

## HHS: 205/206 INDIAN CONSTITUTION

Course: MCA	Branch:	Year / Semester:
Sessional Marks:	50	Credit: 2
End Semester Exam:	50	LTP: 2 1 0

### UNIT – I- Indian Constitution

Sources and Features, Preamble, Fundamental Rights, Fundamental Duties and Directive Principles of State Policy

### UNIT-II- Union Executive

President, Vice President, Prime Minister, Council of Ministers, State Executives- Governor, Chief Minister and Council of Ministers

### UNIT- III- Union Legislature

Parliament- Composition and Functions, Speaker of Lok Sabha, Amendment Process, State Legislature- Vidhaan Sabha, Panchaayati Raj, Institutions- History, Basic Features and 73<sup>rd</sup> Amendment

### UNIT- IV- Judiciary

Supreme Court, High Courts, Judicial Review and Judicial Activism

### UNIT-V- 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.

### Reference Books:

1. Indian Constitution : D.D Basu
2. Indian Administration: Avasthi and Avasti

### Additional Reference Books

1. The Indian Constitution: Corner Stone of a Nation, G. Austin, Oxford University Press.
2. Indian Politics: Contemporary Issues and Concerns, M. P. Singh and Rekha Saxena, Prentice Hall of India, Delhi

### Course Objectives (COs)

At the end of this course students should be able to:

1. Configure the preambles & fundamental rights.
2. Actuate the governance & functioning of constitutional functionaries.
3. Describe the functions of legislative bodies.
4. Decipher the judiciary system & its role in governance.
5. Develop a democratic process through electoral mechanism into system.



### Unit-I

Definition, Scope and importance, Need for Public awareness, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social security.

Effects of Human Activities on Environment: Agriculture, Housing industry, Mining and transportation activities, Basic of Environmental Impact Assessment, Sustainable development.

### Unit-II

Natural Resources: Water Resources – Availability and quality aspects, Conservation of water, Water borne diseases, Water induced diseases, Fluoride problems in drinking water, Mineral resources, Forest wealth, Material cycles-carbon, Nitrogen and Sulphur cycles.

Energy-Different types of energy, Electro-magnetic radiation, Conventional and Non-conventional sources, hydro electric fossil fuel based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an alternative future source of energy.

### Unit-III

Environmental Pollution: Water pollution, Land pollution, Noise pollution, Public health aspects, Air pollution, Soil pollution, Marine pollution, Thermal pollution, Nuclear hazards.

Solid Waste Management: Cause, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: Floods, earthquake, cyclone and landslides.

### Unit-IV

Current environmental issue of importance, Population growth, Variation among nations, Population explosion, Family welfare programme, Climate change and Global warming-effects, Urbanization, Automobile pollution, Acid rain, Ozone layer depletion.

### Unit-V

Environmental Protection-Role of government, Legal aspects, Initiatives by Non-Government Organizations (NGO), Environmental education, Value education, Human rights, HIV/AIDS, Women and child welfare, Case studies.

### References:

1. Dhamija, S.K. (2006). "Environmental Studies", S.K. Katariya and Sons, New Delhi.
2. Anjanayelu, Y. (2002). "Environmental Studies" B.S. Publishers, Hyderabad.

# ECS 255: CYBER SECURITY

L T P C  
0 2 0 0

## Course Outcomes:

1. Understand information, information systems, information security, Cyber Security and Security Risk Analysis. (Understand)
2. Understand and apply application security, data security, security technology, security threats from malicious software. (Understand, Apply)
3. Understand the concepts of security threats to e-commerce applications such as electronic payment system, e-Cash, Credit/Debit Cards etc. (Understand)
4. Understand and apply Information Security Governance & Risk Management, Security of IT Assets and Intrusion Detection Systems. (Understand, Apply)
5. Understand various types of Security Policies, Cyber **Ethics**, IT Act, IPR and Cyber Laws in India. (Understand).

## Syllabus

### Unit-1:

Introduction to information systems, Types of information systems, Development of Information systems, Introduction to information security, Need for Information security, Threats of Information Systems, Information Assurance, Cyber Security and Security Risk Analysis.

### Unit-2

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology- Firewall and VPNs, Intrusion Detection, Access Control, Security Threats- Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce – Electronic Payment System, e-Cash, Credit/Debit Cards, Digital Signature, public Key Cryptography.

### Unit-3

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design, Security Issues in Hardware, Data Storage & Downloadable devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

### Unit-4

Security Policies, why Policies should be developed, WWW Policies, Email Security Policies, Policy Review Process- Corporate policies- Sample Security Policies, Publishing and Notification requirement of the Policies. Information Security Standards- ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India: IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Pattern Law.

## Text and Reference Books:

1. Charles, P., and Shari Lawrence P fleeger, "Analyzing Computer Security". Pearson Education India.
2. V.K. Pachghare, "Cryptography and information security", PHI Learning Pvt. Ltd., Delhi India.
3. Dr Surya Prakash Tripathi, RitendraGoyal, and Praveen Kumar Shukla, "Introduction to Information Security and Cyber Law", Willey Dream tech Press.
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
5. Chander Harish, "Cyber Laws and their Protection", PHI Learning Private Limited, Delhi, India.

## ENVIRONMENTAL POLLUTION CONTROL (ECE 458) DE- III

L T P C 3 1 0 4

### Unit I

Impact of man on environment: Biosphere, biogeochemical cycles, ecosystem, limiting and regulatory factors, consequence of population growth, Population ecology, population growth models, competition, predation, succession

Global environmental issues: energy problem, ozone layer depletion, acid rain, land degradation.

### Unit II

Water pollution: Sources and classification of water pollutants, water quality standards, wastewater sampling and analysis, Eutrophication of lakes, Control strategies: self purification capacity of streams, waste load allocation, recent treatment technologies- phyto-remediation, bio-remediation, river bank filtration, zero valent iron etc.,

Thermal pollution: Sources, effects and control measures

### Unit III

Air pollution: Sources and effects, meteorological aspects, air pollution sampling and measurement, control methods and equipments, control of specific air pollutants, air quality standards, Indoor air quality control, statistical analysis of air quality data.

### Unit IV

**Solid waste management:** solid waste characteristics, collection and transport-hauled and stationary container systems, processing and recovery, disposal of waste- landfills, basic aspects of landfill design, leachate transfer through landfills.

Hazardous waste management and risk assessment- types of hazardous waste, health effects, treatment methods, final disposal, risk assessment

### Unit V

Noise pollution: Sources, effects, sound pressure, power and intensity, measure of noise, loudness, outdoor noise propagation, preventive and control measures, standards/limits.

Environmental impact assessment and audit.

Environmental legislation at National and international level.

### References :

1. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
2. Text of Environmental Engineering by P.V. Rao, Prentice Hall pvt ltd., Delhi
3. "Environmental Engineering: A Design Approach" by Sincero Sr, A.P. and Sincero, G.A., Prentice Hall of India Private limited, New Delhi, 1996

# ENVIRONMENTAL POLLUTION AND MANAGEMENT (ECE 491) OE-I

L T P C 3 0 0 3

## Unit 1

Impact of man on environment, consequence of population growth, energy problem, pollution of air, water and land, Global environmental issues.

## Unit II

Water pollution: Sources and classification of water pollutants, wastewater treatment, control strategies, Eutrophication of lakes, self purification capacity of streams. Waste load allocation.

Thermal pollution: Sources, effects and control measures.

## Unit III

Air pollution: Sources and effects, meteorological aspects, control methods and equipments,

Land pollution: Types of land pollution, solid waste management-generation, storage, collection, transport, processing and disposal.

Noise pollution: Sources, effects, preventive and control measures.

## Unit IV

**EIA:** Planning and management of environmental impact studies; Impact evaluation methodologies: baselinestudies, screening, scoping, checklist, overlays, Environmental impact assessment of water resources and environmental projects, Case study of power plant.

**EA:** Meaning, audit items, audit procedure, safety audit.

## Unit V

**Contemporary issues:** Emission trading, discharge permits, international resource sharing issues, climate change, international environmental treaties and protocol.

**Environmental legislation:** Introduction to various legislations related to water, air, biodiversity, ozone depletion etc at National and International level; Institutions for governance.

## References :

1. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
2. Text of Environmental Engineering by P.V. Rao, Prentice Hall pvt ltd., Delhi
3. Environmental impact assessment methodologies by Y. Ananayulu and C.A. Sastry, B.S. Publications, Hyderabad

## ENVIRONMENTAL MANAGEMENT (ECE 467) - DE -II

L T P C 3 0 0 3

### Unit I

**Introduction:** Need for environmental awareness, protection of natural and manmade systems, Impact of man on environment.

**Emerging global environmental issues:** Population growth, climate change and global warming effects, acid rain, ozone layer depletion, urbanization, automobile pollution

### Unit II

**EIA:** Planning and management of environmental impact studies; Impact evaluation methodologies: baseline studies, screening, scoping, checklist, overlays, Environmental impact assessment of water resources and environmental projects, Case study of power plant, Hydro power plant

**EA:** Meaning, audit items, audit procedure, safety audit.

### Unit III

Sustainable development, Environmental economics, environmental policy in planned, mixed and market economies,

**Emerging technologies for environmental management;** Life cycle analysis- methodology, tools and problems, Concept of ISO and ISO 14000; Environmental cost benefit analysis, Decision methods for evaluation of alternatives, Environment risk assessment, Environmental valuation: Approaches to valuation.

### Unit IV

**Contemporary issues:** Emission trading, discharge permits, international resource sharing issues, international environmental treaties and protocol.

### Unit V

**Environmental legislation:** Introduction to various legislations related to water, air, biodiversity, ozone depletion etc at National and International level; Issues involved in the enforcement of environmental legislation, Initiatives by NGO's, Initiatives by Governments, CPCB, Other institutions of governance.

### References :

1. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
2. Environmental Impact Assessment Methodologies by Y. Ananayulu and C.A. Sastry, B.S. Publications, Hyderabad

## HHS-203/204: ORGANIZATIONAL BEHAVIOR

<b>Course: IIIrd B. Tech</b>	<b>Branch: All</b>	<b>Year / Semester: 2nd Year</b>
<b>Sessional Marks:</b>	<b>50</b>	<b>Credit: 3</b>
<b>End Semester Exam:</b>	<b>50</b>	<b>LTP: 3 1 0</b>

### **Unit 1: Introduction to organizations**

What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analyzing organizational phenomena, organizational and business variables, organizations in the Indian context, institutions and structures.

### **Unit 2: Dimensions of Individual Behavior**

Individual Behavior, Dimensions of individual behavior: Perceptions, Learning, Motivation, Personality, Commitment, Attitudes, Values & Ethics, Stress Management

### **Unit 3: Dimensions of Interpersonal Behavior**

Transactional Analysis, Interpersonal communication, Listening, Feedback, Counseling,

### **Unit 4: Group Behavior**

Leadership, Communication, Group: Formal Vs Informal Groups, Group Decision making, Team: Team building, team problem solving.

### **Unit 5: Organizational Dimensions**

Organizational Structure: Elements of Organizational Structure, Dimensions of Organizational Structure, Organizational change, Organizational Development, Power, Authority, Politics

*Note: Integrating cases (s). Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays, and behavior simulation exercise.*

### **References:**

1. Luthans Fred., "Organizational Behavior", McGraw Hill, 1998
2. Pareek, Udai, "Understanding Organizational Behavior, Oxford university press

### **Additional Reference Books**

1. Robbins (4th ed.), "Essentials of organizational behavior", Prentice Hall of India Pvt. Ltd., New Delhi, 1995
2. Keith Davis, "Organisational Behaviour,
3. Hersey and Blanchard (6th ed.). "Management of organizational behavior L utilising human resources", Prentice Hall of India Pvt. Ltd., New Delhi, 1996.
4. Nancy J. Adler, "International Organisational Behaviour", Cengage Learning
5. Nelson Quick, 'Organizational Behaviour Function Learning' Fifth Edition

### **Course Objectives (COs)**

At the end of this course students should be able to:

1. Apply organizational objectives, components and models in Indian context for better results for attaining organizational goals.
2. Demonstrate individual behavioural dimensions, learning theories, perceptual process, values & ethics with motivational techniques in stressed situations.
3. Identify mechanism for, conducive survival of individual in an organization with interpersonal understanding.
4. Ascertain group, group behaviour, Team & Team building with its key role in organization.
5. Demonstrate organisational structure, organisational change, organisational development for achieving higher productivity and accomplishing goals of organisation.

**Textbooks:**

1. Computer Graphics by Hearn and Baker
2. Finite Element Method with applications in Engg. by Desai, Eldho, Shah, Pearson

**Reference books:**

1. CAD/CAM by Groover & Zimmers, PHI Ltd.
2. CAD/CAM: Theory & Parctice by Zeid & Sivasubramanian, TMH
3. CAD by Tai-Ram Hsu & Dipendra K Sinha, West Publ. Co.
4. Finite Element Method Dhanraj & Prabhkaran, Oxford Higher Education
5. Finite Element in Engineering by Singiresu S. Rao, Elsevier

**ENERGY CONVERSION (EME360)**

Type	L	T	P	Credits
PCC	2	0	2	3

**Course Objectives:** This course provides knowledge of the functioning of certain energy conversion systems in addition to those covered in Applied Thermodynamics course.

**Prerequisite:** Course on Applied Thermodynamics and I C Engines.

**Course Outcomes:**

Student will be able to

CO1	Explain working of different compressors and also carry out performance assessment
CO2	Explain and analyze the working of jet propulsion system and unconventional energy.
CO3	Elucidate the working of non conventional engines for further innovations
CO4	Evaluate power plants parametrically
CO5	Understand and analyze solar energy systems and non-conventional power plants
CO6	Evaluate performance of different energy conversion systems also to determine energy efficiency of various energy conversion systems

**Syllabus:****Unit-1****Compressors:**

Classification, Reciprocating compressors, Single and Multi stage compressors; Rotary compressors, Classification, Centrifugal compressor fundamentals, Velocity diagrams, Introduction to axial compressors, Introduction to radial flow compressors, Surging and stalling, Roots blower, Vaned compressor, Air Motors, Compressor characteristic curves.

**Unit-II**

**Jet Propulsion:** Introduction to the principles of jet propulsion, Turbojet and turboprop engines & their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

**Unconventional Energy Systems:** Thermo-ionic converters, Thermoelectric generators, Photovoltaic generators, Magneto-hydrodynamic generators, Fuel Cells and its types.

**Unit-III**



**Non-Conventional Engines:** Dual fuel and Multifuel engines, Stratified charge engine, Free piston engine, Stirling engine, Wankel rotary engine.

**Exergy analysis:** Exergy analysis of energy conversion systems – systems based on gas turbine, steam turbine.

#### **Unit-IV**

**Basics of Power Plants:** Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units.

#### **Unit-V**

**Solar Energy :** Solar Radiation, Solar Constant, Basic SunEarth Angles, Solar Radiation Geometry and its relation, Measurement of Solar Radiation, Principle of Conversion of Solar Radiation into Heat, Solar thermal collectors, Heliostats

**Non Conventional Power Plants :** Introduction to non-conventional power plants namely Solar, Wind, Geothermal, Tidal, Fuel cell based power plants etc.

#### **Textbooks:**

1. Basic and Applied Thermodynamics by P.K. Nag, Tata McGraw Hill
2. Solar Energy by S. P. Sukhatme, Tata McGraw Hill Publishing Company Ltd.
3. Thermal Turbomachines by Onkar Singh, New Age International (P) Publishers Ltd.
4. Power Plant Engineering by P K Nag, Tata McGraw Hill
5. Applied Thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
6. Non-Conventional Energy Sources by, G D. Rai, Khanna Publishers, New Delhi

#### **Reference books:**

- 1 Power Plant Engineering by R. Yadav, CPH Allahabad
2. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Wesley Long man
3. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Pub., Czechoslovakia
4. Turbines, Compressors and Fans, by S.M. Yahya, Tata McGraw Hill Pub.
5. Solar Energy - "Fundamentals Design, Modelling & Applications", by G. N. Tiwari, Narosa Publishing House

### **ENERGY CONVERSION LAB**

**Course Objectives:** It aims to provide in depth understanding of functioning of different energy conversion systems through study / experiment on such systems.

#### **Any 8-10 experiments out of the following:**

1. Determination of Indicated H.P. of I.C. Engine by Morse Test and Energy Balance Sheet preparation.
2. Determination of ihp, bhp, mechanical efficiency and heat balance of a Diesel Engine.
3. Determination of volumetric efficiency and draw indicator (P-V) diagram of reciprocating compressor
4. To draw the valve timing diagram of a four stroke diesel engine.
5. Dismantling and assembling of carburettor and its study.
6. Study of different types of fuel injection systems.
7. To study and determine the effect of A/F ratio on the performance of a Petrol engine.
8. Study of Fire Tube and Water Tube boiler models.
9. Study of Impulse and Reaction turbine models.
10. Study of Steam Engine models.
11. Study of Gas Turbine Model

## ENVIRONMENTAL ENGINEERING- I (ECE 358)

L T P C 2 1 0 3

### Unit I

Introduction

**Water Demands:** Sources, quantity and quality, Types, per capita demand, variation in demand, design period, population forecasting methods

**Water quality:** Characteristics, Water borne diseases, Quality standards

**Development of ground water:** Introduction, Zones of GW, yield, Wells-Open and Tube wells, Comparison of surface and groundwater

### Unit II

Water collection, conveyance and distribution

Types of intakes

**Conduits of transmission of water-**types, hydraulics, forces acting on conduits, material of pressure pipes, layout of water supply pipes, pipe appurtenances, testing of water mains.

**Pumps for lifting water pipe:** types, horsepower and efficiency of pumps, economical diameter of pumping mains,

### Unit III

Purification of water supplies

**Screening:** coarse and fine screens

**Plain sedimentation:** Theory, sedimentation tank, tube settlers

Sedimentation aided with coagulation: chemicals used in coagulants,

**Filtration:** Theory, types of filters, design of principles

**Disinfection:** methods, chlorination-Break point chlorination, Calculation of dose of disinfectant.

**Water softening:** methods of removing temporary and permanent hardness

**Miscellaneous:** Removal of dissolved salts, iron, arsenic, fluoride, packaged natural mineral waters, adsorption with activated carbon, ion exchange resins

### Unit IV

Distribution system

**Distribution system:** Introduction, requirements of good distribution system, layouts, methods of distribution system,

**Distribution reservoirs:** functions, types, stand pipes, storage capacity, location and height.

**Design of distribution network:** Fixing the size of pipes, analysis, Hardy Cross method.

**Appurtenances:** Fire hydrant, Water meters

### Unit V

**Water supply plumbing in building and houses:** Plumbing system, house water connection, pipe fittings, storage of water in building, design considerations for water piping system in buildings,

### Unit I

**Introduction:** Physical, chemical and bacteriological characteristics of wastewater, Composition of wastewater, Factors affecting the BOD rate of reaction, population equivalent

**Effluent disposal:** Self purification, dissolved oxygen sag curve, Streeter-Phelps equation.

Wastewater collection

Systems of sanitation, water carriage system, systems of sewerage, sources of wastewater, Estimation of quantity of municipal wastewater, Estimation of quantity of storm water, storm sewers and combined sewers. Hydraulic design of sewers, Sewer appurtenances, House drainage and plumbing systems, House disposal system: Septic tank and soak pit.

### Unit II

**Wastewater treatment and Design**

Concept, treatment methods-unit operations and unit processes,

Basic design basic considerations: Strength and characteristics of wastewater, flow rates and their function, mass loading, design criteria.

**Preliminary and primary sewage treatment:** Principles, functions and Design of approach channel, screen chamber, grit chamber, primary sedimentation tank.

### Unit III

**Wastewater Treatment**

**Secondary treatment of sewage:** Principles, functions and design of secondary treatment units- ASP, TF and oxidation pond.

**Sludge treatment:** Quantity and characteristics, concept, sludge digestion-aerobic and anaerobic, methods-sludge conditioning, dewatering, composting.

### Unit IV

**Air pollution Control:** Types and sources of pollutants, units of measurement, causes and effect of air pollution, air quality monitoring and standards, control measures, brief introduction to control devices for particulate contaminants-gravitational setting chambers, centrifugal collector, electrostatic precipitators, automotive emission control, concept of clean and biofuels.

### Unit V

**Solid waste management:** Terminology, characteristics, collection and transport, disposal methods, Design of landfills

## TOT-360: ENVIRONMENTAL ASPECTS OF OILS AND ALLIED INDUSTRIES

**L : T: P:C**  
**3 :0: 0:3**

**Preamble:**

Environmental pollution from industrial operation is important phenomenon which needs specific attention by industries. This course has been designed to make students aware environmental aspects in industrial operation in particular oil & allied industries. The course also includes study on ISO-14000 and all other environmental management system.

**Prerequisite:**

Knowledge of engineering and oil processing.

**Course Outcome:**

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

(CO1)	Understand the various pollutants and their effects on global scenario as well as effects on the processing of oils and allied products.	Understand
(CO2)	Analyze various characteristics of effluent streams.	Analyze
(CO3)	Apply the best treatment option available among the various pollution control methods.	Apply
(CO4)	Apply various waste minimization options available for reduction, recovery, reuse & recycle principles.	Apply
(CO5)	Apply Pollution prevention and environment management system. Audit, different regulations & acts for air, water & solid pollution control. Procedure of lisoning work & cost of processing for the treatment of the effluents produce in the oil & allied industries.	Apply

**Mapping with Program Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	M	M	S	M	M	M	S	M
CO2	S	S	M	S	S	M	S	M	S	S	S	S
CO3	S	S	M	S	M	S	S	S	M	S	S	S
CO4	M	M	S	M	M	S	S	M	M	M	S	M
CO5	S	S	S	S	S	M	S	S	S	S	S	S

**Assessment Pattern:**

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	4
Remember	10	10	10	10
Understand	20	20	20	20
Apply	20	30	30	20
Analyze	30	20	20	30
Evaluate	20	20	20	20
Create	0	0	0	0

**Course Level Assessment Questions:**

Course Outcome 1(CO1)

1. Review theories of water and air pollution.
2. Study sources and global impact of pollution and legislation to control them.

3. Study of by-product utilization.

Course Outcome 2(CO2)

1. Environmental management policy and regulations. Indian and global scenarios.
2. Scope of air and water pollution problems. Methods to control them and convert them to useful resources.
3. Economic consideration of waste disposal, generate energy and recover useful products.

Course Outcome 3(CO3)

1. Physical methods of separation of the sludge, which can be used for soap making, oil recovery etc
2. Waste audit.
3. Assessment of quantity of effluent.

Course Outcome 4(CO4)

1. Liquid effluent treatment technology establishes the process of ETP.
2. Reduce, recycle, recover & reuse concepts.
3. Design of effluent treatment plant.

Course Outcome 5(CO5)

1. Solid biological sludge digestion.
2. Application of solid sludge.
3. Recoveries from flue gas including heat recovery.
4. Air pollution control equipments and devices.

**Syllabus:**

**Module-I**

**Industrial pollution and its impact**

Magnitude of industrial waste, Legislative regulations. Recycle and reuse of waste water, recovery of by-products from industrial effluents.

**Module-II**

**Environmental Management Policy and Regulations**

Environmental policy global and Indian scenario, scope of air and water pollution problems, economic considerations of waste disposal, separation and segregation of wastes, gaseous, liquid and solid waste disposal with special reference to oils and allied product processing CPCB/ state pollution control board guidelines and regulations.

**Module-III**

**Waste Management**

Pollution prevention and environment Management system ISO 14000. Waste audit, Different regulation means & acts for air, water & solid pollution control.

**Module-IV**

**Liquid Effluent Treatment Technology**

Pretreatment methods, centrifugation, filtration, evaporator and concentrator, extraction and distillation, treatment of dilute waste water. Treatment requirements, neutralization liquid-solid separation, biological oxidation, plant control programme, absorption, liquid phase system, reclamation of waste water effluent and by-product recovery, ion exchange system, acid and alkali purification, continuous ion-exchange, Case studies on vegetable oil processing, soaps and detergents.

**Module-V**

**Solid & Gas Effluent treatment**

Waste gas treatment: spent earth, catalyst, fly ash boiler ash, Air pollution control by mechanical method: mechanical collectors, electrostatic precipitator, filters, wet scrubbers, vapour phase system, activated carbon. Typical air purification system.

**Text Books:**

1. Air Pollution Engineering, S.K.Garg, Khanna Publishers(2016), Dariya Ganj, New Delhi.

2. Waste Water Engineering, Metcalf Eddy, Tata McGraw-Hill publishing Company Ltd. (1990) 2<sup>nd</sup> edition, New Delhi.

**Reference Book:**

1. Waste management for Sustainable Development in India by Nonita T Yap & S.K Awasthi, Tata McGraw-Hill publishing Company Ltd. New Delhi.
2. Industrial waste management study at Kanpur by S.K Awasthi & R.K.Trivedi (2001), Wisdom Publishing House.

**Course contents and Lecture schedule:**

Module No.	Topic	No. of Lectures
<b>1.</b>	<b>Industrial pollution and its impact</b>	
1.1	Magnitude of industrial waste, Legislative regulations	3
1.2	Recycle and reuse of waste water	2
1.3	Recovery of bye-product from industrial effluents	3
<b>2.</b>	<b>Environmental Management Policy and Regulations</b>	
2.1	Environmental policy global and Indian scenario	2
2.2	Scope of air and water pollution problems	2
2.3	Economic considerations of waste disposal	2
2.4	Separation and segregation of wastes, gaseous, liquid and solid waste disposal with special reference to oils and allied product processing CPCB/ state pollution control board guidelines and regulations	2
<b>3.</b>	<b>Waste Management</b>	
3.1	Pollution prevention and environment Management system ISO 14000, Waste audit	3
3.2	Quality management systems	2
3.3	Different regulation means & acts for air, water & solid pollution control	3
<b>4.</b>	<b>Liquid Effluent Treatment Technology</b>	
4.1	Pretreatment methods, centrifugation filtration, evaporator and concentrator, extraction and distillation	2
4.2	Treatment of dilute waste water. Treatment requirements, Neutralisation liquid-solid separation, biological oxidation	2
4.3	Plant control programme, absorption, liquid phase system	2
4.4	Reclamation of waste water effluent and by-product recovery, ion exchange system	2
4.5	Acid and alkali purification, continuous ion-exchange, Case studies on vegetable oil processing, soaps and detergents	2
<b>5.</b>	<b>Solid &amp; Gas Effluent treatment</b>	
5.1	Waste gas treatment: spent earth, catalyst, fly ash boiler ash	2
5.2	Air pollution control by mechanical method: mechanical collectors, electrostatic precipitator	2
5.3	Filters, wet scrubbers, vapour phase system, activated carbon. Typical air purification system	2
<b>Total</b>		<b>40</b>

**(Anand Kumar)**  
Dean of Academic Affairs