Total Station instruments – Comparison between Electro – Optical and Microwave system – Care and maintenance of Total Station instruments – Modern positioning systems – Traversing and Trilateration.

UNIT IV SATELLITE SYSTEM 9

GPS – Different segments – Space, control and user segments – Satellite configuration – GPS signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability – Task of control segment – GPS receivers.

UNIT V GPS DATA PROCESSING 9

GPS observables – Code and carrier phase observation – Linear combination and derived observables – Concept of parameter estimation – Downloading the data – Data processing – Software modules – Solutions of cycle slips, ambiguities, RINEX format. Concepts of rapid, static methods with GPS – Semi Kinematic and pure Kinematic methods – Basic constellation of satellite geometry & accuracy measures – Applications – Long baseline processing – Use of different software's available in the market.

TOTAL PERIODS 45

COURSE OUTCOMES:

Upon the completion of course, the students will be able to

- attain knowledge on working of modern surveying equipment such as total station and GPS.
- perceive the concepts of electromagnetic waves and impact of RI
- confess the total station and its applications
- evaluate the concepts of GPS and its different methods and its applications
- perceive the advantages of electronic surveying over conventional surveying methods

TEXT BOOKS

1. Rueger, J.M. "Electronic Distance Measurement", Springer–Verlag, Berlin, 2007.
2. Satheesh Gopi, Sathishkumar, N madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007.

REFERENCES

1. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 1993.
2. GuochengXu, "GPS Theory, Algorithms and Applications", Springer – Verlag, Berlin, 2003.
3. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.

WEB LINKS

1. nptel.ac.in/courses/105104100/lectureA_3/A_3_3_TS.htm
2. nptel.ac.in/courses/Webcourse–contents/IIT–KANPUR/.../ui/Course_homeA_3.htm

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	1	2	-	-	-	-	-	-	2	2	1
CO2	2	1	2	1	3	-	-	-	-	-	-	2	2	1
CO3	2	1	2	1	3	-	-	-	-	-	-	2	2	1
CO4	2	1	2	1	3	-	-	-	-	-	-	2	2	1
CO5	2	1	2	1	2	-	-	-	-	-	-	2	2	1

CE16153 CONSTRUCTION PLANNING AND SCHEDULING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the necessity of the planning in the diverse construction projects.
- know the appropriate techniques used for scheduling the resources.
- have exposure on various costs, control methods and departmental procedure for accounting.
- study the quality control and monitoring techniques and the necessity of training to personnel.
- provide awareness about management information system and usage of data base in the project accountings.

Prerequisite: Nil

UNIT I CONSTRUCTION PLANNING 9

Basic concepts in the development of construction plans – Choice of Technology and Construction method – Defining Work Tasks – Definition – Precedence relationships among activities – Estimating Activity Durations – Estimating Resource Requirements for work activities – Coding systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 9

Relevance of construction schedules – Bar charts – The critical path method – Calculations for critical path scheduling – Activity float and schedules – Presenting project schedules – Critical path scheduling for Activity – on–node and with leads, Lags and Windows – Calculations for scheduling with leads, lags and windows – Resource oriented scheduling – Scheduling with resource constraints and precedencies – Use of Advanced Scheduling Techniques – Scheduling with uncertain durations – Crashing and time/cost tradeoffs – Improving the Scheduling process – Introduction to application software.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem – The project Budget – Forecasting for Activity cost control – Financial accounting systems and cost accounts – Control of project cash flows – Schedule control – Schedule and Budget updates – Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality control – Quality control by statistical methods – Statistical Quality control with Sampling by Attributes – Statistical Quality control by Sampling and Variables – Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information – Accuracy and Use of Information – Computerized organization and use of Information – Organizing information in databases – Relational model of Data bases – Other Conceptual Models of Databases – Centralized Database Management systems – Databases and application programs – Information transfer and Flow.

TOTAL PERIODS 45

COURSE OUTCOMES:

Upon the completion of course, the students will be able to

- confess the requirement of planning techniques exercised in the construction projects.
- choose suitable scheduling technique for the particular project.
- get exposure in the modern cost account systems and control techniques adopted in the construction projects.
- make use of advanced management tools for quality control and monitoring techniques towards speedy and guaranteed projects.
- experience how to use the data base for complex large projects.

TEXT BOOKS

1. Dr.S.Seetharaman, "Construction Planning and Scheduling", Revised edition, Anuradha Publication, Chennai 2014.
2. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw–Hill Publishing Co., New Delhi, 1998.

REFERENCES

1. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Srinath,L.S., "Pert and CPM Principles and Applications ", Third edition, Affiliated East West Press, 2001

WEB LINKS

1. http://nptel.ac.in/courses/Webcourse–contents/IIT–%20Guwahati /cpm/index.html

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	1	-	-	-	1	-	2	1	1	1
CO2	2	-	-	-	1	-	-	-	1	-	2	1	1	1
CO3	2	-	-	-	1	-	-	-	1	-	2	1	1	1
CO4	2	-	-	-	1	-	-	-	1	-	2	1	1	1
CO5	2	-	-	-	1	-	-	-	1	-	2	1	1	1

CE16154 AIR POLLUTION AND CONTROL ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart the knowledge on sources, effect and control of air pollution.
- know the principles of dispersion characteristics of pollution in atmosphere.
- impose the knowledge on the control of air pollution.
- know the concepts behind the air pollution management.
- deliver the sources, effect and control of noise pollution.

Prerequisite: Nil

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation and animals – Global warming – Ozone layer depletion, sampling – Basic principles – Source and ambient sampling – Analysis of pollutants.

UNIT II DISPERSION OF POLLUTANTS 9

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

UNIT III AIR POLLUTION CONTROL 9

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment – Gaseous pollutants control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT IV AIR QUALITY MANAGEMENT 9

Air quality standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental impact assessment on air quality.

UNIT V NOISE POLLUTION 9

Sources of noise pollution – Effects – Assessment – Standards – Control methods – Prevention measures.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- classify the sources and effects of air pollution.
- realize the dispersion characteristics and modeling of air pollution.
- get an exposure to know about air pollution control methods.
- apply on the air pollution management ideas.
- aware with the sources, effects and control of noise pollution.

TEXT BOOKS

1. Rao M.N. and Rao H.V.N., "Air Pollution" McGraw Hill Education, New Delhi, 2013.
2. Rao, C.S. "Environmental Pollution Control Engineering", New Age international, 2018.
3. Mahajan SP, "Air Pollution Control" TERI Press, New Delhi, 2009.

REFERENCES

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2011.
2. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi.
3. Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw–Hill, New Delhi, 2010.
4. Heumann.W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New York, 1997

WEB LINKS

1. http://www.tutorialspoint.com/air pollution
2. http://nptel.ac.in/courses/105104099/

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	1	2	3	-	-	-	-	1	1	1
CO2	2	-	-	-	1	2	3	-	-	-	-	1	1	1
CO3	2	-	-	-	1	2	3	-	-	-	-	1	1	1
CO4	2	-	-	-	1	2	3	-	-	-	-	1	1	1
CO5	2	-	-	-	1	2	3	-	-	-	-	1	1	1

CE16155 COASTAL ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know about the basic concept of coastal area
- provide exposure on types of waves and their characteristics
- gain knowledge in wave transformation
- give exposure to coastal structures and shore protection
- identify about the modeling of coastal areas

Prerequisite: Nil

UNIT I INTRODUCTION TO COASTAL ENGINEERING 9

Introduction – Wind and waves – Sea and Swell – Introduction to small amplitude wave theory – Use of wave tables – Mechanics of water waves – Linear (Airy) wave theory – Wave measurement.

UNIT II WAVE PROPERTIES AND ANALYSIS 9

Introduction to non–linear waves and their properties – Waves in shallow waters – Wave Refraction, diffraction and shoaling – Hind casting of waves – Short term wave analysis – Wave spectra and its utilities – Long term wave analysis – Statistical analysis of ground wave data.

UNIT III TYPES AND WAVE TRANSFORMATION 9

Tide analysis and prediction, storm surge, seiches and seasonal fluctuations – Long term water level fluctuations – Wave shoaling; wave refraction; wave breaking; wave diffraction.

UNIT IV COASTAL STRUCTURES AND SHORE PROTECTION 9

Risk analysis – Design wave – Break waters – Shore protection – Groins, seal walls, offshore break water sand artificial nourishment.

UNIT V MODELING IN COASTAL ENGINEERING 9

Physical modeling in Coastal Engineering – Limitations and advantages – Role of physical modeling in coastal engineering – Numerical modeling – Modeling aspects – Limitations.

TOTAL PERIODS 45

COURSE OUTCOMES:

Upon the completion of course, the students will be able to

- calculate the wave transformations
- comprehend the characteristics of the waves
- analyse and predict the wave transformations
- appreciate the multi–faceted nature of coastal problems and the techniques of coastal engineering analysis
- perceive the different role in modelling of coastal areas

TEXT BOOKS

1. Kamphuis, J.W., "Introduction to coastal engineering and management", 2000
2. Dean, R.G. and Dalrymple, R.A., "Water wave mechanics for Engineers and Scientists", Prentice–Hall, Inc., Englewood Cliffs, New Jersey, 1994.

REFERENCES

1. Mani, J. S. "Coastal Hydrodynamics". PHI Learning Pvt. Ltd., 2012.
2. Coastal Engineering Manual, Vol. I–VI, Coastal Engineering Research Centre, Dept. of the Army, US Army Corps of Engineers, Washington DC, 2006.
3. Ippen, A.T., "Estuary and Coastline Hydrodynamics", McGraw–Hill Book Company, Inc., New York, 1978.
4. Sorenson, R.M., "Basic Coastal Engineering", A Wiley–Inter Science Publication, New York, 1978.

WEB LINKS

1. nptel.ac.in/courses/114106032/
2. https://www.nap.edu/read/11764/chapter/5
3. nptel.ac.in/courses/114106032/

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	2	-	-	-	-	1	1	1
CO2	2	-	-	-	-	2	2	-	-	-	-	1	1	1
CO3	2	-	-	-	-	2	2	-	-	-	-	1	1	1
CO4	2	-	-	-	-	2	2	-	-	-	-	1	1	1
CO5	2	-	-	-	-	2	2	-	-	-	-	1	1	1

CE16603 DESIGN OF REINFORCED CONCRETE AND BRICK MASONRY STRUCTURES **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- familiarize the various steps involved in the design of retaining walls
- understand the design concept of water tank
- acquire knowledge in design of staircases, slabs, foundation and bridge
- learn concept of yield line theory
- gain the knowledge about brick masonry.

Prerequisite: Design of Reinforced Concrete Elements

UNIT I RETAINING WALLS **9**

Design of Cantilever and Counterfort Retaining walls.

UNITII WATER TANKS **9**

Design of rectangular and circular water tanks both below and above ground level – Design of circular slab.

UNIT III SELECTED TOPICS **9**

Design of staircases (ordinary and doglegged) – Design of flat slabs – Principles of design of box culvert and road bridges

UNIT IV YIELD LINE THEORY **9**

Assumptions – Characteristics of yield line – Determination of collapse load / Plastic moment – Application of virtual work method – Square, rectangular and circular slabs – Design problems

UNIT V BRICK MASONRY **9**

Introduction – Classification of walls – Lateral supports and stability – Effective height of wall and columns – Effective length of walls – Design loads – Load dispersion – Permissible stresses – Design of axially and eccentrically loaded brick walls.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- apply knowledge about the design of retaining walls
- acquire knowledge about the design the water tank
- familiarize on the design of staircases, slabs, foundation and bridge
- confess concept of yield line theory
- apply the knowledge about brick masonry

TEXT BOOKS

1. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
2. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing House, 2017

REFERENCES

1. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Varghese.P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2012.
3. Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2013.
4. IS456:2000, "Code of practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2007
5. SP16, IS456:1978 "Design Aids for Reinforced Concrete" to Bureau of Indian Standards, New Delhi, 1999.
6. IS1905:1987, "Code of Practice for Structural use of Unreinforced Masonry Bureau of Indian Standards", New Delhi, 2002

WEB LINKS

1. http://nptel.ac.in/courses/105105105/
2. http://nptel.ac.in/courses/10102088/27

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2	3	1	1	-	-	-	-	-	-	2	1	2
CO2	2	2	3	1	1	-	-	-	-	-	-	2	1	2
CO3	1	2	3	1	1	-	-	-	-	-	-	2	1	2
CO4	2	2	3	1	1	-	-	-	-	-	-	2	1	2
CO5	2	2	3	1	1	-	-	-	-	-	-	2	1	2

CE16604 WASTE WATER ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- illustrate the principles of wastewater supply, treatment and distribution.
- distinguish the concept of transport of wastewater
- estimate the load carrying capacity of the treatment.
- gain knowledge on various advanced wastewater treatment.
- identify disposal method of sewage and sludge.

Prerequisite: Water Supply Engineering

UNIT I PLANNING FOR SEWERAGE SYSTEMS 9

Sources of wastewater generation – Effects ; Estimation of sanitary sewage flow ; Estimation of storm runoff ; Factors affecting Characteristics and composition of sewage and their significance ; Effluent standards – Legislation requirements.

UNIT II SEWER DESIGN 9

Sewerage – Hydraulics of flow in sewers – Objectives – Design period ; Design of sanitary and storm sewers – Small bore systems ; Computer applications ; Laying, joining & testing of sewers – Appurtenances ; Pumps – selection of pumps and pipe Drainage ; Plumbing System for Buildings – One pipe and two pipe systems.

UNIT III PRIMARY TREATMENT OF SEWAGE 9

Objective – Selection of treatment processes; Principles, Functions, Design and Drawing of Units – Onsite sanitation – Septic tank with dispersion – Grey water harvesting ; Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Construction, operation and Maintenance aspects.

UNIT IV SECONDARY TREATMENT OF SEWAGE 9

Objective – Selection of Treatment Methods ; Principles, Functions, Design and Drawing of Units – Activated Sludge Process and Trickling filter ; Oxidation ditches; UASB; Waste Stabilization Ponds ; Reclamation and Reuse of sewage; Sewage recycle in residential complex ; Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

UNIT V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 9

Stand Standards for Disposal – Methods – Dilution – Self–purification of surface water bodies – Oxygen sag curve ; Land disposal ; Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – Disposal – Advances in Sludge Treatment and disposal.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- observe various wastewater resources of India and Tamil Nadu.
- apply the knowledge about the sewer design.
- have an elaborate knowledge about selection of wastewater treatment process.
- explain planning, design, operation and maintenance of STP.
- differentiate the proper disposal methods of sewage and sludge.

TEXT BOOKS

1. Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2007.
2. Punmia, B.C., Jain, A.K., and Jain. A., "Environmental Engineering, Vol.II", Lakshmi Publications, Newsletter, 2005

REFERENCES

1. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2008
2. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
3. Metcalf & Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill Company, New Delhi, 2005.

WEB LINKS

1. http://nptel.ac.in/courses/105106119/
2. http://nptel.ac.in/courses/105104102/

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	1	1	3	1	-	-	-	1	1	-
CO2	2	1	1	-	1	1	3	1	-	-	-	1	1	1
CO3	2	1	1	-	1	1	3	1	-	-	-	1	1	1
CO4	2	1	1	-	1	1	3	1	-	-	-	1	1	1
CO5	2	-	-	-	1	1	3	1	-	-	-	1	1	-

CE16605 FOUNDATION ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge about the geotechnical site investigation.
- understand the types of foundation and design principles
- gain knowledge of footings and special foundation
- discuss different types of pile foundation and its capacity
- study various earth pressure theories

Prerequisite: Soil Mechanics

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed; Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler; Penetration tests (SPT and SCPT) – Data interpretation – Strength parameters and Evaluation of Liquefaction potential – Selection of foundation based on soil condition – Bore log report.

UNIT II SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity – Bearing capacity from in–situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing; Mat foundation- Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum depth for rigid behaviour Applications – Floating foundation – Special foundations – Seismic force consideration – Codal provision.

UNIT IV PILE FOUNDATION 9

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil; Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity – Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- conduct sub surface investigation and select foundation based on soil condition
- calculate bearing capacity of soil and settlement
- confess contact pressure distribution below the footing
- describe the types of piles and their load carrying capacity
- check the stability of retaining wall

TEXT BOOKS

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd, New Delhi 2015
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi 2011.

REFERENCES

1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., New Delhi, 2018.
2. GopalRanjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New age Ltd. InternationalPublisher New Delhi (India) 2006
3. Das, B.M. "Principles of Foundation Engineering" (Eigth edition), Thompson Asia Pvt. Ltd., Singapore, 2013.
4. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2002.
5. Venkatramaiah, C., "Geotechnical Engineering", New Age International Publishers, New Delhi, 2007 (Reprint)
6. IS Code 6403: 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureau of Indian Standards, New Delhi.
7. IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.

WEB LINKS

1. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Foundation_Engineering/TOC–M1.htm
2. http://elearning.vtu.ac.in/06CV64.html

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1	1	-	-	-	-	-	-	-	2	1	1
CO2	2	1	1	1	-	-	-	-	-	-	-	2	1	1
CO3	2	1	1	1	-	-	-	-	-	-	-	2	1	1
CO4	2	1	1	1	-	-	-	-	-	-	-	2	1	1
CO5	2	1	1	1	-	-	-	-	-	-	-	2	1	1

CE16901 BUILDING SERVICES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know about the system of electrical work in building
- acquire the knowledge on various illumination and lighting process in building.
- learn the principles of electrical and air conditioning facilities.
- study the fire safety installation in various types of building.
- enhance the knowledge on water supply and drainage system in building.

Prerequisite: Nil

UNIT I ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply; Protective devices in electrical installations; Earthing for safety – Types of earthing – ISI specifications; Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards; Transformers and switch gears – Layout of substations.

UNIT II PRINCIPLES OF ILLUMINATION AND DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination; Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting – Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT III REFRIGERATION PRINCIPLES AND APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – Saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids; Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air–conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load; Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT IV FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non–combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

UNIT V PLUMBING AND DRAINAGE 9

Plumbing fixtures and fixture fittings – Water conserving fittings – Over flows – Strainers and connectors – Prohibited fixtures – Special fixtures – Installation of water closet – Urinals – Flushing devices – Floor drains – Shower stall – Bath tub – Bidets – Minimum plumbing facilities; Rain water harvesting systems – Necessity – Construction – Different types.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- perceive about the system of electrical work in building
- obtain the knowledge on various illumination and lighting process in building.
- confess the principles of electrical and air conditioning facilities.
- apply the fire safety installation in various types of building.
- gather the knowledge on water supply and drainage system in building.

TEXT BOOKS

1. David .V Chaddert on "Building Service Engineering", Routledge Taylor and Francise group, London and Network 2013.
2. E.R.Ambrose, "Heat pumps and Electric Heating", John and wiley and Sons, Inc., New York, 2011.

REFERENCES

1. William H.Severns and Julian R.Fellows, "Air–conditioning and Refrigeration", John Wiley and Sons, London, 2007.
2. Handbook for Building Services in fred hall and roger greeno, 2013
3. National Building Code 2016.

WEB LINKS

1. nptel.ac.in/courses/107106009/Downloads/LECTURE7.ppt
2. https://nptel.ac.in/courses/112105129/pdf/R&AC%20Lecture%2036.pdf
3. https://www.youtube.com/watch?v=1Hl1TXJUjmg
4. https://www.cibse.org/getmedia/56352fa8–370c–4943–9638–77920939fe3b/The–control–of–air–pressure–within–tall–building–drainage–SoPHE–ppt–Compatibility–Mode.pdf.aspx.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	2	-	-	-	-	-	-	1	1	1
CO3	2	-	-	-	2	-	-	-	-	-	-	1	1	1
CO4	2	-	-	-	2	-	-	-	-	-	-	1	1	1
CO5	2	-	-	-	2	-	-	-	-	-	-	1	1	1

CE16902 CONTRACT LAWS AND REGULATIONS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study various elements in the contract document.
- review different concepts of tender making process as per contract law.
- get an information on arbitration procedure during disputes.
- study the various taxes related to construction business and statutory recommendations.
- know the complexity of labour laws along with legislation in the construction industries.

Prerequisite: Nil

UNIT I CONSTRUCTION CONTRACTS 9

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

UNIT II TENDERS 9

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Preparation of Tender schedules – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamil Nadu Transparency in Tenders Act 1998 Rules 2000.

UNIT III ARBITRATION 9

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award.

UNIT IV LEGAL REQUIREMENTS 9

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

UNIT V LABOUR REGULATIONS 9

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act 1948 – Tamil Nadu Factory Act 1950 – Child Labour Act 1986 Amended in 2016 – Other Labour Laws.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- prepare contract document for various government & non–governmental works.
- make tender as per the current rates along with guidelines from sources.
- perceive the factors of arbitration during the time of court proceedings.
- exercise correctly the procedure during sell; buy their land & property oriented with various tax provisions.
- adopt and follow the various acts and laws related to labour in the field.

TEXT BOOKS

1. Jimmie Hinze, "Construction Contracts", McGraw Hill, New Delhi 2013.
2. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", M.M. TripathiPrivate Ltd., Bombay, 2000

REFERENCES

1. Patil. B.S, "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2015.
2. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2010.
3. Oxley Rand Posicit, "Management Techniques applied to the Construction Industry", GrandPublications, Noida,2009

WEB LINKS

1. http://nptel.ac.in/courses/105103093/11

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO3	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO4	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO5	2	-	-	-	-	-	-	-	-	-	-	1	1	1

CE16903 ARCHITECTURE 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on the fundamentals of visual perception and principles
- get exposure about architectural principles in the design of buildings
- impart knowledge in the national traditions and the local regional heritage in architecture, landscape design including the vernacular tradition.
- provide the basic principles and appropriate application and performance of building envelope materials and assemblies
- demonstrate competency in the technical, practical skills of landscape architecture and their role in investigating complex and innovative ideas.

Prerequisite: Nil

UNIT I INTRODUCTION 9

Definition – Architecture – Classification – Influencing factors – Region, culture, climate, topography, building materials, economic and technology – Historic structure – Prominent world architecture – Anthropometrics – Human scale – Space requirements in architecture.

UNITII ELEMENTS OF ARCHITECTURE 9

Elements – Mass and space visual emotional effects of geometric forms and their derivatives – Sphere, cube, pyramid, cylinder, and cone – Aesthetic qualities of architecture- proportion, scale, balance, symmetry, rhythm and axis – Contrast in form – Harmony.

UNIT III ORIENTATION AND PLANNING OF BUILDINGS 9

General – Factors affecting orientation – Sun – Wind – Rain – Orientation criteria for Indian conditions – Planning – specifications and standards – Planning of buildings – Green building – Carbon rating – Case studies.

UNIT IV INTERIOR DESIGN 9

General – Decorative materials – Cement bonded boards, water proof cement – Paint – Industrial glazing and roofing – Masonry – Plaster and dry wall – Wall surface materials – Effect of color – Home furnishing – Preparation of interior design plans – Case studies.

UNIT V LANDSCAPE DESIGN 9

Principles – Site planning – Design – Styles – Elements and materials – Plant characteristics and design – Landscape planning – Case studies

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- apply the fundamentals of visual perception in two and three–dimensional design
- perceive the architectural principles in the design of buildings and interior spaces
- make plan for the buildings by considering our Indian climatic conditions.
- choose the various building material as per the interior design aspects.
- perform landscape architecture according to the environmental conditions.

TEXT BOOKS

1. Francis D.K.Ching, "Architecture: Form, Space and Order", John Wiley & Sons, Inc. 2007.
2. Mohmohan, MuthuShoba G, "Principles of Architecture" Oxford University Press, New Delhi, 2009.

REFERENCES

1. Arvind Krishnan "Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings", McGraw Hill Education, New Delhi, 2013
2. Simon Unwin, "Analysing Architecture", Routledge, London, 2003

WEB LINKS

1. http://ocw.mit.edu/courses/architecture/

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	3	1	2	-	-	-	-	-	-	1	1	2
CO2	2	1	3	1	2	-	-	-	-	-	-	1	1	2
CO3	2	1	3	1	2	-	-	-	-	-	-	1	1	2
CO4	2	1	3	1	2	-	-	-	-	-	-	1	1	2
CO5	2	1	3	1	2	-	-	-	-	-	-	1	1	2

CE16904 SMART STRUCTURES AND SMART MATERIALS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- familiarize the basics in smart structures and smart materials
- understand the measuring techniques
- acquire knowledge on sensors
- learn concept of actuators
- gain the knowledge about signal processing and control systems.

Prerequisite: Nil

UNIT I INTRODUCTION 9

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

UNITII MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III SENSORS 9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVDT – Fiber optic Techniques – Chemical and Bio–Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fiber Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV ACTUATORS 9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro orheological Fluids – Electromagnetic actuation – Role of actuators and Actuator Materials.

UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Linear and Non – Linear Control System.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- apply knowledge about the smart materials and structures
- attain knowledge about the measuring techniques
- manage various types of sensors
- confess concept of actuators
- apply the knowledge about signal processing and control systems.

TEXT BOOKS

1. Brain Culshaw – "Smart Structure and Materials" Artech House – Borton. London 2003.
2. Gandhi, M.V and Thompson, B.S., "Smart Materials and Structures", Chapman and Hall, 2006.

REFERENCES

1. L. S. Srinath – "Experimental Stress Analysis" – Tata McGraw–Hill, 1998.
2. J. W. Dally & W. F. Riley – "Experimental Stress Analysis" – Tata McGraw–Hill, 1998.

WEB LINKS

1. https://www.electronics–tutorials.ws/blog/wheatstone–bridge.html
2. https://www.smart–material.com/ActuatorSensor.html

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO3	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO4	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO5	2	-	-	-	1	-	-	-	-	-	-	1	1	1

CE16905 REMOTE SENSING TECHNIQUES AND GIS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the concept of remote sensing and its components.
- list the types of platforms and various sensors used in GIS.
- analyze the GIS data and create digital elevation model.
- describe the various types of map projections and software used in GIS.
- know about the land information system and various data model.

Prerequisite: Nil

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL9

Definition of remote sensing and its components – Electromagnetic spectrum – Wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan – Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – Spectral signature concepts – Typical spectral reflective characteristics of water, vegetation and soil.

UNIT II PLATFORMS AND SENSORS 9

Types of platforms – Orbit types, Sun–synchronous and Geosynchronous ; Passive and Active sensors – Resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Air borneand space borne TIR and microwave sensors.

UNIT III IMAGE INTERPRETATION AND ANALYSIS 9

Types of Data Products – Types of image interpretation – Basic elements of image interpretation – Visual interpretation keys – Digital Image Processing – Pre–processing – Image enhancement techniques – Multispectralimage classification – Supervised and unsupervised.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

Introduction – Maps – Definitions – Map projections – Types of map projections – Map analysis – GIS definition

– Basic components of GIS – Standard GIS software's – Data type – Spatial and non–spatial (attribute) data – Measurement scales – Data Base Management Systems (DBMS).

UNIT V DATA ENTRY, STORAGE AND ANALYSIS 9

Data models – Vector and raster data – Data compression – Data input by digitization and scanning – Attribute data analysis – Integrated data analysis Modelling in GIS Highway alignment studies – Land Information System.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- attain the fundamental knowledge in the concept of remote sensing and its components.
- evaluate the various platforms and sensors in GIS.
- create the digital image using various image enhancement techniques.
- use the software's in GIS for map analysis.
- create the various data models and to understand the land information systems

TEXT BOOKS

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman. "Remote Sensing and Image Interpretation" V Edn.John Willey and Sons (Asia) Pvt. Ltd., New Delhi 2007.
2. Anji Reddy, M. "Textbook of Remote Sensing and Geographical Information Systems" BS Publications,2006.

REFERENCES

1. Lo. C.P. and A.K.W.Yeung "Concepts and Techniques of Geographic Information Systems" Prentice–Hall of India Pvt. Ltd., New Delhi. 2011
2. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principles of Geographical Information Systems" Third Edition, Oxford University Press, 2000.
3. Ian Heywood, Sarah Cornelius, Steve Carver "An Introduction to Geographical Information Systems(4th Edition)" Pearson Education Asia, 2000.

WEB LINKS

1. nptel.ac.in/courses/105108077/
2. nptel.ac.in/courses/105108077/module1/lecture1.pdf

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	2	1	1	-	-	-	-	1	1	1
CO2	2	-	-	-	2	1	1	-	-	-	-	1	1	1
CO3	2	-	-	-	2	1	1	-	-	-	-	1	1	1
CO4	2	-	-	-	2	1	1	-	-	-	-	1	1	1
CO5	2	-	-	-	3	1	1	-	-	-	-	1	1	1

CE16606 COMPUTER AIDED DESIGN AND DRAFTING LABORATORY 0 0 2 1

COURSE OBJECTIVES

To enable the students to

- design manually the retaining wall, water tank
- operate with software proficiency
- list the various IRC loadings and the concept of prestressing
- explain the design of plate girder and truss girder for various loading conditions

Design and Drafting of the following Structures

(Manual Design and Drafting by Software)

1. RCC Cantilever Retaining wall
2. RCC Counter fort Retaining wall
3. RCC Underground Water tank
4. RCC Overhead Circular and Rectangular Water Tanks
5. RCC slab culvert
6. Rectangular Steel Tank
7. Welded Plate Girders
8. Truss
9. Ductile Detailing of RC members

TOTAL PERIODS 30

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- apply knowledge for the design and detailing of different types of retaining walls and will be able to
  apply the theoretical concepts in the real–world construction
- perceive the importance of measuring systems and the measuring instruments involved in drafting andrelated fields
- design and draw the detailing of various types of water tanks (RC and steel) along with the staging and
  foundation
- plot the drawing using scaling techniques as per industry requirements

TEXT BOOKS

1. N.Krishnaraju, “Design of Reinforced Concrete Structures”–CBS Publishers, 2016
2. Dr.Ramchandra and Virendra Gehlot “Design of Steel Structures”–Scientific Publishers , 2011

REFERENCES

1. B.C., Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Comprehensive Design of Steel Structures", Laxmi Publications Pvt. Ltd., 2003
2. Krishnamurthy, D., "Structural Design & Drawing – Vol. II and III", CBS Publishers, 2010.
3. Shah V L and Veena Gore, "Limit State Design of Steel Structures" IS800–2007, Structures Publications, 2009.

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2	3	-	2	-	-	-	-	-	-	1	1	2
CO2	1	2	3	-	2	-	-	-	-	-	-	1	1	2
CO3	1	2	3	-	2	-	-	-	-	-	-	1	1	2
CO4	1	2	3	-	2	-	-	-	-	-	-	1	1	2

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CE16607 ENVIRONMENTAL ENGINEERING LABORATORY 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- impart the principles of sampling and preservation of water and wastewater.
- convey the principles of testing of water and wastewater
- provide analyzing methods for water and wastewater
- acquire knowledge about importance of bacteria in wastewater

Prerequisite: Water supply Engineering & Waste Water Engineering

LIST OF EXPERIMENTS

1. Determination of
   i) pH, ii) Turbidity
2. Determination of
   i) Hardness, ii) Electrical conductivity
3. Determination of Alkalinity
4. Determination of Total, Suspended and Dissolved Solids
5. Determination of Residual Chlorine
6. Determination of Optimum Coagulant Dosage
7. Determination of Chlorides
8. Determination of Sulphate
9. Determination of available Ammonia Nitrogen
10. Determination of Dissolved Oxygen
11. Biochemical Oxygen Demand (B.O.D.) test
12. Chemical Oxygen Demand (C.O.D.) test
13. Introduction to Bacteriological Analysis (Demonstration only)

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- acquire the sampling and preservation methods of water and wastewater
- test the water and wastewater and their different characteristics as per standards
- do the different water and wastewater analysis as per standards
- know about importance of bacteria in wastewater

REFERENCES

1. Garg, S.K., “Environmental Engineering Vol. I & II”, Khanna Publishers, New Delhi, 2010
2. Modi, P.N., “Environmental Engineering Vol. I & II”, Standard Book House, Delhi–6, 2008

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (Pos)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	-	-	-	1	1	1
CO2	2	-	-	-	-	2	3	-	-	-	-	1	1	1
CO3	2	-	-	-	-	2	3	-	-	-	-	1	1	1
CO4	2	-	-	-	-	2	3	-	-	-	-	1	1	1

CE16701 ESTIMATION, COSTING AND VALUATION ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- estimate the quantities of item of works involved in buildings, joineries and arches.
- prepare the estimation of water supply and sanitary works, road works and irrigation work.
- analyse the concept of tender and contract in detail.
- study the valuation of properties and buildings.
- know the methods of preparing reports for estimation of various items.

Prerequisite: Nil

UNIT I ESTIMATION OF BUILDINGS 9

Load bearing and framed structures – Calculation of earthwork excavation – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof ; Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for paneled and glazed doors, windows, ventilators, handrails.

UNIT II ESTIMATE OF OTHER STRUCTURES 9

Estimating of septic tank – soak pit – Sanitary and water supply installations – Water supply pipe line, Sewer line ; Tube well – Open well ; Estimate of bituminous and cement concrete roads ; Estimate of retaining walls ; Culverts – Estimating of irrigation works – Aqueduct.

UNIT III SPECIFICATION AND TENDERS 9

Data – Schedule of rates, Analysis of rates, Specifications – Sources, Preparation of detailed and general specifications – Tenders – TTT Act 1998 Rules 2000, E-tender – Preparation of Tender Notice and Document – Contracts – Types of contracts – Drafting of contract documents – Arbitration and legal requirements.

UNIT IV VALUATION 9

Necessity – Basics of value engineering – Capitalized value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease – Case study on Public Private Partnership in India.

UNIT V REPORT PREPARATION 9

Principles for report preparation – Report on estimate of residential building – Culvert – Roads – Water supply scheme and sanitary sewerage projects – Tube wells – Open wells.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- estimate the material quantities in buildings, joineries, arches and prepare a bill of quantities.
- estimate the material quantities in water supply & sanitary installation, road works and prepare a bill of quantities.
- gain the knowledge about specifications in schedule of rates and prepare tender documents.
- perceive the concepts and methods used in evaluating the properties of buildings.
- get an idea in the preparation of reports for estimation of various items.

TEXT BOOKS

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 28th Revised Edition, 2016.
2. Kohli, D. D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand &Company Ltd., 2004

REFERENCES

1. Tamil Nadu PWD Data Book- 2017.
2. Tamil Nadu Transparencies in Tender Act, 1998Tamil Nadu Transparency in Tenders Rules, 2000 and Tamil Nadu Transparency in Tenders (Public Private Partnership Procurement)Rules, 2012.
3. Arbitration and Conciliation Act, 1996

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	3	1	-	-	-	-	-	-	-	2	1	2
CO2	2	1	3	1	-	-	-	-	-	-	-	2	1	2
CO3	2	-	-	-	-	-	-	-	1	-	1	2	1	-
CO4	2	-	-	-	-	-	-	-	1	-	1	2	1	-
CO5	2	-	-	-	-	-	-	-	1	-	1	2	1	-

CE16702 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on SDOF earthquake response of linear system
- study the behaviour and response of MDOF structures with various dynamic loading
- gain a preliminary knowledge of seismology
- enhance awareness of earthquake effects on structures
- understand the codal provisions to design the structure as earthquake resistant

Prerequisite: Nil

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9

Definition of degree of freedom – Idealization of structure as Single Degree of Freedom (SDOF) system, Formulation of equation of motion for various SDOF system – D' Alemberts Principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II MULTI DEGREE OF FREEDOM SYSTEM 9

Formulation of equation of motion for multidegree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING 9

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9

Effect of earthquake on different types of structures – Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- analyze the earthquake response of SDOF linear systems.
- analyze the structures with MDOF system under dynamic loading
- perceive the knowledge of earthquake and its origin
- predict the effects of earthquake on structures
- design the structures for seismic loading as per code provisions

TEXT BOOKS

1. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.

REFERENCES

1. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.
2. Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CBS publishers, 1997.
3. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1	1	1	-	-	-	-	-	-	2	1	1
CO2	2	1	1	1	1	-	-	-	-	-	-	2	1	1
CO3	2	-	-	-	1	-	-	-	1	-	-	2	1	1
CO4	2	-	-	-	1	-	-	-	1	-	-	2	1	1
CO5	2	-	-	-	1	-	-	-	1	-	-	2	1	1

CE16703 IRRIGATION ENGINEERING 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- impart the basic knowledge about crop water requirement
- familiar with different irrigation methods
- impart knowledge about various dam structures
- understand on components of canal irrigation works
- manage the water loss in irrigation

Prerequisite: Nil

UNIT I CROP WATER REQUIREMENT 9

Need and classification of irrigation- historical development and merits and demerits of irrigation types of crops-crop season - duty, delta and base period - consumptive use of crops - estimation of Evapo-transpiration using experimental and theoretical methods

UNIT II IRRIGATION METHODS 9

Tank irrigation - Well irrigation - Irrigation methods - Surface and Sub-Surface and Micro Irrigation, Merits and demerits –Irrigation scheduling - Water distribution system - Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam - Forces on a Gravity dam, Earth dams, Arch dams - Diversion Head works - Weirs and Barrages

UNIT IV CANAL IRRIGATION 9

Canal regulations - Canal drop - Cross drainage works - Canal outlets - Canal alignments - Canal lining - Kennedy's and Lacey's Regime theory

UNIT V WATER MANAGEMENT IN IRRIGATION 9

Modernization techniques - Rehabilitation - Optimization of water use - Minimizing water losses - On form development works - Participatory irrigation management - Water resources associations – Changing paradigm in water management - Performance evaluation - Economic aspects of irrigation

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gather the basic knowledge about crop water requirements
- familiarize with methods and management of irrigation.
- gain knowledge on types of Impounding structures

- understood methods of irrigation including canal irrigation.
- update their knowledge on water management on optimization of water use.

TEXT BOOKS

1. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009
2. Punmia B.C.,"Irrigation and water power Engineering", Laxmi Publications, 16th Edition, New Delhi, 2009
3. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi,2008

REFERENCES

1. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.
2. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
3. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.
4. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi,1999

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO2	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO3	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO4	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO5	2	-	-	-	1	1	2	-	2	-	1	2	1	1

CE16704 PRESTRESSED CONCRETE STRUCTURES 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- impart knowledge on the basic principles of prestressed concrete structures
- understand the flexure and shear design for prestressed concrete beams
- gain knowledge of factors influencing deflection and anchorage zone design
- understand the performance of composite members
- gain knowledge on various prestressed concrete structural elements

Prerequisite: Nil

UNIT I INTRODUCTION 9

Historical developments – Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Losses of prestress in post-tensioned and pre-tensioned members.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post – tensioned and pre–tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post – tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short term deflections of uncracked members, Prediction of long term deflections due to creep and shrinkage, Check for serviceability limit state of deflection – Determination of anchorage zone stresses in post-tensioned beams by Magnels method, Guyon's method and I.S. 1343 code – Design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams – Shrinkage strain and its importance ; Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tension and compression members – Design of tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- selection of various types of prestressing
- design for flexure and shear on prestressed concrete beams.
- design of anchorage zone reinforcement
- design of composite and continuous beams.
- design various prestressed concrete structural elements

TEXT BOOKS

1. Krishna Raju N., "Prestressed concrete", Tata McGraw Hill Company, Fifth Edition, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt Ltd., Second edition, 2014

REFERENCES

1. Sinha.N.C. and Roy.S.K., "Fundamentals of Prestressed Concrete", S.Chand and Co. Ltd., 2011
2. Lin T.Y. and Ned.H. Burns, "Design of prestressed Concrete Structures", John Wiley and Sons, 3rd Edition, 2010.
3. Rajagopalan.N, Prestressed Concrete, Narosa Publishing House, 2002.
4. IS1343 – 2012 – IS Code of Practice for Prestressed Concrete.
5. IS784 – 2001 – IS Specification for Prestressed Concrete Pipes
6. IS3370 – 1999 – Part III – IS Code of Practice for Concrete Structures for the storage of liquids
7. IS1678 – 1998 – Specification for Prestressed Concrete Pole for overhead Power Traction and Telecommunication lines.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO2	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO3	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO4	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO5	2	2	3	1	-	-	-	-	-	-	-	2	1	2

CE16251 INDUSTRIAL WASTE WATER ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart the basic knowledge about waste water
- know the prevention methods of industrial pollutions
- impart knowledge in various treatment process of industrial waste
- acquire knowledge on discharge of waste water
- understand various process of water management

Prerequisite: Nil

UNIT I INTRODUCTION 9

Industrial scenario in India – Uses of water by Industry – sources, generation rates and characteristics of Industrial wastewaters – Toxicity of Industrial Effluents and Bioassay Tests – Environmental Impacts of Industrial Wastewaters – Regulatory requirements for Industrial wastewaters

UNIT II INDUSTRIAL POLLUTION PREVENTION 9

Prevention versus Control of Industrial Pollution – Benefits and Barriers – Waste Minimization Strategies – Evaluation of Pollution Prevention Options – Cost benefit analysis – Payback period.

UNIT III TREATMENT OF INDUSTRIAL WASTEWATERS 9

Physico-Chemical Treatment Processes – Equalization, Neutralization, Oil Separation, Floatation , Precipitation, Aerobic and Anaerobic Biological Treatment Processes ; Sequencing batch reactors, membrane bio-reactors, Advanced oxidation and Tertiary Treatment processes for removal of dissolved organics and inorganics- Ozonation, photo catalysis, Evaporation and membrane Technologies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT 9

Individual and Common Effluent Treatment Plants – Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse – Industrial reuse, Disposal on water and land – Residuals of Industrial Wastewater treatment – Quantification and Characteristics of Sludge – Thickening, Digestion, Conditioning, Dewatering and Disposal of Sludge – Solidification – Incineration – Secured Landfills.

UNIT V CASE STUDIES 9

Industrial manufacturing process description – Wastewater characteristics, Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries – Textiles – Pulp and Paper – Metal finishing – Sugar and Distilleries.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gather the basic knowledge about industrial waste water
- understood the prevention and control of irrigation.
- retrieve the concepts of treatment process of industrial waste water
- gain knowledge on irrigation including canal irrigation.
- execute skills on water management on optimization of water use.

TEXT BOOKS

1. Eckenfelder, W.W. "Industrial Water Pollution Control", Mc-Graw Hill, 2000.
2. Mahajan, S.P.Pollution Control in Process Industries, Tata McGraw Hill Publishing Co., New Delhi, 1991.
3. S.C.Bhatia, Handbook of Industrial Pollution and Control, Volume I & II, CBS Publishers, New Delhi, 2003.

REFERENCES

1. Frank Woodard, "Industrial waste treatment Handbook", Butterworth Heinemann, NewDelhi, 2001.
2. Nelson Leonard Nemerow, "Industrial waste treatment – contemporary practice and vision for the future", Elsevier, Singapore, 2007.
3. Paul L. Bishop, "Pollution Prevention:- Fundamentals and Practice", Mc-Graw Hill International, Boston,2000.
4. Wang L.K., Yung-Tse Hung, Howard H.Lo and Constantine Yapijakis, "Handbook of Industrial and Hazardous Wastes Treatment", Marcel Dekker, Inc., USA, 2004.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	-	-	-	2	1	1
CO2	2	-	-	-	-	2	3	-	-	-	-	2	1	1
CO3	2	-	-	-	1	2	3	-	-	-	-	2	1	1
CO4	2	-	-	-	1	2	3	-	-	-	-	2	1	1
CO5	2	-	-	-	-	2	3	-	-	-	-	2	1	1

CE16252 TRAFFIC ENGINEERING AND MANAGEMENT 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- impart the fundamentals related to the traffic flow
- acquire knowledge on traffic surveys and its operation
- create awareness about the control measures for traffic signs and its regulations
- gain knowledge on accident risk and its management
- provide knowledge on traffic management measures.

Prerequisite: Nil

UNIT I TRAFFIC CHARACTERISTICS 9

Road Characteristics – Classification, Functions and standards – Road user characteristics –PIEV theory ; Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India.

UNIT II TRAFFIC SURVEYS 9

Traffic Surveys – Speed, journey time and delay surveys – Vehicle Volume Survey – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – level of service – Concept, application and significance.

UNIT III TRAFFIC ENGINEERING REGULATION AND CONTROL 9

Capacity of Rotary intersection and Design – Capacity of signalized intersections – Traffic signals, warrants, type – Design and coordination – Intersection channelisation – Grade separation ; Traffic signs and road markings.

UNIT IV TRAFFIC SAFETY AND ENVIRONMENT 9

Road accidents – Causes, effect, prevention and cost – street lighting – Traffic and environment Hazards; Air and Noise Pollution, causes, health effects and abatement measures.

UNIT V TRAFFIC MANAGEMENT 9

Area Traffic Management System – One way street system, exclusive traffic lanes, tidal flow operation, staggering of work hours and road pricing – Non road pricing options – Parking charges, Public transport, Subsidies, Vehicle License fees, Road Building, Permit system, Physical Traffic Management Transport System Management (TSM) and Transport Demand Management (TDM) – Introduction to Intelligent Transportation Systems (ITS) – ITS Applications in Traffic Management.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- analyze the various types of traffic flow
- understand traffic survey and its methods
- practice the traffic engineering regulations and its control measures
- analyse the causes and report the accident
- manage the traffic congestion using the available management measures

TEXT BOOKS

1. Kadiyali. L.R. Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2010.
2. Khanna .K and Justo C.E.G. and Veeraragavan, A Highway Engineering, Nem Chand Bros.,Roorkee, Revised 10th Edition, 2014.

REFERENCES

1. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI LearningPvt. Ltd., 2005.
2. Salter. R.I and Hounsell N.B, Highway Traffic Analysis and design, Macmillan PressLtd.1996.
3. Roger P.Roess, William R.Mcshane and Elena S.Prassas, Traffic Engineering-Second Edition, Prentice Hall Publishers,Upper Saddle River, New Jersey 1998.
4. Indian Roads Congress (IRC) Specifications: Guidelines and special publications on Traffic Planning and Management.
5. C. JotinKhisty, Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 1998.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO3	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO4	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO5	2	-	-	-	3	-	-	-	-	-	-	1	1	1

CE16253 MUNICIPAL SOLID WASTE MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- discuss the source, types and characterization of municipal solid wastes.
- know the storage methods and the processing of solid wastes.
- discuss the methods of collection and transfer stations with option under Indian condition.
- gain knowledge on the processing techniques equipment used for processing.
- understand the disposal methods of solid waste and discuss leachate collection and treatment

Prerequisite: Nil

UNIT I SOURCES AND CHARACTERISTICS 9

Sources and types of solid wastes – Quantity – factors affecting generation of solid wastes – Characteristics ; Methods of sampling and characterization ; Effects of improper disposal of solid wastes – Public health effects; Principle of solid waste management – Social and economic aspects – Public awareness ; Role of NGOs, Legislation.

UNIT II ON-SITE STORAGE AND PROCESSING 9

On-site storage methods – Effect of storage, materials used for containers – Segregation of solid wastes – Public health and economic aspects of open storage – Waste segregation and storage options under Indian conditions – Reduction, Reuse and Recycling.

UNIT III COLLECTION AND TRANSFER 9

Methods of Collection – Types of vehicles – Manpower requirement – Collection routes – Transfer stations – Selection of location, operation & maintenance – Case study under Indian conditions.

UNIT IV OFF-SITE PROCESSING 9

Processing techniques and Equipment – Resource recovery from solid wastes – Composting, incineration, Pyrolysis – case study under Indian conditions.

UNIT V DISPOSAL 9

Dumping of solid waste – sanitary landfills – Site selection – design and operation of sanitary landfills - Landfill bio reactors – Leachate collection & treatment.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- perceive the nature and characteristics of municipal solid wastes.
- attain knowledge about the regulatory requirements regarding municipal solid waste management.
- confess the waste minimization.

- evaluate the design systems for storage, collection, transport, and processing.
- attain the knowledge about the disposal of municipal solid waste.

TEXT BOOKS

1. William A. Worrell, P. AarneVesilind, "Solid Waste Engineering", Cengage Learning, 2012
2. George Tchobanoglous and FrankKreith, "Handbook of Solid waste Management", McGrawHill, New York. 2002.

REFERENCES

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization", Government of India, New Delhi, 2014.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO2	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO3	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO4	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO5	2	-	-	-	-	2	3	-	-	-	-	1	1	-

CE16254 RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge on planning of geometric design of railway
- illustrate proficiency in Railway construction & maintenance
- impart knowledge on components of Airport & Airport Authority
- understand the design concepts & orientation of Runway
- acquire knowledge on Harbour Engineering & Coastal regulation

Prerequisite: Nil

UNIT I RAILWAY PLANNING AND CONSTRUCTION 9

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods – Geometric design of railway, gradient, super elevation, widening of gauge on curves – Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 9

Earthwork – Stabilization of track on poor soil – Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying – Construction and maintenance of tracks –Railway Station and yards and passenger amenities.

UNIT III AIRPORT PLANNING 9

Air transport characteristics – airport classification – airport planning – objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations – typical Airport Layouts – parking and Circulation Area.

UNIT IV AIRPORT DESIGN 9

Runway Design – Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING 9

Definition of Basic Terms – Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours – Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures – Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Environmental concern of Port Operations – Coastal Regulation Zone 2011.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- plan and design of permanent way
- execute construction of Railway elements
- understood the terminologies in Airport & Authorities
- execute the design and orientation of Runways
- plan and design of Harbour and Coastal regulation

TEXT BOOKS

1. Subramanian.K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels. Universities Press (India) Private Limited, Hyderabad, 2015.

REFERENCES

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013
2. Bindra S P, "A Course in Docks and Harbour Engineering", DhanpatRai and Sons, New Delhi, 2013
3. SaxenaSubhash, C.andSatyapalArora, ACourse in Railway Engineering, DhanapatRai and Sons, Delhi, 1998
4. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 1994

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO2	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO3	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO4	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO5	3	-	-	-	1	-	-	-	-	-	-	2	1	1

CE16907 DISASTER MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- provide students an exposure to disasters, their significance and types.
- ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- gain a preliminary understanding of approaches of Disaster Risk Reduction
- enhance awareness of institutional processes in the country
- develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

Prerequisite: Nil

UNIT-I INTRODUCTION TO DISASTERS 9

Definition - Disaster, Hazard, Vulnerability, Resilience, Risks ; Disaster - Types of disasters - Earthquake, Landslide, Flood, Drought, Fire ; Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc. ; Differential impacts - in terms of caste, class, gender, age, location, disability ; Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change ; Do's and Don'ts during various types of Disasters

UNIT-II APPROACHES TO DISASTER RISK REDUCTION 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR- Structural - non-structural measures; Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders ; Institutional Processes and Framework at State and Central Level - State Disaster Management Authority (SDMA) ; Early Warning System - Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use ; Climate Change Adaptation ;IPCC Scenario and Scenarios inthe context of India ; Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India; Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, and Waste Management, Institutional arrangements (Mitigation, Response and Preparedness; Disaster Management Act and Policy - Other related policies, plans, programs and legislation ; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster ; Disaster Damage Assessment

UNIT V DISASTER MANAGEMENT:CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation - Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure - Case Studies; Drought Assessment - Case Studies; Coastal Flooding: Storm Surge Assessment, Floods - Fluvial and Pluvial Flooding - Case Studies ; Forest Fire - Case Studies, Man Made disasters - Case Studies; Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- differentiate the types of disasters, causes and their impact on environment and society
- assess vulnerability and various methods of risk reduction measures as well as mitigation
- draw the hazard and vulnerability profile of India and Scenarios in the Indian context
- retrieve disaster damage assessment and management.
- gain the skills on disaster management case studies and field works

TEXT BOOKS

1. A.K Gupta, Sreeja S. Nair, SandhyaChatterji. "Disaster Management and Risk Reduction", Narosa Public House, 2013.
2. Singhal J.P. "Disaster Management", Laxmi Publications, 2010.

REFERENCES

1. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
2. KapurAnu "Vulnerable India: A Geographical Study of Disasters", IIAS and Sage Publishers, New Delhi, 2010.
3. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
4. Government of India, National Disaster Management Policy, 2009.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	1	-	-	1	1	-
CO2	2	-	-	-	-	2	3	-	1	-	-	1	1	-
CO3	2	-	-	-	-	2	3	-	1	-	-	1	1	-
CO4	2	-	-	-	2	2	3	-	1	-	-	1	1	-
CO5	2	-	-	-	-	2	3	-	1	-	-	1	1	-

CE16910 ENVIRONMENTAL IMPACT ASSESSMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on Environmental management and Environmental Impact Assessment.
- know about the methodologies of Environmental Impact Assessment.
- learn about the prediction and assessment of Impact on land, water, air.
- understand the Environmental Management Plan based on the adverse impact.
- gain knowledge on various case studies.

Prerequisite: Nil

UNIT I INTRODUCTION 9

Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) – Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA - Stages of EIA – Types of EIA

UNIT II METHODOLOGIES 9

Methods of EIA – Check lists – Matrices – Networks – Cost benefits - Analysis of alternatives

UNIT III PREDICTION AND ASSESSMENT 9

Assessment of Impact on land, water, air, social and cultural activities and on flora and fauna – Mathematical models – Public participation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to the Project affected people – Post project monitoring

UNIT V CASE STUDIES 9

EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings, Water Supply and Drainage Projects – Waste water treatment plants, STP.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- carry out scoping and screening of developmental projects for environmental andsocial assessments
- explain different methodologies for environmental impact prediction and assessment.
- identify the assessment of Impact on land, water and air.
- plan environmental adverse impact assessments.
- evaluate environmental impact assessment reports.

TEXT BOOKS

1. Canter, R.L., “Environmental Impact Assessment”, McGraw Hill Inc., New Delhi, 1996.

2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

REFERENCES

1. John G. Rau and David C Hooten, "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.
2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	-	-	-	2	3	-	-	-	-	1	1	-
CO2	2	1	-	-	-	2	3	-	-	-	-	1	1	-
CO3	2	1	-	-	2	2	3	-	-	-	-	1	1	-
CO4	2	1	-	-	-	2	3	-	-	-	-	1	1	-
CO5	2	1	-	-	-	2	3	-	-	-	-	1	1	-

CE16705 ENVIRONMENTAL AND IRRIGATION ENGINEERING DRAWING 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- design and draw the coagulation and sedimentation tank in detail which showing the plan, elevation and sections.
- design and draw the rapid sand filter in detail which showing the plan, elevation and sections.
- design and draw the canal drop, canal regulator in detail which showing the plan, elevation and sections.
- design and draw the siphon aqeduct in detail which showing the plan, elevation and sections.

Prerequisite: Water Supply & Waste Water Engineering

LIST OF EXPERIMENTS

PART A : ENVIRONMENTAL ENGINEERING

1. Design and Drawing of coagulation and sedimentation tank.
2. Design and Drawing of rapid sand filter
3. Design and Drawing of screen chamber and grit chamber.
4. Design and Drawing of septic tank.
5. Design and Drawing of trickling filter.

PART B : IRRIGATION ENGINEERING

6. Design and Drawing of canal drop.
7. Design and Drawing of canal regulator cum foot path.
8. Design and Drawing of syphon aqueduct.

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- design and draw coagulation and sedimentation tank structures
- design and draw rapid sand filter
- design and draw canal drop and canal regulator
- design and draw syphon aqeduct

REFERENCES

1. Mohanakrishnan. A, "A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu", Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy, 2011.
2. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011.
3. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
4. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO2	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO3	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO4	2	1	2	-	-	2	3	-	-	-	-	2	1	2

BA16254 PRINCIPLES OF MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand history and development of management thought.
- know the planning activities in management.
- understand organizing, dimensions of organization structure, and choosing the right structural form.
- know how to manage human resources.
- understand various methods and techniques of control

Prerequisite: Nil

UNIT I INTRODUCTION TO MANAGEMENT 9

Management - Meaning, Scope, Managerial Roles - Management - Science, Art or Profession - Universality of Management - Ancient roots of management theory - Classical schools of management thought - Behavioral School - Quantitative School - Systems Approach - Contingency Approach - Contemporary Management thinkers and their contribution

UNIT II PLANNING 9

Characteristics of planning - Planning Process - Types of plans - Decision making - Decision making tools - Group decision making - Forecasting and MBO.

UNIT III ORGANIZING 9

Organizational structure and design - types of organizational structures - authority, delegation, decentralization and reengineering - Organization Size, Technology, Environment, Power- control - choosing the right structural form.

UNIT IV MANAGING HUMAN RESOURCES 9

Human resource planning – Recruitment, selection, training and development - performance appraisal - managing change - compensation and employee welfare - Leadership theory - Motivation Theory - Communication

UNIT V CONTROLLING 9

Nature of organizational control - control process - Methods and techniques of control - Designing control systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- demonstrate history and development of management thought.
- exhibit the planning activities in management.
- know organizing, dimensions of organization structure, and choosing the right structural form.
- gain knowledge how to manage human resources.
- develop various methods and techniques of control.

TEXT BOOKS

1. Management a Global & Entrepreneurial Perspective, Heinz Weihrich, Mark V. Cannice, Tata McGraw-Hill Education, 2010.
2. Management, James A.F. Stoner & R. Edward Freeman, Prentice-Hall of India Private Limited, New Delhi, 5/e, 2010.

REFERENCES

1. Management, John R. Schermerhorn, Jr., Daniel G. Bachrach, Wiley India, 13/e, 2015.
2. Essentials of Management, Joseph L Massie, Prentice-Hall India, New York, 4/e, 2013.
3. Management, S.A.Sherlekar, Himalaya Publications, Mumbai, 1/e, 2012.
4. Principles of Management, L.M. Prasad, Sultan Chand & Sons, New Delhi, 9/e, 2015.

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	1	1	2	2	2	2	2	-	-
CO2	-	-	-	-	1	1	1	3	2	2	2	2	-	-
CO3	-	-	-	-	1	1	1	3	2	2	2	2	-	-
CO4	-	-	-	-	1	1	1	3	2	2	2	2	-	-
CO5	-	-	-	-	1	1	1	3	2	2	2	2	-	-

CE16353 MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the maintenance and repair strategies.
- identify an overview of quality assurance for concrete construction and explain the serviceability and durability properties of concrete under various exposure conditions.
- explain the repair materials and techniques used in the Construction Industry.
- identify the repair, rehabilitation and retrofitting techniques to overcome the structural damage due to various exposure conditions.
- explain the demolition techniques of broken-down structures.

Prerequisite : Nil

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance-Repair and Rehabilitation - Facets of Maintenance, importance of Maintenance - Various aspects of inspection ; Assessment procedure for evaluating a damaged structure - causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9

Quality assurance for concrete - Strength, Durability and Thermal properties of concrete ; Cracks, different types, causes ; Effects due to climate, temperature, Sustained elevated temperature; Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETE 9

Polymer concrete ;Sulphur infiltrated concrete ; Fibre reinforced concrete ; High strength concrete ; High Performance concrete ; Vacuum concrete ; Self compacting concrete ;Geopolymer concrete - Reactive powder concrete - Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Non-destructive Testing Techniques - Epoxy injection, Shoring, Underpinning, Corrosion protection techniques ;Corrosion inhibitors, Corrosion resistant steels - Coatings to reinforcement, Cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Strengthening of Structural elements - Repair of structures distressed due to corrosion, fire, leakage, and Earthquake demolition techniques - Engineered demolition methods - Case studies.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- apply knowledge about the quality of concrete.
- attain knowledge about the durability aspects of concrete.
- perceive the causes of deterioration of concrete structures..
- evaluate the assessment of distressed structures.
- attain knowledge about repairing of structures and demolition procedures.

TEXT BOOKS

1. P.C.Varghese, Maintenance Repair and Rehabilitation & Minor works of building, PrenticeHall India Pvt Ltd 2014.
2. B.Vidivelli, Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009
3. Santhakumar. A.R "Concrete Technology", Oxford Higher Education, 2006.

REFERENCES

1. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008
2. Ravishankar.K.,Krishnamoorthy. T.S, Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Allied Publishers, 2004
3. DovKominetzky.M.S., - Design and Construction Failures, Galgotia Publications Pvt. Ltd.,2001
4. Hand Book on "Repair and Rehabilitation of RCC Buildings" – Director General works CPWD , Govt of India New Delhi – 2002

CO PO MAPPING

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO2	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO3	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO4	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO5	2	-	-	-	-	-	-	-	1	-	1	1	1	-

CE16952 ADVANCED SURVEYING USING TOTAL STATION 0 0 2 1

COURSE OBJECTIVE

To enable the students to

- know about the principles involved in total station.
- gain knowledge in solve the surveying problems.
- gain knowledge about the working of total station equipment
- acquire knowledge in handling electro-optical and microwave system instruments.

Course Content

Introduction – Basic Principles of Total Station – Historical Development, Classifications, Applications and Comparison with Conventional Surveying – Fundamental Parameters of Total Station – Precautions to be taken while using a Total Station – Field equipment – Setup – Setting up a back sight – Initial Setting (General Setting)

– Field book recording – Radial shooting – Traverse – Construction layout using Total Stations – Data Collection operating procedures – Digital Data – Requirements of a Data Collector – Coding of field data while using a Data Collector – Electro-optical system: Measuring principles, Working Principles, Sources of error, Infra red and Laser Total Station Instruments – Microwave system: Measuring principles, Working Principles, Sources of error, Infra red and Laser Total Station Instruments

TOTAL PERIODS 30

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- apply the basic principles and operation of Total Station.
- gain knowledge about the working of total station equipment and solve the surveying problems.
- learn techniques, skills necessary for surveying by using Total Station.
- take measurements and apply the procedure for data collection.

CO PO MAPPING:

Mapping of Course Objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3–Strong, 2–Medium, 1–Weak														
COS	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	-	2	2	2	2	2	2	-	-	2	3	-
CO2	3	2	-	2	2	2	2	2	2	-	-	2	3	-
CO3	3	2	-	2	2	2	2	2	2	-	-	2	3	-
CO4	3	2	-	2	2	2	2	2	2	-	-	2	3	-

CE16953 BUILDING VALUATION 2 0 0 1

COURSE OBJECTIVE

To enable the students to

- understand the value of building materials.
- know about the concept of building rate.
- gain knowledge in valuation of building property
- learn about different valuation standards

Course Content

Purpose of valuation – Principles of Valuation – Definition of terms such as depreciation – Sinking fund, salvage and scrap value – Site inspection and observation note – Valuation of building property by replacement cost method and rental return method – Method of calculation of Standard rent concept of Capitalized value and Years Purchase – Principles, Concepts and Methods – Market value basis of Valuation statement of standards.

TOTAL PERIODS 30

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- obtain knowledge about building valuation.
- prepare the valuation document.
- describe about building property valuation
- explain different market value based valuation standards.

CO PO MAPPING:

Mapping of Course Objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3–Strong, 2–Medium, 1–Weak														
COS	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	-	-	2	2	2	2	-	2	2	-	3
CO2	3	2	2	-	-	2	2	2	2	-	2	2	-	3
CO3	3	2	2	-	-	2	2	2	2	-	2	2	-	3
CO4	3	2	2	-	-	2	2	2	2	-	2	2	-	3